BRITISH COLUMBIA
MINISTRY OF FORESTS

Golden
Timber Supply Area

Rationale for
Allowable Annual Cut (AAC)
Determination

Effective January 1, 2000

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Chief Forester

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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 Golden timber supply area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TSA

The Golden TSA is located in southeastern British Columbia within the Nelson Forest Region and covers approximately 893 000 hectares. The TSA is bounded by the Selkirk and Purcell Mountains to the west and the Rocky Mountains to the east. It straddles the Rocky Mountain Trench and the upper Columbia River Valley northward to the Big Bend area near Mica Dam. The TSA is bordered by five national parks: Kootenay, Yoho, Banff, Jasper and Glacier, as well as Hamber and Cummins Lakes provincial parks.

The Golden TSA area is sparsely populated, with 5856 residents (1996 census) of which about 67 percent (about 4000 people) live in the town of Golden. The TSA is administered by the Columbia Forest District office located in Revelstoke and an office in Golden.

The forest industry provides a substantial source of revenue and employment in the Golden TSA. In 1996, the forest sector accounted for 18 percent of the TSA's total employment. The major forest licensees in the TSA are Evans Forest Products Limited and Wood River Forest Incorporated. While Evans processes much of its timber in Golden, Wood River's timber is processed mainly in Revelstoke.

The Trans-Canada Highway and major railways pass through the south-central part of the TSA providing relatively easy access to an area of outstanding mountain scenery. Tourism is also important in the Golden TSA economy. Other significant sectors in the TSA include transportation and services due to the community's position on national east-west transportation routes.

The Golden TSA is within the traditional territory of the Ktunaxa Nation and Shuswap Nation. The Ktunaxa Kinbasket Tribal Council has submitted a comprehensive land claim, which covers the southeast corner of the province, including the Golden TSA. Currently, there are no First Nations reserves or communities within the Golden TSA.

Numerous natural resources are associated with the forest land base. Forest products, recreation and tourism amenities, and significant wildlife habitat highlight the wide range of values found in the Golden TSA.

Most of the TSA lies within the interior wet belt of the province. The mountainous environment has a varied climate and growing conditions, resulting in diverse forests. In wetter parts of the TSA, lower elevations are occupied predominately with western redcedar, western hemlock and spruce species, with stands of spruce and subalpine fir occupying most of the higher elevations. Some southern parts of the TSA experience a drier climate, with Douglas-fir forests in valley bottoms and lodgepole pine at higher elevations. Throughout the TSA, mountain peaks are covered by large areas of alpine

tundra, rock and ice. Because of the rugged, mountainous landscape, a relatively small portion of the TSA consists of productive forest land.

The diverse forest environments provide habitat for a wide variety of wildlife species. Approximately 274 bird, 63 mammal, 9 amphibian and 8 reptile species inhabit the TSA area. Some of the more well-known large mammal species include black bear, grizzly bear, moose, elk, mule deer, mountain goat, bighorn sheep and mountain caribou.

History of the AAC

In 1981, the AAC for the Golden TSA was 650 000 cubic metres. Effective January 1, 1995, the AAC was reduced by 17 percent to 540 000 cubic metres. The harvestable volume for the area is apportioned as follows:

Apportionment	cubic metres/year	percentage
Replaceable Forest licences (2)	426 543	79.0
Small Business Forest Enterprise Program	81 911	15.2
Forest Service Reserve	29 887	5.5
Woodlot licences	1 659	0.3
Total	**540 000**	**100.0**

New AAC determination

Effective January 1, 2000, the new AAC for the Golden TSA will be 530 000 cubic metres. This 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 of the present determination.

Information sources used in the AAC determination

- *Golden Timber Supply Area (TSA) Data Package and Information Report*, British Columbia Forest Service (BCFS), September 1997;
- *Golden TSA Analysis Report*, BCFS, August 1998;
- *Golden TSA Public Discussion Paper*, BCFS, August 1998;
- *Golden TSA Summary of Public Input on Data Package and TSA Analysis Report*, BCFS, November 1998 (draft);
- *Golden TSA Inventory Audit*, BCFS Resource Inventory Branch, 1995;
- *Pre-Inventory Assessment Golden TSA*, BCFS, January 1996;
- *Kootenay/Boundary Land Use Plan Implementation Strategy*, Kootenay Inter-Agency Management Committee, June 1997;
- *Working Paper 36/1998, Site Index Adjustments for Old-growth Stands based on Veteran Trees*, Nigh, G.D., BCFS Research Branch, 1998;
- *Working Paper 37/1998, Site Index Adjustments for Old-Growth Stands Based on Paired Plots*, Nussbaum, A.F., BCFS Research Branch, 1998;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province;

- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources;
- Letter from the Deputy Ministers of Forests and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts on timber supply from biodiversity management;
- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the BCFS, including the AAC determination meeting held in Revelstoke, November 18 and 19, 1998;
- *Golden Timber Supply Analysis*, BCFS, July 1993;
- *Golden TSA Rationale for AAC determination*, BCFS, August 1994;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Act Regulations and Amendments*, April 1995;
- *Forest Practices Code of British Columbia* Guidebooks, BCFS and MELP;
- *Biodiversity Guidebook*, Province of British Columbia (B.C.), September 1995;
- *Riparian Management Area Guidebook*, B.C., December 1995;
- *Community Watershed Guidebook*, B.C., October 1996; and
- *Forest Practices Code Timber Supply Analysis*, BCFS and MELP, February 1996.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for the Golden TSA, I have considered 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 particular factors in determining AACs for timber supply areas and tree farm licences. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires a reasonable degree of consistency of approach in incorporating these changes and uncertainty. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it may be necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

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

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of 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 me 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 either 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 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).

The *Forest Practices Code of British Columbia Regulations* were approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Code is now fully implemented following the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still 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, the eventual timber supply impacts associated with land-use decisions resulting from the various planning

processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy, and Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions. However, where 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 no longer considered to contribute to the timber supply in AAC determinations.

In the Golden TSA, clarification has been provided on many aspects of land and resource use by government's approval of the Kootenay/Boundary Land Use Plan and follow-up Implementation Strategy, and by decisions on protected areas.

Forest Renewal British Columbia funds a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

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 redetermine 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 recent decisions in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting the Crown's obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Golden 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 my obligation as steward of the forest land of British Columbia, 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 the *Forest Practices Code of British Columbia Act*.

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 (FSSIM), a series of timber supply forecasts is produced, reflecting different decline rates, starting harvest levels, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid 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 its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These 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, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Base case for the Golden TSA

The base case in this timber supply analysis incorporates a number of significant changes from the base case that was generated in the 1993 analysis used in the 1995 AAC determination. The specific assumptions used in this analysis are discussed in detail in the considerations presented below in the appropriate sections of this document. In overview, they include changes incorporated to reflect the following:

- the Forest Practices Code, including provisions for both stand- and landscape-level biodiversity, has been factored in (the Code was not in effect during the previous determination);
- a new protected area, Cummins Lakes Provincial Park, has been formally established and removed from the Golden TSA; this area therefore no longer contributes to the timber harvesting land base;
- the Kootenay/Boundary Land Use Plan Implementation Strategy (June 1997) was approved by the provincial government and now reflects current management practices
- the results of an inventory audit for the Golden TSA, completed in 1995, have been taken into account
- improved volume estimates for existing mature stands have been used
- improved volume estimates for regenerated stands have been used
- an updated timber supply model (new version of FSSIM) has been used to consider management guidelines and produce timber supply forecasts
- an updated analytical approach was taken in the timber supply analysis including assessment of how non-contributing lands (outside the timber harvesting land base) contribute to achievement of resource objectives such as biodiversity.

With these changes and other appropriate factors incorporated, a “base case” was generated and submitted for public review, as follows.

In the "base case" forecast, an initial harvest level of 535 000 cubic metres was chosen. This level represents the current AAC of 540 000 cubic metres minus a 5000-cubic metre reduction to allow for the allocation of woodlot licences in the period between the previous AAC determination (January 1, 1995) and this current determination. (In fact the actual allocated volume was larger, as discussed below under *woodlot licences*.) The base case indicates that this initial harvest level of 535 000 cubic metres could be maintained for two decades (starting from the 1994 inventory update) followed by a decline of 10 percent in the third decade and 7 percent in the fourth decade, before reaching a long-term harvest level of 446 000 cubic metres per year.

In addition to the base case, I was also provided with a number of sensitivity analyses and projections of alternative harvest flows carried out using the base case as a reference. All of these analyses have been of assistance to me in considering the factors leading to my determination.

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 Golden TSA, as estimated from inventory data updated to 1994 by the BCFS to account for changes such as the deletion of the Cummins Lakes Provincial Park, woodlot licences, etc., and reported in the August 1998 timber supply analysis, is 893 352 hectares. Of this, 295 797 hectares (about 33 percent) are productive Crown forest land.

As part of the process used to define the timber harvesting land base (i.e. the land base estimated to be economically and biologically available for harvesting), a series of deductions were made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for economic or ecological reasons. In timber supply analysis, assumptions, and if necessary, projections, must be made about these factors prior to quantifying appropriate areas to be deducted from the productive forest area in order to derive the timber harvesting land base.

In deriving the timber harvesting land base for the Golden TSA, deductions were made to account for numerous factors such as non-commercial cover and stand-level biodiversity. A detailed accounting of the areas deducted is given in the analysis report, and is summarized in Table 3 of that report. After the deductions, the current timber harvesting land base for the Golden TSA was estimated to be 166 615 hectares—56.3 percent of the productive area, or 18.7 percent of the total TSA area.

In general this represents, in comparison with the timber harvesting land base in the previous (1993) timber supply analysis, a reduction of roughly 8000 hectares—about 5000 hectares of which are attributable to Cummins Lakes Provincial Park.

My consideration of these deductions is as follows:

- *non-commercial cover*

For the analysis, a total of 2090 hectares were deducted from the productive forest land base for non-commercial cover (brush). Since this is in accordance with the best available information from the inventory files, I accept this deduction as appropriate.

- *inoperable areas*

Those portions of the TSA which are not physically accessible for harvesting, or which are not feasible to harvest economically, are excluded in deriving the timber harvesting land base. In the analysis, a total of 82 459 hectares were removed as inoperable.

Inoperable areas were determined primarily by a 1989 operability assessment carried out jointly by the BCFS and forest licensees for the majority of the TSA. The assessment focused primarily on conventional/cable and obvious helicopter harvesting opportunities, and included economic and regeneration considerations. This assessment was also used to support the 1994 AAC determination.

In his rationale for the 1994 AAC, the former chief forester requested that this operability assessment be evaluated for the next timber supply analysis. District staff have undertaken some studies to evaluate the operable land base, but resources have not permitted full completion of the task.

One study completed mostly by licensees was incorporated into the present analysis. This assessment concluded that the Bluewater north drainage (454 hectares) is inoperable due to access problems and this area was deducted from the timber harvesting land base derived for the base case.

Since the timber supply analysis was undertaken, BCFS district staff have reviewed more refined assessments of operability in nine areas with Total Resource Plans (TRPs) covering nearly 8 percent of the timber harvesting land base of the TSA, mainly in northern parts of the TSA with more rugged terrain. In these TRP areas the combined estimated timber harvesting land base of 12 750 hectares is 187 hectares (1.5 percent) less than that estimated from the 1989 operability study. However, one of the TRP areas was the Cummins, which is now removed as a park. Excluding this area from the land base assessment gives a net increase in the timber harvesting land base in TRP areas of 150 hectares (1.5 percent) over that in the 1989 study.

This limited change could appear to generally confirm the timber harvesting land base as assessed from the 1989 study. However, district staff are uncertain of this conclusion since substantial parts of the refined ‘operable’ areas have not been proposed for harvesting in recent Development Plans and Silvicultural Prescriptions (SPs).

BCFS district staff made another assessment of about 4000 hectares in SPs from 1995 to 1998. This showed that about 5 percent of the SP area (i.e. the area intended for timber harvesting) included forests that were considered to be inoperable, based on the 1989 study, while 9 percent of the forests assumed to be operable based on the 1989 study were excluded from the SP area due to operability problems. This resulted in a net 180-hectare (4-percent) decrease in the timber harvesting land base in the SPs due to inoperability. Because the area in this review was comparatively small and not necessarily representative of the TSA, district staff do not feel the results can be validly extrapolated to other areas until a more comprehensive evaluation of operability can be completed.

District staff also undertook a cursory review of the 1989 operability study to note any obvious changes not already picked up by the assessments noted above. This identified about 2000 hectares as physically or economically inoperable.

Public input included concerns about the accuracy of the 1989 operability study, a desire for a more comprehensive review of operability, and a request from one licensee to review and comment on the SP assessment noted above.

From the foregoing information it is evident there is some uncertainty in the size of the operable land base and thus in the timber supply projection. The SP review indicates an overestimation of about 180 hectares in the timber harvesting land base. The overview study indicates a further potential overestimation of up to 2000 hectares, but licensees have not yet reviewed the study and not all of this area may be confirmed as inoperable. In combination these figures indicate a potential overestimation of up to 2180 hectares, or 1.3 percent of the timber harvesting land base, with a corresponding overestimation in the base case projection throughout the forecast period. I have taken this into account in my "Reasons for Decision."

Reducing uncertainty in the operable area is an important issue in the Golden TSA. Unfortunately, the necessary resources were not available for a comprehensive review of the 1989 study before the current analysis. The remaining uncertainty can only be reduced by a thorough review of operability, which I strongly encourage when resources permit.

- *environmentally sensitive areas*

The identification of environmentally sensitive areas (ESAs) in the Golden TSA is based on inventory work carried out in the late 1970's. In deriving the timber harvesting land base for the TSA, a total area of 9982 hectares, or 3.4 percent of the productive forest was removed to account for ESAs with high sensitivity. This included areas with difficult soil conditions (7703 hectares), potential regeneration problems (1936 hectares), watershed sensitivity (158 hectares), wildlife habitat (141 hectares), avalanche concerns (36 hectares) and recreation values (8 hectares).

In the analysis a high exclusion factor was applied to areas with high sensitivity (e.g. 90 percent was deducted from the land base in ESAs due to soils and regeneration concerns) consistent with the approach frequently taken in timber supply analysis.

Since the timber supply analysis was undertaken, BCFS staff have reviewed silviculture prescriptions from 1995 to 1998 concerning harvest in ESA areas. The review of about 4000 hectares showed a net 4-percent decrease in the timber harvesting land base in the SP areas due to high-sensitivity ESAs. This SP review is a small and not necessarily representative sample of the TSA; therefore staff do not feel the results can be extrapolated to other areas until a more comprehensive review can be completed. The analyses, however, did confirm that very little timber harvesting occurs in high-sensitivity ESAs, suggesting that the high exclusion factor applied to these areas is reasonable.

ESAs with moderate sensitivity (ESA2) were not excluded from the timber harvesting land base. BCFS district staff confirm that harvesting is taking place in these areas in a manner that addresses identified environmental sensitivity. A review of the ESA2 areas confirms that they overlap significantly with management zones which have constraints applied in the analysis that reflect the sensitivity of these sites. For example, most (6500 of 7700 hectares) of the ESA2 designations are "EW2" (i.e. sensitive for wildlife habitat). The location of these zones overlaps with the caribou zone, to which two forest cover constraints were applied in the analysis to reflect the sensitivity of managing in these areas. Given current management within the TSA I am satisfied that the ESA2 designation has been adequately accounted for in the analysis. From these considerations I find that ESAs were properly recognized and reasonably reflected in the analysis. I therefore accept the ESA deductions, taken in context of other land-base considerations, as suitable for the purposes of this determination.

- *deciduous stands*

In the Golden TSA, deciduous volumes are not currently used in local mills and are not billed against the AAC for cut-control purposes. The majority of deciduous stands are comprised of aspen and are located in southern portions of the TSA. In the previous (1993) timber supply analysis, all predominately deciduous stands (6348 hectares) were excluded from the timber harvesting land base. In this analysis, all predominately deciduous stands and all deciduous volumes in predominately coniferous stands were excluded, resulting in a total reduction of 10 629 hectares.

About 4500 hectares of deciduous stands excluded from the timber harvesting land base are very young aspen stands (less than 40 years of age) that BCFS district staff feel may become predominately coniferous as the stands age. In addition, district staff note that some older predominately deciduous stands have coniferous understories which are likely to yield coniferous volumes eventually.

This indicates that in the base case analysis the future timber harvesting land base may have been underestimated by about 4500 hectares or 2.7 percent, although the projected short-term timber supply is unaffected. I have taken this into account in my determination as discussed in "Reasons for Decision".

- *low timber productivity*

In the timber supply analysis, 2112 hectares were deducted to account for areas having low timber productivity. Sites were considered to be of low productivity if they were unable to produce a minimum stand volume by a particular age. For example, cedar-hemlock sites were classified as having low productivity if they were unable to produce a minimum volume of 200 cubic metres per

hectare by 200 years. Similarly, pine sites were considered to be of low productivity if they were unable to produce a minimum volume of 150 cubic metres per hectare by 150 years. These criteria were applied in the analysis to all sites carrying mature forest stands but not to sites carrying immature stands, as discussed below.

District staff indicate that there is some uncertainty associated with the criteria used as they are based on their best judgement rather than on an analytical study. I encourage BCFS staff to undertake field assessments before the next analysis in order to better determine which low productivity sites can in fact contribute to the timber harvesting land base, and which should be excluded.

(1) immature stands:

BCFS staff noted after the analysis was completed that the low-site criteria were only applied to mature stands already above the indicated age. Volumes in younger stands should have also been projected to determine if they could achieve the minimum volume by the indicated age. Subsequent work by staff shows that an additional 7595 hectares of younger stands on sites of low productivity should have been deducted as well. This additional deduction would have made the approach taken in the timber supply analysis closer to that taken for this factor in the previous (1993) timber supply analysis.

In my determination I have taken this into account as an overestimation of up to about 7600 hectares, or 4.6 percent, in the long-term timber harvesting land base, as discussed in "Reasons for Decision".

(2) mature spruce stands:

In the analysis for existing mature stands, I note that some predominately spruce (including spruce/balsam) sites with very low site indices (SI 5-9) were not excluded from the timber harvesting land base, as is common practice in other units. District staff report some harvesting of sites classified as having low productivity, but this appears to occur more commonly on sites where productivity is known to have been underestimated. The inventory audit for the Golden TSA tends to support this observation, in that seven of nine audit samples with site indices noted in the inventory files as being below 10 actually had a ground-based site index of higher than 10.

At the determination meeting, I asked BCFS district staff to review these stands further. It was found that there are 10 877 hectares of predominately spruce stands with a site index of 9 or less that are assumed in the analysis to contribute to the timber harvesting land base. Aerial photos for 47 of these stands (totalling 6003 hectares) were examined and staff concluded that 20 percent of the area should be deducted from the land base due to low site productivity. Extrapolating the 20 percent reduction to the entire area of low site spruce (a 10 877-hectare area), staff estimate that the timber harvesting land base appears to be overestimated by 2175 hectares, or 1.3 percent, based on this factor.

The BCFS district staff review was reasonably thorough and I accept the conclusion that about 2175 hectares should not have been included in the timber harvesting land base based on this assessment of low-site mature spruce stands. The relatively low volumes associated with these stands, however, mean that they contribute less to the timber supply than more productive growing sites. I have accounted for these considerations in my "Reason for Decision".

- problem forest types

Problem forest types are those non-merchantable stands that are physically operable and exceed low-site criteria yet are not currently utilized. These types were identified based on current forest management practices and recent harvesting performance and were excluded from the timber harvesting land base. For this analysis, these types were stands primarily composed of pulp material such as some predominately hemlock stands. In this analysis, 1255 hectares of problem forest types were deducted from the land base.

In the previous (1993) timber supply analysis, additional stand types were also considered problem forest types and either fully or partially deducted. District staff have some concerns regarding the accuracy of the species classification within the inventory files for problem forest type areas (see discussion in "Existing forest inventory"). Analysis by district staff in the last 5 years indicates that those additional stand types as identified in the inventory files are being harvested. Therefore they were not deducted for this timber supply analysis.

District staff are confident that the current accounting for this factor adequately reflects current harvest profile. I therefore accept the deductions for problem forest types as applied in the base case as suitable for use in this determination.

- roads, trails and landings

(1) existing roads, trails and landings:

In the timber supply analysis, a deduction of 5315 hectares (about 3.2 percent) was made from stands potentially contributing to the timber harvesting land base to account for 3322 kilometres of existing logging roads which have an assumed average width of 16 metres. The estimate for the length of the roads was derived from a recent GIS-based analysis data set that is considered by BCFS staff to be more accurate than the estimate used in the previous (1993) timber supply analysis.

In the current analysis, however, a deduction for landings and skid trails was inadvertently omitted. For landings, a 1988 study in the TSA indicates that a 3-percent land base reduction should be applied to areas supporting very young stands (20 years of age or less) and to areas classified as not-satisfactorily- restocked (NSR). This results in the need for a combined additional reduction of 1200 hectares.

For skid trails, based on field assessments, MOF staff conclude that an additional 3-percent reduction applied to very young stands and NSR sites would provide a reasonable accounting. This would necessitate a further 1200-hectare reduction.

Applying these proposed deductions totalling 2400 hectares, or roughly 1.4 percent of the timber harvesting land base, for landings and skid trails, would result in a combined overall reduction for existing roads, trails and landings of about 4 percent of the timber harvesting land base, which is of a similar magnitude to deductions in other units. I accept the proposed correction as reasonable, and note that it causes no impact on the short-term timber supply, as the deductions are made to young stands and NSR sites. I have taken the resulting overestimation in the long-term timber supply into account as discussed in "Reasons for Decision".

(2) future roads, trails and landings:

In deriving the long-term timber harvesting land base for the timber supply analysis it was assumed that in the future 8522 hectares will need to be removed from the land base to account for future roads, trails and landings. In deriving this figure, district staff estimated that about 4 percent of the area of immature stands currently over 30 years of age will be needed for future roads to access these stands when they reach harvestable age. Based on the 1998 study referred to above, staff estimate an additional 3-percent reduction must be applied to these stands to account for future landings.

Public comments included concern that these reductions may be excessive. However, the combined 7-percent reduction applied to future harvestable stands currently older than 30 years to account for future roads, trails and landings is consistent with guidelines for soil conservation under the Code, and in my judgement represents a reasonable deduction for operations in the mountainous topography that characterizes the Golden TSA.

I am therefore satisfied that the deductions in the analysis for future roads, trails and landings are acceptable, and I note that any related uncertainty does not affect timber supply projections for the short-term, since the standing merchantable volumes will be harvested before new roads, trails and landings are constructed.

- *riparian habitat*

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires 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. Stream classes described in the *Riparian Management Area Guidebook* are determined, to estimate the area needed in riparian reserves and riparian management zones.

To support the analysis, stream classes were estimated using the watershed atlas and methods (including a sample design) developed by regional BCFS and MELP staff. Application of the *Guidebook* to these stream classes resulted in a 7167-hectare deduction in deriving the timber harvesting land base used in the analysis.

District staff note that some smaller streams are not shown on the watershed atlas due to the 1:50 000 scale of mapping. Larger scale 1:20 000 TRIM maps do show smaller streams, but do not have the additional information needed to classify them. Any new information which can be developed to help to reduce uncertainty in this regard should be incorporated in the analysis for the next determination. In the meantime I am mindful of the fact that the smaller stream classes do not constrain the timber harvesting land base nearly as much as the larger streams and therefore I feel that waiting for better information does not introduce an unacceptable level of risk to this decision.

For the present determination, while some uncertainty is evident with respect to the potential for overlooked smaller streams, in my judgement the approach taken does provide, overall, a reasonable and adequate accounting for riparian habitat. On this basis I am prepared to accept the current assessment as the best available information and satisfactory for use in this 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 the stand and landscape levels.

Stand-level biodiversity is managed in part by retaining reserves of mature timber or wildlife tree patches (WTP) within cutblocks to provide structural diversity and wildlife habitat. In considering stand-level biodiversity for this analysis, a weighted average of the WTP guidelines noted in the *Biodiversity Guidebook* was assumed and, further, that 25 percent of the WTPs would come from the non-contributing land base. In the Golden TSA, established WTPs are often greater than 2 hectares, and in the analysis are assumed not to contribute to the timber harvesting land base. However, they are assumed to contribute to the seral-stage targets for landscape-level biodiversity, as discussed below under "Integrated Resource Management objectives". As a consequence of the above assumptions, 8171 hectares were excluded in deriving the timber harvesting land base for the analysis, to account for stand-level biodiversity.

Public comment from the forest industry reiterated the need to ensure that WTP provisions come from the non-contributing land base as much as possible, which is in fact current practice and was a consideration in the analysis.

Another stand-level biodiversity component, coarse woody debris, was not specifically addressed in the analysis. District staff are confident that, due to the age and nature of most stands in the TSA, if coarse woody debris objectives are established in the future, they are likely to be readily achieved through normal utilization practices, and in the absence of any clear evidence to the contrary I consider this to be a reasonable assessment for the purpose of this determination.

I consider the average assumed retained cover from wildlife tree patches to be reasonable, and I am therefore satisfied that the requirements of stand-level biodiversity are adequately accounted for in the Golden TSA base case analysis.

- *protected areas*

Since the 1993 timber supply analysis was undertaken, Cummins Lakes Provincial Park has been legally established by Order-in-Council (OIC). Most of the protected area has been established under the *Park Act*, but about 1000 hectares are under the *Environment and Land Use Act* to allow for a resource road in the future, if this should be required. The establishment of this new protected area completes the Protected Areas Strategy for the Golden TSA portion of the Kootenay/Boundary Land Use Plan.

The timber supply analysis was undertaken before the protected area was legally designated. However, the area anticipated for designation—including that part formerly within the timber

harvesting land base—was assumed to be removed from the TSA. Thus no contribution to the timber supply was assumed from the protected area. Although the precise boundary for the protected area was not used in the analysis, the number of hectares assumed to be removed reasonably reflects those actually designated. I am therefore satisfied that for the purposes of this determination the protection of this area was adequately accounted for in the timber supply analysis.

- woodlot licences

The *Forest Act* requires AACs determined for TSAs to be exclusive of the areas and timber volumes allocated to woodlot licences. Thus, when woodlot licences are issued in 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 Golden TSA, effective January 1, 1995, approximately 4500 hectares of the timber harvesting land base in the TSA have been allocated to woodlot licences, with an associated total timber volume of 9108 cubic metres.

In the 1998 timber supply analysis these woodlot licence allocations were only partly accounted for, by a deduction of approximately 2500 hectares in deriving the timber harvesting land base, and by an initial base case harvest level established at 535 000 cubic metres, 5000 cubic metres below the AAC of 540 000 cubic metres, as noted above in "Base case for the Golden TSA".

Thus to fully account for the actual area and volume allocated to woodlot licences between the 1995 determination and the date of this present determination—i.e. 4500 hectares and 9108 cubic metres respectively—the timber harvesting land base assumed in the analysis must be further reduced by approximately 4500 minus 2500 = 2000 hectares, and the base case initial harvest level must be reduced by a further 9108 minus 5000 = 4108 cubic metres. These figures imply a realized mean annual increment on this area of two cubic metres per hectare per year. However, to ensure a full accounting for the implications over time of removing the 2000 hectares from the timber harvesting land base in the TSA, I have reasoned further, as follows.

In my "Reasons for Decision", I refer to alternative timber supply projections in which several changes are made to the assumptions in the base case in accordance with considerations discussed in this rationale. From the ranges of projected long-term harvest levels and contributing land bases represented in these analyses, I have derived a mid-range value for the realized long-term average mean annual increment in the TSA. Applying this average value indicates that over time the removal of the approximately 2000 hectares for woodlot licences will remove from the TSA an average of approximately 5000 cubic metres per year.

Finally, I note that the woodlot program has been administered out of the apportionment for the TSA from both the Forest Service Reserve and the woodlot categories. Clearly there is sufficient volume remaining in these two categories to account for the transfer of the 5000 cubic metres to the separate administration under the woodlot program (i.e. outside the AAC for the TSA) without impacting or causing a reduction in other existing licenses within the TSA.

Therefore, in my determination, as noted below in "Reasons for decision", I have accounted for a further reduction of 2000 hectares to the timber harvesting land base, and for a volume deduction of 5000 cubic metres, to fully account for woodlot licences issued since the 1995 AAC determination.

- *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 TL area.

For the Golden TSA, there are eight remaining TLs totalling about 4000 hectares—all of which are due to expire between 2000 and 2008. In the analysis all of these areas were assumed to be already reverted back to the TSA.

This assumption introduces little risk to the analysis since only a relatively small area is involved, the time period before actual reversion takes place is short, and no contribution to the timber supply was assumed until harvestable age is reached. Any associated constraint on timber supply is not considered significant and in any case acts primarily in the very long term. I therefore consider the slight difference in the assumed reversion schedule to be acceptable for the purpose of this determination, and I suggest that this factor should be modelled more accurately at the time of the next determination.

Existing forest inventory

- *current inventory*

The inventory used for the timber supply analysis is based on a forest inventory completed for the Golden TSA in 1968 and updated to mid-1994 to account for growth, disturbances such as harvesting and fires, and silvicultural treatments. The starting year of the timber supply forecast in the analysis is 1994. The average harvest rate in the last four years has been 330 000 cubic metres per year on about 900 hectares per year, which is below the initial harvest level of 535 000 cubic metres projected in the base case.

To address uncertainties in the last AAC determination, the chief forester in his rationale directed BCFS staff to complete an inventory audit prior to the next analysis, which has been done. The audit reviewed:

- the mature component of the inventory, assessing differences between the existing inventory's estimate of mean mature volume per hectare for the TSA and a new estimate obtained from the audit samples;

- the immature component, testing site index assignment; and
- the non-forest component, testing the non-forest classification assignment.

The results of the audit for the mature component of the inventory suggest that the inventory volumes are acceptable. Subsequent analysis of the data also showed a similar level of acceptability for the mature volume inventory estimates in the operable forest land base. For the immature component of the inventory, the audit results suggest an acceptable level of accuracy in the assignments of site indices for young stands. The audit assessment also found the non-forest classification in the TSA was within provincial standards. I have discussed some aspects of the audit further in the sections below on *volume estimates for existing stands* and *site productivity estimates.*

In the timber supply analysis, lands that are not part of the timber harvesting land base, including national parks, still contribute to some resource values such as landscape-level biodiversity. A forest cover inventory in national parks was undertaken in 1956 and projected to 1997 to account for increasing forest age. However, no updates have been done to account for disturbances such as fire. I encourage staff to obtain any relevant vegetation inventories from Parks Canada that will support future timber supply reviews.

Public input included concern that the current forest inventory is old and that models developed to update it go beyond its intended design. These are valid comments, but the audit results show that the inventory is acceptable for use in the analysis, and at this time no other, improved information exists.

An important consideration in this determination, which is being completed in early 1999, is the fact that the projected period for the base case timber supply forecast begins not in 1999 but in 1994. Thus, if harvesting had proceeded at the projected initial level for that approximately five-year period, if there were no other considerations, the remaining inventory would support the projected initial harvest level not for two decades as shown on the projection, but for fifteen more years from the present date. However, as noted, over the past four years the actual harvest level in the TSA has averaged not the 535 000 cubic metres projected in the base case, but a lower 330 000 cubic metres, representing something less than three years' depletion at the base case level. Therefore the duration for which the timber supply would continue to support the projected initial harvest level in the absence of other considerations approximates to between 16 and 17 years.

In my determination, as discussed in "Reasons for Decision", I have been mindful of the date of projection of the base case, and I have allowed for an assumed reduction of about three or four years in the duration of the projected initial harvest level.

My considerations in this regard have relied on the availability of the recent "undercut" volume to support the AAC determined for the TSA. If future consideration is given to harvesting any portion of these undercut volumes independently of the AAC, a further examination of the stability of this AAC determination may be required.

- *age-class distribution*

The distribution of age categories in the timber harvesting land base is as follows:
34 percent of the area is comprised of mature stands greater than 140 years of age (including 13 percent stands with greater than 250 years of age), and 66 percent consist of stands 140 years of age or younger. Just over 50 percent of the timber harvesting land base is covered by stands exceeding the minimum harvestable ages used in the analysis. BCFS staff do not view age class distribution as a limiting factor with respect to timber supply in the Golden TSA, and given this level of availability of harvestable volumes, and having reviewed the projections of age-class composition over time, I agree with this conclusion.

- *species profile*

The forest inventory currently shows that the timber harvesting land base consists mainly of stands comprised primarily of spruce (about 40 percent of the land base by area), Douglas-fir (about 22 percent), lodgepole pine (22 percent), western red cedar (nearly 10 percent) and western hemlock (about 7 percent). The spruce stands include some stands dominated by balsam (subalpine fir). A pre-inventory assessment for the Golden TSA indicated some potentially significant errors in the species composition in the current forest inventory, and district staff are concerned about species classifications for problem forest types. These issues should be addressed by the ongoing TSA reinventory project, so that any potential timber supply implications can be identified and accounted for in the next determination.

- *volume estimates for existing stands*

In the BCFS analysis, existing natural stand volumes were estimated and projected using forest inventory attributes and the Variable Density Yield Prediction (VDYP) model (version 6.4a).

As noted above under *current inventory*, the results of the forest inventory audit conducted in the Golden TSA suggested that the inventory volumes are acceptable for the mature component of the inventory and for the mature volume inventory estimates in the operable forest land base. The *Golden TSA inventory audit* report noted that the audit showed a small overestimation in mature volumes over 140 years, but also noted that the overestimation is based on a limited sample size and is not statistically significant.

In assessing the implications for timber supply of uncertainty in the existing stand volume estimates used in the base case analysis, I have been assisted by sensitivity analyses. These analyses showed that when the assumed volumes for existing stands were increased by 10 percent, the duration of the initial harvest level in the base case could be extended from two to five decades, whereas a 10-percent decrease in estimated volumes would shorten the projected duration from two decades to one. Thus an overestimation in existing stand volumes by as much as 10-percent would not of itself necessitate a change in the initial harvest level.

From these considerations I conclude as follows. The applicability of inventory audits to timber supply analysis in general is complex, since the audit process is designed to assess the validity of the inventory on a statistical basis, rather than the stand-by-stand, polygon-by-polygon basis on which

BCFS timber supply analysis relies. Nevertheless, in this TSA the audit results do tend to confirm the overall validity of the inventory used for the analysis, and in any case the initial harvest level shows a low sensitivity to changes in the estimates for existing volumes. I am therefore satisfied that the use of the current inventory estimates for existing stand volumes in the timber supply analysis is appropriate and introduces little if any risk to the projected initial harvest level.

The Nelson Forest Region has prioritized the Golden TSA for a reinventory, in view of the age of its original inventory work. A reinventory should reduce any uncertainty with respect to volumes in existing natural stands, although I note that the ability of staff to complete a reinventory in the TSA prior to the next AAC determination will depend on available funding.

Expected rate of growth

- *site productivity estimates*

Inventory data includes 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 the Golden TSA, the timber supply analysis uses the site productivity estimates represented in the forest inventory planning (FIP) file for site index values. As previously discussed under *current inventory*, the inventory audit report suggests an acceptable level of accuracy for site index assignments for young stands.

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 studies—known as the old-growth site index or OGSI project—suggest that actual site indices may be higher than those indicated by existing data from mature forests.

Preliminary OGSI adjustments for age classes 8 and 9 (i.e. greater than 140 years of age) were provided by BCFS Research Branch, based on studies that were completed outside the Golden TSA but which are considered by district staff to be relevant to the TSA area. The OGSI adjustments were not applied in the base case analysis; their implications for the timber supply were examined in a sensitivity analysis carried out after publication of the Golden TSA Analysis Report for the AAC determination meeting. The results showed that if OGSI adjustments were made to site indices for mature stands older than 140 years of age, the initial harvest level assumed in the base case could be maintained for one extra decade. This analysis also indicated that application of OGSI

adjustments could increase the long-term harvest level in 100 years by 17 percent from 446 000 cubic metres per year in the base case to 522 000 cubic metres.

Public input included a concern over the OGSI study methods, and a concern that the OGSI study results should have been included in the base case analysis.

In recent years it has been concluded consistently from studies such as OGSI that site productivities in British Columbia have generally been underestimated; managed forest stands tend to grow faster than projected by inventory site index estimates. In the present case the OGSI results applied in the sensitivity study were from plots outside the Golden TSA. However, provided management practices such as brush control are undertaken, it is not unreasonable to expect higher site productivity than assumed in the base case analysis. I therefore accept that site indices for regenerated stands following the harvest of stands of age-classes 8 and 9 are likely underestimated by an amount approximated by applying the interim OGSI adjustment factors, with timber supply impacts as shown in the sensitivity analysis. The sensitivity analysis showed that applying the preliminary OGSI adjustments could extend the initial harvest level projected in the base case by one decade, with a greater impact in the long term, and in my determination I have taken this into account as an unquantified underestimation of the timber supply throughout the forecast period as discussed below in "Reasons for Decision."

In view of the considerable implications for timber supply from changes in site productivity estimates, performance in regenerated stands should be monitored with field-based plots to determine whether suggested OGSI increases are being attained.

- *volume estimates for regenerated stands*

To estimate regenerated stand volumes for managed stands, the BCFS uses the standard Table Interpolation Program for Stand Yields (TIPSY). Volume predictions using TIPSY are based on management of stocking density, full site occupancy and the absence of significant brush competition. In the BCFS analysis, TIPSY was used for all regenerated managed stands including those under 20 years.

In the previous (1993) timber supply analysis for the Golden TSA, regenerated stand volumes were estimated using the VDYP model, which is more appropriately used to estimate volumes for existing mature stands, as was noted and accounted for by the previous chief forester in his 1995 determination. This difference resulted in the projection of a much higher long-term harvest level in this analysis than in the 1993 analysis.

TIPSY projections are initially based on ideal conditions, assuming full site occupancy and the absence of pests and diseases in the stand. Operational Adjustment Factors (OAFs) are applied to account for losses of timber volume due to stand openings for unproductive areas like small swamps and rock outcrops (OAF1), as well as for age-dependent factors such as pests, disease, decay, waste and breakage (OAF2). In the BCFS analysis, the provincial standard reductions of 15 percent for OAF1 and 5 percent for OAF2 were applied.

District staff note that root disease is a concern in the TSA, but they do have a strategy in place to reduce impacts. They acknowledge that it is difficult to determine if the OAF reductions are appropriate for the TSA and that there is some uncertainty in this factor.

In the public input, concern was expressed that the analysis may have underestimated potential losses in managed stands due to disease and insects, but no evidence was provided to support making an adjustment to the base case.

Sensitivity analysis was performed to assess changes in the harvest forecast that would result from a 10-percent increase or decrease in regenerated stand volumes. A 10-percent increase did not affect the base case forecast for the first 70 years, but did increase the projected long-term timber supply after 70 years. Counterintuitively, a 10-percent *decrease* in regenerated stand volumes actually enabled the projected initial harvest level to be maintained for three decades instead of two, as more time was allowed for the harvest forecast to step down to a lower long-term harvest level.

Although no work has been done to test the accuracy of the OAFs used in the analysis specifically for the Golden TSA, the OAFs used are the provincial standards which are based on the best available information, and I have no evidence before me to suggest that these estimates are not reasonable for use in this determination. Furthermore, sensitivity analysis shows that in this TSA uncertainty in regenerated volumes introduces risk to the timber supplies projected for the middle and long terms, but not for the short term.

I am therefore satisfied that with respect to regenerated volumes the initial harvest level in the base case projection provides a suitable basis for my considerations in this determination. From this basis, in accordance with the discussion in the previous section on *site productivity estimates*, in my determination I have accounted for the likely implications for regenerated stand volumes of an underestimation in site indices for sites currently occupied by stands of age-classes 8 and 9, as noted in "Reasons for Decision".

- minimum harvestable ages

A minimum harvestable age is an estimate of the earliest age at which a forest stand has grown to a harvestable condition. The minimum harvestable age assumption mainly affects when second growth 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 older ages than the minimum harvestable age, due to economic considerations and constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

The minimum harvestable ages assumed in the timber supply analysis were based on four factors:

(1) the age at which forest stands reach a minimum volume (at least 150 cubic metres/hectare for predominately fir, spruce and pine stands, and at least 200 cubic metres/hectare for predominately cedar and hemlock stands);
(2) the age at which stands reach a minimum 25-centimetre diameter at breast height;
(3) ninety percent of culmination age (culmination age is the age at which a stand achieves its maximum average annual rate of volume production); and
(4) professional judgement by BCFS staff.

The actual ages used in the timber supply analysis for both existing natural stands and regenerated managed stands are provided in the *Golden Timber Supply Area Analysis Report*.

Public input from the forest industry suggested that the minimum harvestable volume should be 150 cubic metres per hectare for all species and that the 25-centimetre minimum diameter criterion can be reduced. BCFS staff advise that harvesting at ages less than assumed in the analysis is, in fact, already occurring in southern portions of the TSA in order to address mountain pine beetle problems.

Other public input showed concern that larger wood sizes are being harvested in the Golden TSA than suggested by the minimum harvestable ages, and BCFS staff agree that, with the noted exception of the beetle-harvest areas, the minimum harvestable ages assumed in the analysis are generally lower than the ages currently being harvested in most of the TSA. However, this is not inconsistent with the possibility of harvesting, in times of tight timber supply, at lower ages than at present, to a minimum age as assumed in the analysis, or even lower, as already practiced in some southern portions of the TSA.

Public input also pointed out that the importance of high quality timber has not been factored into the analysis. Although there remains some debate about the roles of quantity and quality in assessing timber supply, the general current approach is for volume- rather than value-based objectives, and in that respect this TSA is consistent with most management units in the province.

Sensitivity analysis indicates that the timber supply in the Golden TSA is quite responsive to changes in minimum harvestable ages. If these ages are decreased by 10 years, the initial harvest level can be extended from two to five decades. Conversely, a 10-year increase in minimum harvestable ages reduces the duration of the initial harvest level from two decades to one.

As I have noted in other determinations, in view of the many associated variables, it is often difficult to assess future minimum harvestable ages with precision. In this TSA, the timber supply has been shown to be significantly sensitive to changes in these ages, and if lower minimum harvestable ages are reasonable and attainable, this provides a positive source of optimism for the timber supply. District staff should therefore continue to study this factor strategically, with a view to optimizing the timber supply through appropriate management of harvestable ages.

Given that some harvesting is already occurring in southern portions of the TSA below the assumed minimum harvestable ages, from my observations in other areas of the province I consider it reasonable to expect that under the appropriate conditions further harvesting could take place at lower ages than assumed in the analysis. Therefore, while I find that the minimum harvestable ages used in the analysis are a reasonable reflection of the majority of current practice, s, I am also satisfied that in suitable circumstances, stands with ages below the assumed minimum harvestable ages could be harvested if required. The relatively high sensitivity of the short-term timber supply to changes in these ages indicates a potential for additional supply that could help buffer against uncertainty in other factors. I have taken this into account in my determination as discussed in "Reasons for Decision".

(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 timber supply analysis, a regeneration delay of two years was assumed for all forest stands.

Brush competition is the main impediment to regeneration in the Golden TSA. Some sites where this is believed to be severe are identified as environmentally sensitive areas (ESAs) in the forest inventory and the timber harvesting land base was reduced in the analysis to reflect curtailed harvesting of these sites.

For most sites, brush competition can be addressed through follow-up silvicultural treatments. In this TSA, on average over the past six years, brush control has been carried out on nearly 300 hectares per year. The average area treated for brushing represents a significant portion (about 20 percent) of the average area that would be harvested under the current AAC, and contributes towards achievement of base case assumptions.

Public input included concern about reforestation following high-elevation harvesting. In the last determination, staff were asked to evaluate the ability to carry out successful regeneration in high elevation stands. Since the problem spans more than one TSA, BCFS regional research staff initiated a study, but this is not yet complete.

A review of regeneration delay conducted by BCFS district staff showed that over the past five years, regeneration within two years has been achieved about 40 percent of the time and that this has improved to 56 percent in the last three years. BCFS district staff note significant improvements in silviculture delivery by licensees, and with minor exceptions on some Small Business Forest Enterprise Program (SBFEP) blocks, expect to move close to 100-percent achievement of a 2-year regeneration delay over the next five years.

From the observed trends I conclude that the attainment of a 2-year regeneration delay as assumed in the base case analysis is likely attainable, and for the purposes of this determination, I am satisfied that regeneration delay has been adequately represented in the analysis.

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. Where a suitable stand has not been regenerated and the site was harvested prior to 1987, the classification is “backlog” NSR.

In the Golden TSA, the NSR area in the timber harvesting land base was estimated from the 1994 forest inventory file to be about 15 000 hectares. In the analysis it was assumed that many of these areas are no longer NSR, and it was noted that 3530 hectares now support stands that are 10 years of age or older, while 11 470 hectares were assumed to be at age zero.

Subsequent to the analysis, BCFS district staff reviewed current data sources including the Major Licence Silviculture Information System (MLSIS) and the Integrated Silviculture Information System (ISIS). The review indicated that in the TSA there are about 4500 to 5000 hectares of NSR in operable areas (i.e. within the operability line for the TSA), of which about 500 hectares are now reforested but poorly stocked, about 3400 hectares are considered current NSR, and about 600 to 1100 hectares are considered backlog NSR.

BCFS district staff do not currently consider it cost-effective to treat the 500 hectares of reforested but poorly-stocked stands. However, opportunities for effective treatments should continue to be explored; even if a lack of treatment means reduced yield when the stand is harvested, it is important for these stands to contribute to the timber harvesting land base in the long term.

The difference between the total area assumed in the analysis to be at age zero, 11 470 hectares, and that indicated by the recent BCFS review, 4500 to 5000 hectares, is about 6700 hectares. This means that in the analysis, the time needed for trees to reach green up on roughly 4 percent of the timber harvesting land base has been overestimated. Sensitivity analysis on reduced green-up ages shows that this would have no effect on the projected initial harvest level, and I therefore accept that the analysis has provided an adequate accounting for this factor.

(iii) silvicultural treatments to be applied to the area:

Silvicultural systems

In 1991-97, the main silvicultural system used in the TSA was clearcutting; less than 10 percent of the total volume harvested was by alternative systems. BCFS district staff note that the current and proposed harvest for 1997-2001 indicates an expected increase (at or below 10 percent by volume) in the use of alternative silvicultural systems—mainly patch/group selection systems. The alternative systems are needed to address values such as visual resource management and pest concerns such as bark beetles. Over one-half of the area in current and proposed harvests using clearcut systems are expected to have wildlife tree reserves.

In the analysis, it was assumed that all harvesting would be by clearcutting. However, as noted in other sections of this document, requirements of the Forest Practices Code— such as managing visually sensitive areas and reserving wildlife tree patches for stand-level biodiversity—were satisfactorily represented. On this basis, and in view of the complex difficulties of modelling the implications for timber supply of using alternative silvicultural systems, for the purposes of this determination I accept that current practice has been adequately reflected in the base case analysis. As new information becomes available and modelling capabilities improve, a more direct representation of any changes in the mix of silvicultural systems can be analyzed for use in future determinations. In the meantime, I am satisfied that the current means of representation poses negligible risk to my determination.

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 Golden TSA, on average over the past 6 years about 40 hectares per year have been pruned.

Fertilization was undertaken in the mid-1980s, but none is occurring at the present time or assumed in the timber supply analysis. Commercial thinning is not currently carried out in, or planned for, the Golden TSA and none was assumed in the analysis.

The level of incremental silviculture undertaken in a given management area is very dependent on funding and is difficult to project into the future. If the amount or kind of incremental silviculture actually practiced differs significantly from that assumed in the analysis, this will lead to a change in the forest that can be captured in the inventory updates used to support future AAC determinations. For the purposes of this determination I am therefore satisfied with the treatment of this factor in the analysis.

(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 most species were a minimum 17.5-centimetre diameter at breast height (dbh) with a 30-centimetre maximum stump and 10-centimetre minimum top inside bark. For pine stands, the standard for minimum dbh is 12.5 centimetres.

BCFS district staff indicate that, with one minor exception, these standards reflect current utilization standards and current practice in the TSA. The minor exception is that for older cedar stands (greater than 140 years of age) the minimum top diameter inside bark is actually 15 centimetres—not 10 centimetres as was assumed in the analysis. Since this would amount to only an insignificant overestimation in the projected timber supply, I accept the assumptions employed in the base case as a reasonable accounting of utilization standards.

Decay, waste and breakage

The VDYP model used to project volumes for natural stands incorporates estimates of volume of wood lost to decay, waste and breakage. Decay losses are built into the volume estimates, while standard waste and breakage factors were applied into the analysis when developing VDYP yield curves. These estimates of losses have been developed for different areas of the province based on field samples.

For regenerated stands, as previously discussed (see *volume estimates for regenerated stands*), the TIPSY model incorporates OAFs that account for anticipated decay, waste and breakage.

In the last AAC determination, the chief forester requested that an analysis be done to determine the accuracy of volume estimates including destructive testing to assess allowances for decay, waste and breakage. Volume and decay studies are underway for cedar and hemlock stands and there may be higher volumes than assumed at the tree level but it is uncertain whether these tree-level volume increases translate to significant differences at the stand level. The intent was to study other species as well but funding support did not enable a more comprehensive assessment.

At this time, while the studies are still underway for cedar and hemlock, it would be inappropriate to draw a definitive conclusion. When the volume and decay studies are complete, any relevant findings at the stand-level can be incorporated in the next determination.

For the present determination, the estimates incorporated in the analysis constitute the best available information with respect to decay, waste and breakage. I have accepted the applicability of the factors as used in the analysis and have made no further adjustment to the base case timber supply projection.

(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.

To manage for resources such as water quality and aesthetics, current harvesting 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 provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

- forest cover and cutblock adjacency

Objectives for forest cover and cutblock adjacency guide harvesting practices in order to address resource values such as wildlife, water, and visual quality. The objectives modeled in the analysis address:

- cutblock opening size
- minimum green-up height required before an adjacent area may be harvested,
- maximum area permitted to be less than the minimum green-up height, and
- minimum area required to be in older forests of a specified age.

The FSSIM timber supply analysis model does not have the capability to represent the adjacency constraints of specific areas explicitly. In the analysis these constraints were modeled by applying a maximum permitted area on which trees may be below a specified green-up height, as noted above. This restriction was applied not just to the timber harvesting land base but to the whole operable land base—i.e. to all areas within the operability line, including riparian and other areas deducted from the timber harvesting land base to meet a range of forest objectives.

About 50 percent of the TSA's timber harvesting land base is in the integrated resource management (IRM) zone, in which the general forest cover objective (as for all zones except the VQO zone) is for no more than 25 percent of the area to be covered by stands with less than a green-up height of two metres. Sensitivity analysis shows that if this requirement were relaxed to 30 percent in all zones except the VQO zone, there would be little impact on the timber supply.

No other forest cover objectives exist in this zone, other than those noted below under *landscape-level biodiversity.* The specific forest cover objectives assumed in the analysis in management zones for wildlife, visual quality and water quality are detailed in those sections of this rationale (see below).

BCFS district staff note that guidelines for forest cover and cutblock adjacency have been implemented in the TSA for many years. However, it is generally accepted that the use in analyses of maximum-permissible-area-below-green-up-age, to approximate the timber supply impacts of these guidelines, does introduce uncertainty into the projections.

Preliminary estimates by BCFS district staff, conducted at the landscape unit level, indicate that in the IRM zone, in 17 of the TSA's 29 landscape units, more area (than the 25 percent assumed in the analysis) could be below the indicated green-up condition without compromising objectives for hydrologic equivalent-clearcut-area (ECA). Conversely, in 7 landscape units it was found that the area permitted to be below the indicated green-up condition should be smaller than the assumed 25 percent. As operational decisions regarding hydrology should be based upon a watershed-level analysis, these findings are considered to be preliminary at this time.

Public input included concern about the modeling method used in FSSIM to deal with cutblock adjacency, and support for the use of models employing "spatially explicit" analysis. Through spatially explicit models, analysts constrain the projected timber harvest by representing and tracking cutblocks and their spatial relationships, rather than by imposing (as in FSSIM) a more broadly applied constraint such as a maximum fraction of a larger area that is permitted to be below green-up (known as a "spatially implicit" method). In view of recent work carried out in the Nelson Forest Region, and in view of a report prepared recently on this work, which I have now had an opportunity to review, these public comments warrant some detail in response.

In recent years, staff in the Nelson Forest Region have used a spatially explicit model (ATLAS) to assess the timber supply implications of proposed guidelines, and in support of the Kootenay/Boundary Land Use Plan Implementation Strategy (KBLUPIS). The model has also been used as the basis for a recent overview study of timber supply in the Golden TSA. I am advised that the purpose of the study was to (a) investigate the effect on the projected timber supply of using spatially explicit analysis techniques (the ATLAS model), and (b) to determine whether the information provided to the chief forester via the FSSIM analysis process is sufficient.

The study is popularly interpreted as demonstrating that because the timber supply projected when explicitly applying adjacency restrictions (as in this ATLAS analysis) is usually lower—at least in the short term—than that projected using more generalized forest cover requirements (as in the FSSIM analysis for the Golden TSA), FSSIM overestimates the actual timber supply by not adequately accounting for spatial constraints. Such interpretations, however, must be viewed with considerable caution, and at this time can only be viewed as preliminary and inconclusive in their potential for application in the AAC determination process, for the reasons discussed immediately below.

The ATLAS study team has described its own results in the recently produced report *ATLAS & FSSIM Timber Supply Analyses, Golden Analysis Area, March, 1999*. The executive summary of this report is reproduced in full below:

> Spatial or not spatial what is the answer.
>
> This brief analysis attempts to highlight differences between traditional aspatial (quasi-spatial) and truly spatial analysis methods and techniques. Unfortunately, more questions than answers arise necessitating further study in this area. It can be surmised, however, that rigidly apply [*sic*] spatial adjacency requirements does [*sic*] exude [*sic*] a significant downward pressure on available timber supply (may not be as significant with imposition of timber flow objectives). Application of spatial forest cover requirements requires a thorough examination before meaningful analyses can be carried out. Forest managers must be cognizant of both spatial and temporal aspects of allocating timber for harvest. Spatial patterns set in the past and those planned for the future play a key role in timber and habitat supply as well as many other resource objectives.

The preface to the report emphasizes the following in boldface type:

> The report that follows provides an assessment but should not be construed as a recommendation on permissible harvest levels. Due to complexities involved with spatial analyses (both temporal and spatial), the use of spatially explicit modelling techniques requires further testing and refinement of spatial objectives.

I have reviewed this report, and I have discussed its contents with staff of BCFS Research and Timber Supply branches who are experienced in timber supply analysis. From this, I agree with the intent of both the above passages from the report—that further work is required before this methodology may be used to support AAC determinations. For that reason, and others including the following, at this time I cannot rely on the findings of this study to assess the adequacy of the representation in FSSIM of spatial constraints on timber supply, or for any quantitative evaluation of the validity of the base case forecast produced for the Golden TSA by FSSIM.

- Due to the very large size of the data sets involved, the ATLAS model was used to analyse the timber supply in sub-units (groups of landscape units) in the TSA, with the results then summed to provide an analysis for the whole TSA. This summary was based not on a "regulated" harvest flow, but on the assumed availability for harvest of every cubic metre of timber not constrained for another objective. This produces an essentially disconnected succession of available volumes without the reference to earlier or later decades needed to eliminate large fluctuations in the overall flow of timber over time. In the case of the Golden TSA, this results in sudden increases and decreases of hundreds of thousands of cubic metres in the harvestable volumes for consecutive decades. So far, the study team has not used the ATLAS model to produce a forecast for the whole TSA which incorporates a stable "harvest flow", as is customary in timber supply analysis in B.C., whereby harvests in successive decades are sequenced to provide acceptable steps in a managed transition toward a steady long-term level. Imposing a regulated harvest flow affects the outcome of a timber supply forecast perhaps more than any other single factor—as can be seen in the large differences between the harvest levels projected in the BCFS FSSIM base case on page 25 of the August 1998 *TSR Golden TSA Timber Supply Analysis Report*, and the alternative harvest flow on page 36 of that report, which shows the effects of no harvest flow control. For this reason, the incorporation of a regulated harvest flow is *indispensable* to any timber supply projection from which I may take guidance in assessing the overall appropriateness of an AAC as an integral part of a planned series of environmentally, socially, economically acceptable steps toward a projected long-term harvest level.
- The ATLAS study employs assumptions and data that differ from the publicly reviewed package in the FSSIM analysis process with respect to a number of factors including land base, yield estimates, domestic watersheds, and others.
- Specifically, for example, the ATLAS study does not account for contributions to biodiversity from 156 000 hectares of forested areas within parks.
- No sensitivity analyses were provided to identify the implications for timber supply of changes in key assumptions.
- No diagnostic information was provided on essential parameters such as growing stock, average harvest age, volumes per hectare, etc.

From these considerations I conclude that while the information produced by the ATLAS study is of interest in developing spatially explicit approaches to timber supply analysis, more work is required to produce and present information in a form that will permit direct comparisons with the timber supply projections used in FSSIM timber supply analyses, or support for the statutory requirement for regular determination of AACs for TSAs and tree farm licences. Until such direct comparisons are possible, I can do no more than acknowledge that the ATLAS model produces results which differ from those projected by FSSIM. I cannot at present assess conclusively any extent to which this might reflect a risk to the timber supply projected by FSSIM, nor can I assess whether the results are a function of methodological inconsistency or error. However, I do note that the ATLAS report summary quoted above acknowledges that the difference in results from those of FSSIM "may not be as significant with imposition of timber flow objectives"—a component of timber supply analysis which, as I have noted, I consider indispensable.

Notwithstanding some of its shortcomings in supporting this AAC determination, the ATLAS analysis for the Golden TSA suggests that implementation of cutblock adjacency restrictions as modelled has the potential to significantly reduce timber supply. However, it is not clear that the modelled restrictions mimic the actual implementation of spatial restrictions on harvests. For example, the modelled representation of adjacency restrictions does not allow for field-level operational flexibility that could allow achievement of spatial objectives without severe impacts on timber availability. Furthermore, particularly given the potential for significant timber supply impacts, it is not clear that adjacency restrictions are the best method for achieving desired spatial outcomes in the forest. Both of these uncertainties—the link between modelling and practice and the link between practice and objectives—are at the core of the recognition of the need for further study stated in the ATLAS report. While recognizing the potential for spatial objectives to affect timber supply, the degree of effect is uncertain due to the uncertain relationship among modelling, practice and achievement of forest management objectives.

In summary, I am aware of the preliminary indications of the *potential* for this work to indicate some risk to timber supply forecasts produced using FSSIM. In order to assess the likelihood of such a risk in the Golden TSA, and also to assess the applicability of spatially explicit models to support the timber supply review process in general, I most strongly urge the continuation and completion of the work initiated in this study. This should proceed to a point where a regulated harvest flow projection can be produced for the whole TSA, using land base and management assumptions identical to those used in FSSIM, in such a way that the results may be rigorously peer-reviewed to validate approach, method, data and completeness, and may be compared directly with those generated by FSSIM. In this way I may obtain a thorough understanding of the sources of any firm differences that may remain between the projections. Any such differences may then be taken into account in a future determination as appropriate, and if necessary, before the period required by statute.

In the meantime, for the purposes of this determination, I am satisfied that the FSSIM timber supply base case analysis has adequately addressed forest cover and cutblock adjacency for the IRM zone as currently practiced. I have nevertheless remained mindful of the findings of the ATLAS study and of the potential for future confirmation of some risk to the short-term timber supply projection on this account.

Guidelines for other management zones in the TSA are discussed in the relevant sections below.

- *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 this—together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions—will provide for the habitat needs of most forest and range organisms.

A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

Although some general forest management practices can broadly accommodate the 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 landscape level biodiversity in the analysis, a number of modeling assumptions were made which are discussed below.

(1) biodiversity emphasis options:

The delineation and formal designation of "landscape units" is a key component of a sub-regional biodiversity management strategy. *The Forest Practices Code of B.C. Biodiversity Guidebook* outlines three biodiversity emphasis options—low, intermediate and high—which may be employed when establishing biodiversity management objectives (BEOs) for a landscape unit. Each option is designed to provide a different level of natural biodiversity and a different risk to the maintenance of elements of natural biodiversity when finding an appropriate balance between biodiversity and timber supply in setting objectives for a landscape unit.

In the absence of approved BEOs, in order to balance social and economic impacts against risk to biodiversity, the provincial policy identified in the *Biodiversity Guidebook* and currently incorporated in timber supply analysis is to model approximately 45 percent of the area in the lower, approximately 45 percent in the intermediate, and approximately 10 percent in the higher BEO.

The KBLUPIS has draft BEO assignments for landscape units that are currently being implemented in forest development plans. BEOs, however, have not yet been formally established under the Code for the Golden TSA. In view of their draft status, and to avoid prejudging the outcome of decisions to be made by authorized statutory decision-makers, in the analysis, consistent with the *Biodiversity Guidebook*, an average forest cover requirement was applied to each landscape unit based on 45 percent low, 45 percent intermediate, and 10 percent high biodiversity emphasis.

Public comments, including those from the forest industry, suggested that the analysis should have used the KBLUPIS draft BEO assignments since they are currently being applied to guide forest development. Sensitivity analysis indicates that use of the draft BEOs would have an impact on short-term timber supply by reducing by one decade the time period in which the base case initial harvest level can be maintained.

I have considered the appropriateness of the "weighted-average" assumption used in the analysis with respect to BEOs very carefully. In my "Guiding principles" I have noted that in AAC determinations I take direction from land use plans that are approved. Although the KBLUPIS is approved, the identified BEOs are still in draft form, and I am therefore satisfied that the BEOs applied in the analysis were consistent with provincial policy for areas where BEOs are not yet formally established. Nevertheless, noting the significant implications for short-term timber supply, for several reasons I have taken the draft BEOs identified in the KBLUPIS into account in this determination.

One potential reason to defer accounting for the draft BEO assignments would be to allow for public discussion of their appropriateness, which, given the known sensitivity of the short-term timber

supply to this factor, could result in adjustments to the BEOs. However, I am advised that much public discussion and negotiation regarding the appropriate assignments has already taken place in arriving at the draft BEOs in the KBLUPIS, and I note that their use was advocated in the public input to this determination, including that from industry. I also note that the derivation of the draft BEOs included considerable socio-economic analysis to strike a balance between environmental protection and economic implications. I understand that government was pleased that a compromise could be struck, and that a general sense of agreement exists that there would be great reluctance to change the BEO assignments. It is also significant that in view of all this, BCFS staff are currently managing to the draft BEOs, believing they are highly likely to become formally established, and have recommended their use in this determination.

From these considerations it is reasonable to conclude that the draft BEOs in the approved KBLUPIS are in fact more reflective of government's land use decision than the weighted average approach taken in the analysis. While the approach taken in the analysis was certainly consistent with the general provincial objective, the draft BEO objectives in the KBLUPIS were discussed and negotiated specifically for the area in question, and the likelihood of substantial change in these draft objectives appears very limited. I have therefore decided to accept that the timber supply would be more accurately represented by the draft BEOs, and as discussed in "Reasons for Decision", in this respect I have accepted an overestimation by one decade in the projected duration of the initial harvest level projected in the base case.

(2) seral stage guidelines in low biodiversity emphasis option:

In accordance with the *Biodiversity Guidebook* and with the August, 1997direction from the deputy ministers of the ministries of MELP and MoF, old forest requirements for low BEOs were designed in the analysis to be met within three 70-year rotations, one-third at a time, and early seral guidelines for low BEOs were not applied. According to BCFS staff, both these modelling assumptions match current operational practice in the Golden TSA.

Some public comments supported full (immediate) application of low BEO seral stage guidelines. Sensitivity analysis indicates that short-term timber supply would be affected by such an approach in that the period of maintenance of the base case initial harvest levels would be reduced by one decade.

The assumptions used for the Golden TSA are the current standard approach taken in timber supply analysis for other units as they are reflective of current government direction. I am therefore satisfied that there was a proper accounting for this consideration in the analysis.

(3) old seral requirements in operable areas:

Consistent with the recent direction in applying the *Biodiversity Guidebook*, in the analysis the forest cover requirements for old-seral stage biodiversity guidelines were assumed to be met first, and to the extent possible, from inoperable forests and then from operable forests. Prior to this direction, the KBLUPIS had taken more of a proportional approach; for example, if 50 percent of a biogeoclimatic unit was in operable areas, then about 50 percent of the guideline would need to be met in operable forests.

As a result, in about one-half of the landscape units within the TSA, BCFS district staff have identified to licensees Old Growth Management Areas (OGMAs) needed to meet old-seral biodiversity guidelines, based on a proportional assessment. The district manager has not yet formally designated these OGMAs; they are considered draft and requiring operational review. Licensees are able to propose alternative OGMAs during the forest development process. Many of the draft OGMAs may not be needed if the proportionate approach is no longer taken in keeping with recent provincial direction.

The relationship between recent government direction for the province and the implementation approach taken for the KBLUPIS raises the important policy question of which approach should be applied in the KBLUP area. Until this question is answered, it is not clear whether the analysis appropriately reflects the KBLUP.

BCFS staff note that the analysis did not model forest interior habitat conditions (i.e. the area of an old forest needed to reduce the edge effects associated with being adjacent to younger seral stages). Therefore, in meeting the old seral requirements in the analysis, forests of older age are assumed to contribute, regardless of their size. As a result, in the analysis some small fragmented (e.g. two hectare) old growth patches are assumed to contribute to old forest guidelines, even though they probably do not provide the required forest interior conditions. Operational practice therefore may not match the analysis in this regard.

Public comment from the forest industry included concern that the analysis modeled biodiversity guidelines at the biogeoclimatic variant level rather than at a more general subzone or natural disturbance type (NDT) level. However, the analysis is consistent with current policy direction and therefore I accept the modeling assumption used.

Industry also commented that the analysis modeled both the “mature-plus-old” as well as “old” seral guidelines, and should have only modeled “old”, in consistency with most analyses in B.C. BCFS staff have advised me that sensitivity analysis shows no difference in the timber supply implications of modeling “mature-plus-old”, or “old”, or both, as was done in the analysis. Hence, regardless of the merit of the concern, there is no associated issue with respect to timber supply.

A local non-governmental environmental organization commented that a proportionate approach and draft OGMAs should be used to define the base case. They expressed concern that inoperable areas may have forest stands that are less biologically representative of typical ecosystem conditions (e.g. occurring on atypical steep slopes). This concern has been raised elsewhere and is currently being reviewed as a provincial policy matter. Concern was also expressed that accounting for old seral forests in inoperable areas may cause operational difficulties as these areas sometimes represent “opportunity wood” that may be harvested in the future.

Sensitivity analysis indicates that if a proportionate approach were taken to account for old seral forest biodiversity guidelines, the period of maintenance of the base case initial harvest level would be reduced by one decade.

In summary, the KBLUP appears unclear on the matter of proportional representation of old-seral forests from operable and inoperable areas. BCFS staff are uncertain what approach will be taken in the future. I understand government is discussing this in light of recent provincial direction, under the Forest Practices Code, that a non-proportional approach should be taken to account for old-

seral guidelines for biodiversity. Although the analysis is consistent with this recent provincial direction, whether this will be practiced in the Golden TSA is currently unclear. I therefore acknowledge that, based on the results of the sensitivity analysis, uncertainty in this factor could introduce some risk to the projected short-term timber supply.

However, for the purposes of this determination, I accept the analysis as modeled, as this is consistent with recent provincial direction. I look forward to receiving further clarification on this matter, either in the form of a higher level plan or further policy guidance. If this direction is different from what was assumed in this decision, then, given the importance of this consideration, if necessary I may revisit this decision sooner than the five years required by legislation. In the meantime, I accept that uncertainty in this factor represents an unquantified risk to the projected short-term timber supply, as discussed in "Reasons for Decision".

(4) future ages of non-contributing forests:

In the analysis, forests outside the timber harvesting land base, that do not contribute to timber supply, were assumed to age over time so that, eventually, all non-contributing forests are over 250 years of age. While the forest inventory supporting timber supply analyses is updated regularly to reflect recent disturbances such as those from fire, insects or disease, in the analysis no allowance was made for the fact that these natural disturbances will be ongoing in the future. In the analysis this resulted in the assumption that, over time, an unrealistic proportion of the old seral requirements for landscape-level biodiversity will be met by non-contributing forests.

An alternative approach would be to assume that the existing age-class distribution in non-contributing stands remains the same over time (i.e. that disturbances will offset the aging of the forests). However, this "static" approach would probably lead to an overestimation in the number of natural disturbances, assuming that fire suppression will enable a higher proportion of non-contributing forested areas to age undisturbed over time, than in the past. This in turn would likely lead to an underestimation in the future contribution to old seral requirements made by currently young stands, as these age. Sensitivity analysis indicates that this static approach would have an immediate impact on the projected short term timber supply by lowering the initial base case harvest level from 535 000 cubic metres to just over 500 000 cubic metres per year. This lower initial harvest level would be needed to permit a reasonable decline in harvest levels in the future.

The risks in assuming that non-contributing stands all continue to age, and that stand disturbances do not occur, were also noted in the public input.

Clearly, since non-contributing forests do experience stand-level disturbances, the contribution of these forests to meeting old-seral biodiversity guidelines may have been overestimated in the analysis. In the absence of supporting research, it might have been more realistic in the analysis to apply a disturbance factor based on professional judgement. Although BCFS inventory updates do capture past disturbances in non-contributing provincial forests, some risk is introduced by the modeling assumption of continually aging all non-contributing forest, since it is known that disturbances do occur in these areas.

It is likely that the base case and the sensitivity analysis (assuming no change in age class distribution) represent the upper and lower bounds of the timber supply with respect to this factor, with actual conditions being somewhere between. On this basis, as noted in "Reasons for Decision", in my

determination I have accepted an unquantified overestimation in the base case projection on this account. The introduced risk will be limited by the fact that the next AAC determination will benefit from inventory updates for most non-contributing forests.

(5) parks contribution

The boundaries of some draft landscape units extend into national and provincial parks, where these have the same biogeoclimatic subzone as the adjacent TSA lands. These parks are assumed in the analysis to be part of the land base that does not contribute to timber supply, but which can help to meet seral stage guidelines for biodiversity. This assumption is consistent with provincial policy direction.

As discussed above, non-contributing lands were assumed in the analysis to age continuously over time, and public comments raised concerns about the validity of assuming park lands can continue to meet old seral guidelines particularly since current approaches to vegetation management in parks encourage a natural mosaic of forest stands and ages. Sensitivity analysis suggests if no contribution from parks were assumed, maintenance of the base case initial harvest levels would be reduced by one decade.

The assumption in the analysis that parks contribute to meeting seral stage guidelines for landscape-level biodiversity is consistent with provincial policy direction, and I accept this approach. The separate concern about future ages of forests in non-contributing lands, including parks, was discussed in consideration (4), above.

- *grizzly bear habitat*

The direction from the KBLUPIS is that important habitat for grizzly bears will be secured by the application of guidelines for landscape-level biodiversity, without a requirement for additional forest cover constraint. For example, it is assumed that forests adjacent to avalanche chutes that provide important habitat for grizzlies can be identified within biodiversity seral stage guidelines. This direction is reflected in the analysis, with no further allowance for grizzly bear habitat through additional forest cover guidelines.

As discussed under *landscape-level biodiversity* above, it is currently unclear whether seral stage guidelines will be met proportionally in both operable and inoperable areas under the KBLUPIS or, as modeled in the analysis and in accordance with current legal direction under the Code, by meeting old and mature seral requirements in non-contributing forests first, at the variant level of representation.

Current operational practice involves delaying the harvest in operable forest areas adjacent to some avalanche paths. The KBLUPIS notes that implementation of the Grizzly Bear Conservation Strategy in the KBLUP area will continue to evolve and some refinements in management guidelines can be expected. Until these refinements have been made and approved by government, the current approved direction in the KBLUPIS is for habitat needs for grizzlies to be met through the implementation of other guidelines, particularly those for landscape-level biodiversity, without additionally constraining the timber supply.

In that light, government direction for grizzly bear habitat is clear, and I accept the assumptions in the base case as properly reflecting this direction, subject to my overall evaluation of other matters associated with the KBLUPIS. As discussed above, under *landscape-level biodiversity*, the issues of proportionality and mature-plus-old seral stage guidelines need to be reviewed by government for further clarification, both in the context of biodiversity and in addressing grizzly bear habitat. In the meantime, for this determination, I accept the analysis as appropriately reflecting current government direction for grizzly bear habitat.

- *caribou habitat*

In the timber supply analysis, the areas accounted for as caribou habitat were: in the Interior Cedar-Hemlock (ICH) biogeoclimatic zone, 19 797 hectares in the and 4313 hectares in the Engelmann Spruce- Subalpine Fir (ESSF) zone.

The guidelines applied in the analysis for caribou habitat required at least 40 percent of the operable area to be in forests older than 140 years of age, and 10 percent of the operable area to be in forests older than 250 years of age. No more than 25 percent of the operable area was allowed to be in stands with less than two metres green-up height. The guidelines used in the analysis are generally consistent with the KBLUPIS.

Public comments included both concerns that guidelines for caribou habitat are excessive in terms of their impact on timber supply, and that the guidelines might not be adequate to protect caribou habitat.

The assumptions used to define the base case provide a reasonable accounting of the government-approved KBLUPIS caribou guidelines, and therefore I am satisfied that it reflects current management direction. If government amends caribou management guidelines, this can be reflected in future determinations.

- *ungulate winter range*

In the analysis, about 44 895 hectares (27 percent) of the timber harvesting land base and 68 209 hectares (30 percent) of the operable land base are in the ungulate winter range management zone. The forest cover and cutblock adjacency guidelines for this zone allow for a maximum of 25 percent of the operable land base in ungulate winter ranges to be in forest stands less than two metres in height. There is also an older-forest guideline whereby a minimum of 40 percent of the operable land base is to be in forests older than 100 years of age in order to provide thermal cover. These guidelines are consistent with the KBLUPIS.

Public comments included both concern that the above guidelines overly impact timber supply and that the guidelines did not adequately protect winter range values.

The KBLUPIS also includes a guideline calling for maintenance of mature forest cover in smaller patches than modeled in the base case. However, a sensitivity analysis used to assess the timber supply implications of maintaining smaller patches (250 hectare size) of mature forest cover found essentially no impact on the base case harvest forecast.

The CORE process that eventually evolved into the KBLUPIS involved an exhaustive public consultation process intended to integrate the need to access timber supply with environmental protection. The guidelines used in the analysis were consistent with the KBLUPIS, and therefore for the purposes of this determination I am satisfied that current operational practice is adequately reflected in the base case.

- *identified wildlife*

"Identified wildlife" refers to species at risk (red and blue listed) and to regionally significant species which have not been accounted for with existing management strategies, such as for biodiversity, riparian management or other wildlife species (like caribou). Government has not established specific wildlife habitat areas or management strategies for particular identified wildlife species in the Golden TSA, and for many species there are no current management practices and only limited inventories. The analysis did not account for identified wildlife in the base case.

In February 1999, the provincial government announced its Identified Wildlife Management Strategy (IWMS). Government has set a one-percent limit for the province on the allowable impact on short-term harvest levels from management for identified wildlife. BCFS staff advise that they are uncertain at this time how much habitat area within the timber harvesting land base of the Golden TSA may be required to implement the recently announced IWMS. However, they are aware of the one-percent cap on timber supply impacts and of the existence of blue- and red-listed species within the TSA.

Public input suggested a one-percent land base deduction be applied in this determination.

I consider it reasonable to expect that accounting for the likely impact of the IWMS could lead to a reduction of up to one percent in timber supply, as noted in "Reasons for Decision". On its own merits, this would be primarily a long-term impact.

- *visually sensitive areas*

Careful management of scenic areas along travel corridors and near recreational sites is an important IRM objective. The Code enables the management of visual resources by providing for scenic areas to be identified and made known, and by providing for the establishment of visual quality objectives (VQOs). To achieve this, visual landscape inventories are carried out to identify, classify and record those areas of the province that are visually sensitive.

VQOs limit the amount of visible disturbance that is acceptable in sensitive areas. Guidelines to meet VQOs include setting a maximum percentage of a viewshed allowed to be harvested at any one time, and setting "visually effective green-up" (VEG). VEG refers to the stage at which a stand of reforested timber is perceived by the public to be satisfactorily "greened-up" from a visual standpoint. Additionally, the degree to which landscape unit principles are utilized plays heavily in the evaluation of maximum percentage alteration limits.

For the Golden TSA, scenic areas were identified through the KBLUPIS consistent with Forest Practices Code timber supply impact targets. For the purposes of the analysis, to simplify modeling while still achieving a reasonable accounting for this factor, partial retention VQO guidelines were applied to all identified scenic areas. The guidelines were applied to 21 343 hectares (about 13

percent) of the timber harvesting land base, and it was assumed that no more than 15 percent of the operable land base in a landscape unit may be covered by stands less than 6 metres in height (VEG).

BCFS staff advise that the impacts of managing scenic areas were probably overestimated in the analysis for two reasons:

(1) The guidelines should have been applied to the total forested area, rather than the operable forested area only; and

(2) The guidelines should have been based on visual landscape units, which are more operationally applicable than the landscape units used in the analysis.

BCFS staff also feel that the probable use of partial cutting silviculture systems in the future within scenic areas will further reduce the timber supply impacts assumed in the analysis.

In respect of the two identified issues I have reasoned and concluded as follows.

(1) Sensitivity analysis indicates that applying the VQO guidelines to the total forest (instead of to the operable area only) extends the duration of the projected initial harvest level by one decade. Since this approach is more consistent with modeling assumptions applied in other TSAs, in my determination I have allowed for this quantified underestimation in the short-term timber supply.

(2) Although the impact of applying the guidelines to visual landscape units has not been quantified, BCFS staff conclude this would be less constraining on timber supply, and in my determination I have allowed for an unquantified underestimation in the projected short-term supply.

I have noted both of these conclusions in "Reasons for Decision".

-recreation values

Reductions to the timber harvesting land base specifically for recreation objectives are noted above, in *environmentally sensitive areas*. Recreation management objectives were assumed in the analysis to be addressed through forest cover constraints for other resource values, such as visually sensitive areas, wildlife habitat, and riparian areas. Although 10-metre buffers along recreation trails are intended as an operational management guideline, they have not yet been required as most trails occur in inoperable areas. BCFS staff are confident that recreation values have been adequately factored into the analysis, and I am satisfied that the base case timber supply projection appropriately reflects current management of recreation values.

- archaeological values

An archaeological overview assessment (AOA) was completed in the Golden TSA in 1996. This led to archaeological impact assessments (AIAs) on some areas whose potential importance was identified in the AOA as medium and high. Additional areas of potential importance were identified in 1998 forest development plans as requiring AIAs. This work was coordinated with one of the First Nations whose areas of interest overlap with the TSA.

To date, only one area where AIAs have been conducted has included an identified site of archaeological importance. No mitigation measures have yet been needed that would affect the

timber supply. It is suspected that many areas of importance were lost due to the flooding of the Columbia River valley.

In view of the above findings, no special allowances were made in the analysis for cultural heritage values. I accept this as satisfactory for the purpose of this determination, recognizing that any emerging new information can be accounted for in future determinations as appropriate.

- *community and domestic watersheds*

The TSA includes no community watersheds as defined by the Code. The TSA does include eight domestic watersheds, which cover about 3900 ha (2.3 percent) of the timber harvesting land base and approximately 8950 ha (3.9 percent) of the operable land base. The guideline applied in the analysis to reflect hydrologic recovery permitted no more than 25 percent of the area in each domestic watershed to be covered by stands less than 6 metres in height.

BCFS staff noted that some of the woodlot areas—which were excluded in deriving the timber harvesting land base for the analysis, as previously discussed—occur in domestic watershed areas. Therefore, coordination with woodlot managers may be necessary to ensure the guidelines are effectively applied.

Notwithstanding this concern, BCFS staff are confident that domestic watersheds were adequately modeled in the analysis, and from my review I am satisfied that this factor presents no risk to the base case timber supply projection.

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

Operating costs

In the past, licensees have been reluctant to operate in some northern portions of the TSA, due to added operational costs associated with the reservoir, unfavourable timber profiles and seasonal access constraints. Sporadic harvesting has occurred in these northern areas when markets have been favourable. In developing the base case analysis, no special assumptions were made to account for this factor.

A study requested by the Job Protection Commissioner (the Saunders Report) concludes that "the reservoir flooding has created a transportation and development problem, instead of being a transportation asset." The incremental cost to operations affected by the reservoir is estimated in the report to be $13.20 per cubic metre. One licensee is seeking compensation from BC Hydro for those portions of its operating area affected by these higher costs.

The avoidance of more expensive operations in northern portions of the TSA due to the added costs incurred by the reservoir and other factors is of some concern, as harvest levels may be concentrated in the southern end of the TSA. This concern was raised in the public input.

From my discussions with BCFS staff I am satisfied that by appropriate arrangements, such as possible realignment of chart areas, accommodations for the higher costs incurred by the reservoir, or by other means, harvesting will be able to proceed in the higher-cost northern areas of the TSA. At this point I see no reason to adjust the projected timber supply in any way on this account.

However, this situation will be reviewed at the time of the next determination and a further assessment of the current optimism will be made at that time.

Forest development plans and harvest sequencing

Licensees in the TSA annually prepare forest development plans identifying a realistic 5-year timber harvesting strategy. Recent experience has shown that ensuring a 5-year supply of wood increasingly requires licensees to enter difficult areas and marginal timber types.

In the base case analysis, it was assumed that older forests are harvested first, although many of these forests occur in the more northern portions of the TSA. Forest development plans show that in fact a higher proportion of stands in the southern parts of the TSA are harvested first. This results in the harvesting of stands in a sequence that is not consistent with the "oldest-first" assumption in the analysis.

A sensitivity analysis shows the impact on timber supply of a random-age harvest sequence. In this case, the initial harvest level projected in the base case was not affected, but the long-term timber supply was reduced from 446 000 cubic metres to 408 000 cubic metres per year.

While the actual ages of harvested stands are not truly random—because licensees, even within the southern part of the TSA, will likely seek out stands of maximum value, and these will tend to be older, higher volume stands—I recognize that licensees will probably have greater difficulty finding short-term wood in the south than implied by the assumption in the base case of unrestricted access to older stands including those in the north. BCFS staff anticipate the challenge in finding short-term timber will likely continue in the immediate future while access and development issues in the northern part of the TSA are being addressed and resolved, as discussed in the previous section. After that, as access improves in the TSA, staff indicate the actual profile harvested may better resemble the older-age first assumption used in the analysis.

I am satisfied that under current operational conditions the modelling assumption of "oldest first" in the base case does not accurately reflect the true current sequence of harvested ages. However, sensitivity analyses show that the assumptions of "random-first" and even "youngest-first" sequencing do not affect the projected initial harvest level. However, the analyses do show that the selection of stands in a sequence other than "oldest first" does reduce the optimum harvest over time, as shown by lower long-term harvest levels. Also, as noted in "Reasons for Decision", the timber supply implications of harvest sequences other than "oldest-first" are increased when analysed in combination with changes in other factors.

From these considerations I find the initial harvest level in the base case to be a reasonable projection of the timber supply on this account. However, to avoid the identified potential for timber supply reductions over the longer term, I recommend that staff place priorities on harvesting older stands first wherever possible in the currently harvested portions of the TSA, and on facilitating access to older stands in northern portions of the TSA.

Actual harvest levels

Over the 5-year period from 1993 to 1997, actual harvest levels have averaged 385 000 cubic metres per year, which is well below the current AAC. This is partly due to weak markets and restructuring of operations within the TSA. One major licensee closed its sawmill and constructed a laminated veneer lumber (LVL) plant. The requirements for the new plant are for about 250 000 cubic metres per year, while the licensee's apportionment of the AAC is 375 227 cubic metres.

It is hard to identify a trend from the recent actual harvest levels resulting from the significant restructuring by the licensee. Since the licensee's new facility does not require as much timber as did its now closed sawmill, the fact that the harvest level is below the current AAC does not necessarily suggest difficulty in finding sufficient timber to achieve the AAC. Another licensee, which operates in the northern portions of the TSA, has been able to attain its apportionment of the AAC.

(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 volumes of older forests often permits harvesting above long-term levels without jeopardizing 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, BCFS staff assessed other harvest flow alternatives. One alternative was to identify the highest initial harvest level that could be attained while limiting per-decade declines to 10 percent. This forecast resulted in an initial harvest level of about 580 000 cubic metres for the first decade declining over the next three decades to a long term harvest level similar to the base case.

In another alternative harvest flow, the analyst attempted to maintain the initial harvest level in the base case for as long as possible without affecting the long-term harvest level. In this case the initial annual harvest level of 535 000 cubic metres was maintained for two additional decades, but then fell sharply by about 100 000 cubic metres (nearly a 20-percent decline) to a medium-term harvest level slightly below the long-term level.

An "even flow" harvest forecast alternative was also examined, where an initial harvest level was determined that could be maintained throughout the medium and long terms. This resulted in an immediate reduction of 15 percent (82 000 cubic metres) in the initial harvest level relative to that in the base case, and an increase of two percent in the long-term harvest level (which would revert at

some point after the 250-year planning horizon to the long-term level projected in the current base-case).

In the base case analysis, the analyst applied harvest flow guidelines developed for timber supply reviews, which seek to maintain the current AAC while allowing gradual declines in future harvest levels, and assuring the attainment of long-term harvest levels. In reviewing the alternative harvest flows presented, I note there is some flexibility to extend the initial harvest level, which provides some buffer for constraints and risks introduced by uncertainty in some of the assumptions used in defining the base case.

I have taken this flexibility into account in making my determination, as noted in "Reasons for Decision".

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

Timber processing facilities

As noted above, under "Actual harvest levels", One licensee has a new LVL plant that requires about 250 000 cubic metres of wood per year. Douglas-fir and pine are the preferred species, but hemlock, spruce and balsam can also be used. This licensee optimizes its operations through log purchases and trades to obtain preferred dimensions and species. For example, harvested cedar is sent to its Eagle River Division in Malakwa, in return for fir and hemlock peelers.

The other major licensee's timber harvest goes to the Downie Street sawmill in Revelstoke. Downie Street has an aggressive purchase program and also relies quite heavily on SBFEP wood. Downie Street has been actively seeking quota with the Golden TSA to support its sawmill.

Pulp quality logs from both licensees' operations go to the Celgar pulp mill in Castlegar and Georgia Pacific chip facility in Cache Creek. There are no pulpwood agreements in the Golden TSA.

Other smaller companies are also operating in the Golden TSA with facility requirements of about 74 750 cubic metres per year. The timber requirements for smaller processing facilities can vary considerably depending on the circumstances of individual companies.

In conclusion I note that as previously discussed, the current AAC exceeds existing mill requirements in the TSA, and that the TSA does not have a strong secondary forest industry. The demand outside the Golden TSA for wood from the TSA is also noted.

(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 are consistent with the objectives stated in the Forest Renewal Plan and include 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.

I have reviewed the opportunities for commercial thinning, and, as discussed under *incremental silviculture,* commercial thinning is not currently carried out in, or planned for, the Golden TSA, and none was assumed in the analysis. I have also reviewed opportunities for harvesting in previously uneconomic areas, in respect of which I note that harvesting in marginally economic stands is already assumed in the base case projection.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. I have discussed this above under "*Visually sensitive areas*," where I noted that for the Golden TSA, analysis guidelines for scenic areas were developed in consideration of other objectives now required under the Forest Practices Code.

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 Golden TSA including public opportunities to review the data package and the timber supply review analysis, and to respond to a public discussion paper.

The KBLUPIS, which has been accounted for in this determination as well as possible, was approved after years of public dialogue and negotiation. The KBLUPIS has not been declared a higher level plan under the Code, and as referenced elsewhere in this document, some elements of the plan would benefit from further clarification as the plan continues to be interpreted and implemented. Key elements of the plan are reflected in the assumptions in the analysis, except where

otherwise noted, such as in the case of draft biodiversity emphasis option assignments for landscape-level biodiversity, or in the case of "proportional representation" of OGMAs on the timber harvesting land base.

Wherever possible, I have attempted in this rationale to respond briefly to the views expressed in the public input, and consideration of this input has been an important component of this determination. Public input commonly included expressions of a need to either (a) fully employ the objectives of KBLUPIS, or (b) modify these objectives where they were felt to be (i) too constraining on timber supply, or (ii) inadequate for the purposes of environmental protection. I note that the KBLUPIS does provide opportunities for amending approved objectives in the future. If and when this is done, the refined or updated objectives can be considered and taken into account in future AAC determinations. In the meantime, I have taken guidance from the existing approved KBLUPIS. As noted in my "Guiding Principles", I do not consider it appropriate in AAC determinations to attempt to predetermine or prejudge land-use plans, or to anticipate possible changes to existing, approved land use plans; rather I will account for such decisions when they have been made by the appropriate statutory decision makers. At this point it is my view that declaring appropriate parts of the KBLUPIS as a higher level plan under the Code could remove uncertainty and provide clear direction to statutory decision makers responsible for either interpreting or implementing the plan.

(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 causes such as fire and 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. Losses associated with second-growth stands are addressed by application of operational adjustment factors (OAFs) as noted under *volume estimates for regenerated stands* .

In order to estimate non-recoverable losses in the Golden TSA, actual quantified losses were assessed from licensees' annual reports, fire reports and other relevant data sources. The total annual loss was estimated to be 75.5 hectares or about 24 700 cubic metres. Nearly all the annual losses (23 440 cubic metres) were attributable to fire—either wildfire or broadcast fringe burns. Mountain pine beetle damage and blow-down accounted for the remaining losses. The total estimated unsalvaged volume losses were deducted from the timber supply forecast in the analysis.

Public comments from the forest sector expressed concern that the loss estimates were too high and also expressed disagreement with the assumption that the losses will remain constant over time. It was felt that losses should decline over time, as operations move from older into younger, healthier stands. BCFS staff agree there is uncertainty in applying estimated losses in the future. Other comments suggested the estimates for unsalvaged losses may be too low, particularly in the mountain

pine beetle category. BCFS staff note that they have an active beetle management and salvage program and feel the estimated losses are reasonable.

Having reviewed the approach taken by BCFS staff in accounting for losses in the analysis, I conclude it is based on reasonable methodology and considers existing available data, and I find the estimates reasonable for consideration in this determination. I acknowledge that the estimated losses may decrease in the future, as harvesting shifts from older to younger stands, in which case this can be accounted for in future determinations. However, uncertainty about future losses does not affect the projected short-term timber supply. For this determination I have therefore acknowledged the possibility of a small increase in the projected timber supply for the medium and long-terms only, as noted in "Reasons for Decision".

Reasons for Decision

In reaching my AAC determination for the Golden TSA, I have considered all of the factors presented above, and I have reasoned as follows.

The timber supply analysis base case projected an initial harvest level of 535 000 cubic metres per year. The initial harvest level was projected to be maintained for two decades from the inventory update in 1994 before beginning a decline a long-term level of 446 000 cubic metres.

In determining AACs, my considerations typically identify factors which, considered separately, indicate that the timber supply may be either greater or less than that projected in the base case. Some of these factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by introducing an element of risk or uncertainty to the decision, but cannot be reliably quantified at the time of determination. These latter factors are accounted for in determinations in more general terms.

The following factors have been identified in my considerations as reasons why the timber supply projected in the base case may have been underestimated to a degree that may be quantified:

- Deciduous stands: About 4500 hectares now covered by immature deciduous stands may contribute eventually to the timber supply. Their inclusion would increase the timber harvesting land base by about 2.7 percent, but will not affect the timber supply until the longer term.
- Visually sensitive areas: Applying visual quality guidelines to the total forest, instead of the operable forest only as was done in the analysis, enables the initial harvest level to be maintained for an additional decade.

The following factors have been identified as indicative of potential underestimations of the timber supply to degrees that currently cannot be quantified with accuracy:

- Visually sensitive areas: The application of visual quality guidelines to visual landscape units, rather than to landscape units as was done in the analysis, caused an unquantified underestimation in the timber supply, including in the short term.
- Old Growth Site Index adjustment: Application in the analysis of OGSI adjustments to site indices for mature stands older than 140 years of age showed the potential for the initial harvest

level assumed in the base case to be maintained for an extra decade, and for an increase of 17 percent in the long-term harvest level.

- Minimum harvestable ages: Sensitivity analysis indicated that a 10-year reduction in the minimum harvest age assumed in the analysis could extend the base case initial harvest level by three decades. Some reduction appears operationally feasible and represents the possibility for a very significant addition to the projected short-term timber supply.
- Unsalvaged losses: The probable decline in future losses as harvesting shifts from older to younger stands could increase the projected timber supply in the medium and long terms, but will not affect the short-term.
- Alternative harvest flows: Examination of alternatives indicated some flexibility to extend the base case initial harvest level (with a greater subsequent rate of decline).

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

- Roads, trails and landings: The omission of deductions for existing landings and trails indicates an overestimation of up to 2400 hectares—1.4 percent—in the timber harvesting land base used in the analysis; this affects the long-term timber supply only.
- Inoperable areas: Studies suggest that inoperable areas not accounted for in the base case analysis indicate a potential overestimation of to 2180 hectares—up to 1.3 percent—in the timber harvesting land base; this affects both short- and long-term timber supply.
- Woodlot licenses: A reduction of 2000 hectares must be applied to the timber harvesting land base together with a firm reduction of 5000 cubic metres annually in the timber supply from the base case initial harvest level of 535 000 cubic metres and continuing throughout the forecast period, to account for all woodlot licences issued since the January 1, 1995 AAC determination.
- Low productivity sites with immature stands: The inclusion in the analysis of low productivity sites with immature stands that are not expected to be merchantable at maturity indicates an overestimation in the timber harvesting land base of about 7600 hectares or 4.6 percent; this affects the long-term timber supply.
- Low productivity sites with mature stands: The inclusion of about 2175 hectares of mature spruce and spruce/balsam-leading stands with low site indices indicates an overestimation in the timber harvesting land base of 1.3 percent, with a somewhat lower percentage impact on the timber supply due to the lower volumes associated with these low productivity sites. This affects both short and long-term timber supply.
- Identified wildlife: To account for implementation of the provincial Identified Wildlife Management Strategy in this TSA, consistent with Provincial guidance I have accepted an overestimation of up to one percent in the timber supply throughout the forecast period.

The following factors have been identified as indicative of a potential overestimation of the timber supply to degrees that currently cannot be quantified with accuracy.

- Biodiversity emphasis options: Acceptance of the draft biodiversity emphasis options in the approved KBLUPIS as more reflective of government's land use decision shortens the duration of the base case initial harvest level by one decade.
- Biodiversity guidelines: Provincial direction to apply biodiversity guidelines non-proportionally to non-contributing stands, as assumed in the analysis, is at odds with some interpretations of the KBLUPIS. Clarification is needed from government on the KBLUPIS is this regard. If a proportional approach were taken, this would shorten the duration of the base case initial harvest level by up to one decade.
- Aging of non-contributing forests: The assumption in the analysis that non-contributing stands continue to age without dying or being destroyed clearly overestimates their contribution to meeting old seral conditions for biodiversity and constrains the short-term timber supply to an unquantified extent.
- Current inventory: The projected period for the base case timber supply forecast begins not in 1999, but in 1994. Since harvesting in recent years has been well below the AAC, a reduction of between three and four years is indicated the projected duration of the base case initial harvest level.

From the above extensive list of factors identifying separate under- and overestimations in the projected timber supply—some of which may be interactive—without the benefit of further analysis it is difficult to assess with precision the resultant overall implication for the validity of the base case forecast. A general summation is as follows. Underestimations in the timber supply amount to the potential for maintaining the initial harvest level for roughly an additional five decades. However, the timber harvesting land base has been overestimated by something over seven percent, and this is combined with other overestimations which amount to reducing the duration of the initial harvest level by two-and-a-half decades plus a one-percent overall reduction and other possible unquantified risks.

In view of the complexity of this set of implications, I requested BCFS staff to carry out some additional analysis based on reviewing a combination of factors with salient differences from base case assumptions, and I have taken guidance from the resulting harvest forecasts.

One such "synergistic" analysis in particular accounts specifically for changes in the following five factors:

- a reduction in the timber harvesting land base of 7.5 percent relative to the base case;
- application of draft biodiversity emphasis options (BEOs) from the KBLUPIS;
- application of OGSI productivity adjustments (through higher regenerated stand volumes on sites currently occupied by age-class 8 and 9 forests);
- application of visual quality guidelines to the total forest area instead of operable areas only;
- random-age harvest pattern for stands of harvestable age, rather than older-age first.

In this harvest forecast, the base case initial harvest level was maintained for one rather than two decades, and the projected long-term level was 467 000 cubic metres. In this case, reducing the minimum harvestable ages by 10 years did not increase the duration of initial harvest level (as in the base case) but did influence the medium and long term timber supplies.

This harvest forecast suggests that after accounting for major factors identified in my considerations as influencing the timber supply relative to the base case, the current allowable harvest level can be maintained for at least the next five years. Additional assurance is provided in this respect by the volumes remaining unharvested in recent years in the TSA. However, as I have noted, if future consideration is given to harvesting any portion of these undercut volumes independently of the AAC, a further examination of the stability of this AAC determination may be indicated.

BCFS staff also provided me with other "synergy" analyses in order to assess the sensitivity of timber supply in the TSA to varying other management assumptions relative to the base case. This enabled me to determine the responsiveness of the timber supply to uncertainties and risk. One projection examined the above-mentioned five factors and also assumed that biodiversity guidelines would be proportionally applied to operable lands, as well as a five-percent increase in cedar and hemlock stand volumes (due to early indications from decay, waste and breakage studies). This projection also allowed the base case initial harvest level to be maintained for one decade, with a long-term level of 455 000 cubic metres.

Another synergy analysis examined the five factors noted above and also included the assumption that the age-class distribution of non-contributing stands does not change overall due to forest disturbances (such as fire) and that there is a five-percent increase in cedar and hemlock stand volumes. For this analysis the initial harvest level needed to be lowered from the base case by about 10 percent to approximately 480 000 cubic metres per year in order to meet the 10-percent -per-decade rate of decline specified in the harvest flow objectives in the base case. The long-term level in this analysis was 405 000 cubic metres. This latter analysis does underscore the sensitivity of timber supplies in the TSA to changes in management assumptions, and stresses the importance of reducing the risks and uncertainties in these factors before the next determination. I have identified the follow-up work ideally needed before the next determination below, under "Implementation."

Overall, in reviewing the factors influencing the projected timber supply in the TSA, I find that the initial harvest level is unlikely to be maintained for as long as the two decades indicated in the base case, and, based on today's view, will likely need to decline at an earlier date than formerly projected. However, I am satisfied that the timber supply is sufficiently stable to support maintenance of the projected harvest level for the duration of the five-year effective period of this determination.

As discussed in my consideration of *woodlot licences*, the base case projected initial harvest level of 535 000 cubic metres for the TSA (already reduced by 5000 cubic metres from the current total harvest level of 540 000 cubic metres to partially account for the issuance of woodlot licenses) must now be reduced by a further 5000 cubic metres to fully account for the issuance of all such licences since the last AAC determination. This will bring the allowable harvest level for the TSA to 530 000 cubic metres per year.

Determination

I have 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, 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 530 000 cubic metres.

This determination is effective January 1, 2000, 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.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination,
I encourage BCFS staff 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.

- Inoperable areas: Comprehensively review operability in cooperation with forest licensees.
- Reinventory: undertake a new forest inventory for the TSA
- Low-productivity sites: Undertake field assessments to determine which sites can realistically contribute to the timber harvesting land base.
- Site productivity estimates: Monitor performance in regenerated stands with field-based plots to determine whether the increases in site productivity suggested by the old growth site index studies are in fact warranted.
- Forest dynamics in non-contributing stands: Determine these dynamics so that a model can be developed to better account for this factor in subsequent timber supply analyses. This is an issue of provincial significance and will be managed in that context and applied in future determinations.
- Park inventories: Obtain any relevant vegetation inventories from Parks Canada so that the best available information can be used to support future timber supply reviews.
- Decay, waste and breakage: Complete and determine the relevance at the stand level of ongoing studies of cedar and hemlock loss factors, in consultation with staff of Resources Inventory Branch.

- Spatially explicit analysis: Continue spatially explicit analysis work and conclusively assess its relevance to supporting AAC determinations. Again this is a matter of provincial significance and will be managed in that context.
- Biodiversity emphasis options: Establish BEOs under the Code in order to provide clarity to future analysis.
- Continue to study the appropriate strategic management of harvestable ages, with a view to optimizing the timber supply.

In addition, this determination has underscored the need for clarification on KBLUPIS factors that affect the attainment of objectives both for timber supply and other values. There is a particular need for direction on the application of landscape-level biodiversity guidelines in operable and inoperable forests, and the resultant implications for grizzly bear habitat management. Many public comments received in the timber supply review for this TSA raised concerns about existing KBLUPIS guidelines. Confirmation and clarification of management guidelines either in the form of a higher level plan or policy direction are therefore needed to address these concerns.

Original signed

Larry Pedersen
Chief Forester

May 5, 1999

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1996, reads as follows:

8. 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 (1) (a) to (d),

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).

(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,
(b) different types of timber and terrain in different parts of private land within a tree farm licence area, and
(c) gains in timber production on Crown land that are attributable to silviculture treatments funded by the government of British Columbia, the federal government, or both.

(6) The regional manager or district manager must determine a volume of timber to be harvested from each woodlot licence area during each year or other period of the term of the woodlot licence, according to the licence.

(7) The regional manager or the regional manager's designate must determine a volume of timber to be harvested from each community forest agreement area during each year or other period, 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 stand 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) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(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.

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

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

(a) encourage maximum productivity of the forest and range resources in the Province;
(b) manage, protect and conserve the forest and range resources of the Crown, having regard to the immediate and long term economic and social benefits they may confer on the Province;
(c) plan the use of the forest and range resources of the Crown, 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 Crown and with the private sector;

(d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and
(e) assert the financial interest of the Crown 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: Summary of Public Information

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
Ministry of Forests
OFFICE OF THE MINISTER

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: The Crown's Economic And Social Objectives Regarding Visual Resources

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis.*

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests