

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Lakes Timber Supply Area

**Rationale for
allowable annual cut (AAC)
determination**

effective September 1, 1996

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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 a determination, under Section 7 of the *Forest Act*, of the allowable annual cut (AAC) for the Lakes Timber Supply Area (TSA). The document will also identify where new or better information is required for incorporation into future AAC determinations.

Description of the timber supply area

The Lakes TSA covers 1.12 million hectares and is located in the easternmost part of the Prince Rupert Forest Region. The TSA extends from Babine Lake in the north to the Entiako River in the south and lies along the northeastern boundary of Tweedsmuir Park.

Approximately 114 000 hectares, or 10 percent of the total TSA land base is classified as lake. The area drains into two major rivers, the Skeena and the Fraser, and is divided by three major water bodies—Babine Lake in the north, Francois Lake in the centre and Ootsa Lake further south. The largest community in the Lakes TSA is Burns Lake, which serves as the supply and distribution centre for various rural areas, as well as smaller settlements situated along the Highway 16 and the Canadian National Railway transportation corridor and between Francois and Ootsa Lake.

The economy of the area is mainly based on forestry activities. Decker Lake Forest Products Ltd. and Babine Forest Products Ltd. provide much of the local economic activity through direct employment in their sawmills, and the associated timber harvesting activities. Mixed farming and cattle ranching are secondary and many of the operators on small farms turn to logging or sawmilling in the winter months to supplement their incomes. In the summer, and increasingly in the winter, tourism is becoming an important economic activity.

The Lakes TSA contains important habitat for several ungulate species. The southern portions of the TSA, which border on Tweedsmuir Provincial Park, provide an important migration corridor and winter range for the Entiako caribou herd. Areas of highly productive moose and deer habitat in the TSA are connected by numerous wetland complexes and scattered populations of mountain goat inhabit higher elevations. The Lakes TSA also supports a small grizzly bear population in the Klaytahnkut Lake and Sutherland River areas.

Visual quality is an important landscape consideration for forest management activities in the Lakes TSA due largely to the high density of lakes which afford abundant scenic views for both residents and tourists. Approximately 35 percent of the TSA has been classified as visually sensitive.

Presently, the Lakes Land and Resource Management Planning (LRMP) process is underway for the TSA. Representatives of the provincial and local governments, First Nations and the community are working cooperatively to develop a land use and management plan identifying resource objectives for the diverse natural values in the area.

History of AAC

During 1979 and 1980, a timber supply analysis of the Lakes TSA was undertaken by the BCFS. Following this, a TSA report was released, and in 1982 an AAC of 1 500 000 cubic metres was established.

The BCFS conducted another timber supply analysis in 1985, which led to the development of a Lakes TSA Plan approved by the Chief Forester in 1987. Upon approval of the plan, the AAC was re-determined and was unchanged from the previous AAC of 1 500 000 cubic metres. However, the new AAC was subject to the following requirements. First, the utilization standard for pine species was to be increased from a minimum 17.5 centimetre diameter at breast height (dbh) to a 15.0 centimetre dbh within two years. Secondly, harvesting would take place in lower-volume-per-hectare stands to a minimum volume of 140 cubic metres per hectare. Thirdly, the BCFS was to institute a monitoring system to help ensure appropriate harvesting was taking place across the volume class profile for the TSA. Finally, the BCFS was to establish juvenile spacing objectives for the TSA in order to help address the TSA age class gap. These requirements have been addressed as discussed in appropriate sections in the rationale.

The current AAC is apportioned by the Minister of Forests as follows:

Apportionment	cubic metres	% of total
Forest Licences	1,022,960	68.2
Timber Sale Licences, replaceable	1,899	.1
Small Business Forest Enterprise Program	438,939	29.3
Unallocated woodlot licences	6,602	.4
Forest service reserve	15,000	1.0
Subtotal	1,485,400	99.0
Allocated woodlot licences *	14,600	1.0
Total	1,500,000	100

* N.B.: Allocated woodlot licence volumes are not included in AACs determined by the Chief Forester under Section 7 of the *Forest Act*.

New AAC determination

Effective September 1, 1996, the AAC for the Lakes TSA will be 1 500 000 cubic metres which, maintains the AAC at the current level. This will remain in effect until a new AAC is determined, which must take place within five years of this determination. This AAC is exclusive of the currently allocated woodlot licences.

Information sources used in the AAC determination

Information considered in determining the AAC for the Lakes TSA includes the following:

- *Caribou habitat use in the Chelaslie River migration corridor and recommendations for management.* (in press). J. D. Steventon. BCFS. 1996;
- *Effects of Stocking on Estimated Site Index in Morice, Lakes, and Vanderhoof Timber Supply Areas in Central BC.* (in press). BCFS. 1995;
- *Forest Practices Code of British Columbia Act.* July 1995;
- *Forest Practices Code of British Columbia Regulations.* April 1995;
- *Forest Practices Code Timber Supply Analysis.* BCFS. February 1996;
- Forest inventory planning file, British Columbia Forest Service (BCFS);
- Five-year timber harvesting development plans;
- Geographic Information Systems (GIS) maps, produced for the Lakes TSA timber supply analysis and land and resource management planning. BCFS. October 1994 - September 1995;
- Lakes District Change Reporting System 1986-1988, Forgis Resource Consultants, BCFS;
- Lakes District Change Reporting System 1988-1990, Forgis Resource Consultants, BCFS;
- *Lakes Timber Supply Analysis.* BCFS. 1985;
- *Lakes TSA Plan.* BCFS. 1987;
- Lakes TSA AAC Rationale. BCFS. 1989;
- *Lakes TSA Timber Supply Analysis.* BCFS. June 1995;
- *Lakes TSA Socio-Economic Analysis.* Crane Management Consultants Ltd. June 1995;
- *Lakes TSA: Timber Supply Review Discussion Paper.* BCFS. June 1995;
- *Lakes TSA Summary of Public Input.* BCFS. 1996 (attached);
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives (attached);
- Memo from the Minister of Forests to the Chief Forester, dated February 26, 1996, stating the Crown's economic and social objectives regarding visual resources (attached);
- *Management strategy and options for the Tweedsmuir-Entiako caribou winter range,* Land Management Report #79. Cichowski, D.B. and A. Banner. BCFS. 1993;
- Mountain Pine Beetle susceptibility surveys, Lakes TSA. BCFS. 1991;
- *Procedures for Factoring Recreation Resources into Timber Supply Analyses.* Recreation Branch. BCFS. December 1993;
- Response to Ministry of Forests Lakes TSA Timber Supply Analysis and Discussion Paper, Lakes TSA Licensee Interest Group, Timberline Forest Inventory Consultants, October 1995;
- Silviculture history records, BCFS;

- Technical review and evaluation of current operating conditions through comprehensive discussions with Forest Service staff, notably at the AAC determination meeting, Burns Lake, January 24 - 25, 1996.

Role and limitations of the technical information used

The *Forest Act* requires me 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 formed the major body of technical information used in my AAC determination for the Lakes TSA. The timber supply analysis and associated inventory 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. The analysis also indirectly incorporates some economic information such as an operability classification that defines the types of terrain and timber that can be physically and economically accessed given current technology and markets.

However, the analytical techniques used to assess timber supply are simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variation in physical, biological and social conditions—although ongoing science-based improvements in the understanding of ecological dynamics will help to 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 the complete answer or solution to forest management decisions such as AAC determinations. This 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 I must consider in AAC determinations.

In making the AAC determination for the Lakes TSA, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a sound basis for my determination.

Statutory framework

Section 7 of the *Forest Act* requires the Chief Forester to consider various factors in determining AACs for TSAs and TFLs. Section 7 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. Two important ways of dealing with uncertainty are (i) minimizing risk, and (ii) redetermining AACs frequently to ensure they incorporate up-to-date information and knowledge. In respect of these: (i) 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 AACs from a range of possible harvest levels; and (ii) the benefits of frequent decision making have been recognized in the legislated requirement to redetermine AACs every five years. This is central to many of the guiding principles that follow.

In considering the various factors that Section 7 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 impact of the Code on timber supply is a matter of considerable public concern. In determinations made before the Code was brought into force, no final standards or regulations were available at the time the BCFS timber supply analyses were conducted. Accordingly, the analyses were unable to assess the impacts of any new constraints on timber production which might be imposed under the Code. In those determinations I did not consider any more stringent restrictions or additional impacts upon timber supply beyond those anticipated to occur due to the application of guidelines current at the time of determination. However, I assumed that the Code would at least entrench the standards exemplified by those guidelines as statutory requirements.

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. Studies in selected TSAs (*Forest Practices Code Timber Supply Analysis*, BCFS, February 1996) indicate that under the Code there will be some impacts on timber supply additional to those expected under previous guidelines. In AAC determinations made since the coming into force of the

Code, I have viewed with some caution the timber supply projections in BCFS timber supply analyses that pre-date the Code, as is the case in the Lakes TSA. At the same time, I am mindful that the full force of the Code may not be felt during the transition phase of its implementation, and that the impacts of specific factors on timber supply may not yet have been assessed on a local basis.

The impact on the timber supply of land-use decisions resulting from planning processes such as the Commission on Resources and Environment (C.O.R.E.) process, the Land and Resource Management Planning (LRMP) process, such as the Lakes LRMP, and the Protected Areas Strategy (PAS), is a matter often raised in discussions of AAC determinations. In determining AACs it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions that have not yet been taken by government. Thus I do not consider the 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 land-use decisions, it may not always be possible to analyze their timber supply impacts in an AAC determination. In most cases government land-use decisions must be followed by 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 is impossible to properly assess the impact of the land-use decision. However, the legislated requirement for AAC reviews at least every five years will ensure that such decisions will be addressed in future timber supply analyses.

The Forest Renewal Plan will fund a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long term. In general, it is too early for me to assess the consequences of these activities, but wherever feasible I will take their effects into account. The next timber supply analysis of the Lakes TSA will be better positioned to determine how the Plan may affect timber supply.

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 has created the extensive delays that have resulted in the current urgency to redetermine many outdated AACs. In any case, the data and models available today are far 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 interests 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 the June 1993 Delgamuukw decision of the B.C. Court of Appeal regarding aboriginal rights. The AAC I determine for a TSA should not in any way be construed as limiting the Crown's obligation under the Delgamuukw decision, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the TSA. My determination is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Aboriginal rights will be taken into account as far as possible under Section 7(3) of the *Forest Act*, and will be respected in the administration of the AAC determined.

Regarding future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government.

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 Act* and the *Forest Practices Code of British Columbia Act*.

Consideration of factors as required by section 7 of the *Forest Act*

The role of the "base case"

In considering the factors required under Section 7 to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the work of the Timber Supply Review project. For each TSA determination a timber supply analysis is carried out, using a data package of information from three categories: land base inventory, timber growth and yield, and management practices. Using this set of data, and a Forest Service computer simulation model (FSSIM), a series of timber supply forecasts is produced. Each forecast is based on the same set of data, and reflects different decline rates, initial harvest levels, and trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen that 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 is maintained. This is known as the "base case" forecast, which 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 is not an AAC recommendation. Rather, it is one possible forecast of timber supply, the validity of which—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 about 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 information available about forest management, which—particularly during the period leading up to, and now during the implementation of, the Code—may well have changed since the original data package was produced.

Thus it is important to remember, in reviewing the considerations that 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. But once an AAC has been determined that reflects appropriate assessment of all factors required to be considered, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined—it would be impossible for any such analysis to fully incorporate the subtleties of the judgement involved.

In the analysis conducted by the British Columbia Forest Service (the "BCFS analysis"), the land base allocated to woodlots, about 6 800 hectares, was deducted to reflect their separate AAC administration. The Lakes Forest District intends to increase the woodlot program in the near future, but to date these changes have not been made. Therefore, until such time as these changes are made, it would be inappropriate for me to speculate on what the impacts might be on TSA timber supplies or to remove these additional areas from consideration in the base case harvest projection.

For the Lakes TSA, the base case projected an initial harvest level at the current AAC of 1 500 000 cubic metres per year. The base case projection maintained this harvest level for 7 decades, followed by a decrease of 10 percent to 1 350 000 cubic metres for one decade. After the eighth decade, the harvest level then decreased by a further 3 percent to 1 310 000 cubic metres for the next 9 decades before increasing by 9 percent to the long-term harvest level of 1 441 000 cubic metres per year.

The Forest Act, section 7 (3)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 10, shall 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 Lakes TSA as reported in the BCFS analysis is 1 123 667 hectares. The land base considered available for timber harvesting (the "timber harvesting land base") is limited by environmentally sensitive areas, non-merchantable forest types and the use of the area for purposes other than timber production. Reasonable assumptions and, if necessary, projections, must be made about these factors, and appropriate areas must be deducted from the productive forest area to determine the timber harvesting land base. In the BCFS analysis, about 77 percent of the TSA is classified as productive forest, of which approximately 73 percent is considered the timber harvesting land base. Therefore, in the BCFS analysis, approximately half of the total area of the TSA is considered available for timber harvesting.

- environmentally sensitive areas (ESAs)

In the BCFS analysis, 42 267 hectares were identified as environmentally sensitive and were deducted from the productive forest. Areas classified as ESA₁ and ESA₂ in the inventory files were not differentiated for the purposes of the BCFS analysis, and reductions for ESAs ranged from 70 to 100 percent.

The Lakes TSA Licensee Interest Group commissioned Timberline Forest Inventory Consultants to critique the BCFS timber supply analysis and discussion paper. The licensee critique noted that in the BCFS analysis, ESA₁ and ESA₂ were not defined separately. In addition, it reported very different numbers of hectares in each ESA category than those reported by the BCFS. The licensee critique contends that most of the ESAs are due to moderately sensitive soils, not highly sensitive soils as reported in the BCFS analysis. As a result, the critique submits that with a smaller reduction for ESA₂, there are an additional 20 000 hectares that contribute to the productive forest. In response to this concern, BCFS staff requested additional information from the licensees to better substantiate their estimates of ESAs; but none was provided and I am unable to verify their conclusions.

BCFS staff have further reviewed the ESA components in the inventory file and have assured me that the BCFS analysis accurately reports those areas classified for soil sensitivity. The largest ESA category removed was for highly sensitive soils (31,559 hectares). After deducting for ESA₁ (highly sensitive) areas, there were only 875 hectares

of ESA₂ (moderately sensitive) areas, which were again mostly classified for sensitive soils.

Also, the licensee critique suggests that a reduction of 100 percent to account for recreation ESAs is unnecessary as recreation values are adequately accounted for in the BCFS analysis by VQOs.

I agree with the licensee critique that a reduction of 100 percent of the recreation ESAs may be unnecessary and that a reduction of 90 percent is more appropriate as some harvesting will occur in these areas. As there are approximately 4000 hectares of recreation ESAs, a lower reduction would increase the timber harvesting land base by about 400 hectares. This results in a very small upward pressure on the base case harvest projection. Nonetheless, I am mindful of this small influence in this determination as discussed in "Reasons for decision."

In respect to the other concerns raised in the licensee critique regarding ESAs, I find insufficient information in the submission to verify a 20 000 hectare adjustment. With the exception of the recreation ESAs, district staff have confirmed that the reduction factors used in the BCFS analysis are reflective of current practice in the Lakes TSA. Therefore, with the exception of ESAs for recreation as discussed above, I am satisfied that the ESA reductions are reasonable and within the range found in similar areas elsewhere in the province.

- low productivity sites

In determining the timber harvesting land base, sites with low timber-growing potential (stands not projected to achieve a minimum volume of 140 cubic metres per hectare at 200 years of age or greater) were deducted from the productive forest land base. A total of 39 713 hectares was deducted in the Lakes TSA to account for low productivity sites. A significant proportion of these low sites are found at high elevations in the Engelmann Spruce Sub-alpine Fir biogeoclimatic zone.

Results of the Lakes paired-plot study, discussed in detail below in *estimates of site productivity*, indicate the likelihood of improved growth of pine stands currently classified as low site if they were treated and managed. District staff estimate that approximately 50 percent (about 9 700 hectares) of the candidate pine stands could be successfully treated. While this does represent a potential opportunity, any gains will be to future timber supplies and will likely not affect short-term harvest levels. Also, at present there are no plans in place that indicate a commitment to undertake such treatments.

A submission from the public stated that the land base deductions for low productivity sites were too great in the BCFS analysis, although no evidence was provided to support this concern.

"Change Reports" conducted between 1986 and 1990 to monitor harvesting performance in lower volume (problem forest) types indicate that the factors used in the BCFS analysis closely reflect current harvesting performance in low productivity stands. I consider the reports to be reliable for consideration as they are based upon statistical evidence. I am satisfied that deductions for low sites in the BCFS analysis are appropriate, and I have made no further adjustments to them.

- deciduous forest types

In the BCFS analysis, a total area of 40 973 hectares was removed from the timber harvesting land base to account for deciduous-leading stands (broadleaf species). As well as land base reductions, the deciduous volume within coniferous-leading stands was removed.

Deciduous stands were removed for two reasons. Firstly, at present, commercial utilization of deciduous stands in the Lakes TSA is limited to small scale harvesting operations on private lands that are, in large part, transported out of the TSA for processing. Secondly, current management of deciduous species in the TSA is predominately based on a "no net-loss" strategy in recognition of their contributions to other values such as biodiversity, riparian areas and important moose and deer winter habitat. Thus, based upon current activity in the TSA, deciduous stands were assumed to be non-merchantable in the BCFS analysis.

However, approximately 1000 hectares of aspen and conifer mixed stands less than 21 years old were incorrectly removed as part of the deciduous reduction. Although these stands have a major component of deciduous species, they are managed plantations that meet coniferous species stocking and free growing standards. District staff submit that these stands should have been included in the timber harvesting land base. Including these stands has a very small (0.2 percent) quantified upward influence on the base case harvest projection in the mid- to long-term, as I have discussed below under "Reasons for decision."

The Licensee Interest Group suggests an alternative approach to a reduction of all deciduous types is to consider a minimum conifer volume requirement of 140 cubic metres per hectare at 200 years old. This suggestion has some merit; however, there is little evidence to verify that harvesting in these stands is current practice.

While I note that demand for hardwoods is seen to be increasing slightly, it is presently being met by sources outside of the TSA where higher quality stands are available. District staff estimate that as much as 70 percent of the deciduous stands in the TSA are of too poor a quality to be considered suitable for commercial utilization. Also, almost half of the deciduous forest types deducted are found in the retention and partial retention VQO areas.

I encourage BCFS District staff to clarify the management objectives for these stands, and I will return to this point below under "Implementation of Decision." As some deciduous stands, albeit on private land, are being harvested, it is likely that some level of deciduous harvest could be supported in the Lakes TSA.

In the future, should demand continue to increase—with clear management objectives established and more certainty of suitable areas—I am prepared to consider a partition to harvest deciduous stands. However, for now I have not established a deciduous partition, and, apart from the 1000 hectares of mixed aspen and coniferous stands, I have considered the assumptions for deciduous types in the BCFS analysis as appropriate for this determination.

- problem forest types

In the BCFS analysis, pure sub-alpine fir stands and sub-alpine fir stands with less than 30 percent spruce or pine content, all mature stands less than 19.5 metres in height and all pine leading stands with a stocking class 4 designation or those with significant aspen and cottonwood components were assumed to be problem forest types. In total, 67 151 hectares of problem forest types were considered non-merchantable and were removed from the productive forest land base.

A recent review of the deductions for problem forest types found that 5832 hectares of sub-alpine fir leading forest types were incorrectly removed from the timber harvesting land base. Therefore, the total area removed for problem forest types is more appropriately 61 228 hectares.

The assumptions for problem forest types were based upon an examination of harvesting records. At the time of conducting the BCFS analysis, district staff found negligible harvesting activity in mature coniferous stands that have failed to achieve a stand height of 19.5 metres or more. Thus, in order to accurately represent current practices in the BCFS analysis, areas with such stands were removed from the timber harvesting land base. About 92 percent of the stands deducted as problem forest types are height class 2 lodgepole pine stands (50 770 hectares), and approximately 40 percent of these are located in the IRM zone.

A total area of 93 hectares were removed from the timber harvesting land base to account for stocking class 4 stands. Such stands are generally excessively dense with extremely small stem diameters that have mostly regenerated following wildfire. While there may be opportunities for future stand conversion to more productive stands on these sites, the area involved is very small, and any impacts on timber supply would be insignificant.

All pine-leading stands having an aspen or cottonwood component of 30 percent or greater (about 2 900 hectares, or less than one percent of the TSA) were deducted in the BCFS analysis. Although some harvesting has occurred in these stand types to help control mountain pine beetle outbreaks, harvesting in these areas generally is not carried

out. Stands such as these are recognized for their contributions to wildlife habitat and biodiversity.

Between 1986 and 1990, Change Reports conducted to monitor harvesting performance in lower volume (problem forest) types indicated little performance in these stands. However, more recently there has been some performance in pine stands between 17 and 19.5 metres in height, and, as a result, approximately 20 000 hectares of these generally shorter and smaller diameter stands may now be considered harvestable.

The licensee critique supports the view that some harvesting has been occurring in these stands, and that an examination of operational plans and cutting permits indicates that harvesting of these stands will continue. Also, improved harvesting techniques and milling has enabled harvesting in stand types currently classified as problem forest types.

Given both the district and the licensees' findings, I accept that some harvesting has been occurring in problem forest types. I agree with the licensees' submission that new improvements in harvesting and milling technologies could, depending upon market forces, make some stands currently considered problem forest types economically operable. Specifically, as discussed below in *estimates of site productivity*, managed pine stands are expected to achieve a significant increase in merchantable stand volume over natural pine stands in this TSA. The prospect of this will likely improve investment forecasts and may encourage more activity in these stands. I am also aware that the Lakes LRMP is examining merchantability criteria. Should additional opportunities in these stands be identified, I will consider these in future determinations.

Overall, I observe that some of these stands, especially mature pine stands between 17 and 19.5 metres in height (i.e. approximately 20 000 hectares), are likely merchantable. Also, I am mindful of the correction of 5832 hectares for sub-alpine fir leading forest types. These two factors represent an upward pressure of approximately 4 percent on the timber harvesting land base in the short term, which I have discussed below under "Reasons for decision."

- estimates for roads, trails and landings

In order to estimate deductions for existing and future roads, trails and landings, district staff conducted a two-part survey of the Lakes TSA in 1994. In part 1 of the survey, roads and landings located outside of existing cutblocks were measured and found to account for 0.5 percent of the timber harvesting land base. The second part of the survey measured the area currently occupied by roads, trails and landings within existing cutblocks. The results were classified into two harvesting systems. In areas where roadside harvesting systems were used (about 70 percent of the Lakes TSA), the average deduction was found to be 4.2 percent. In conventional harvesting areas (about 30 percent of the Lakes TSA), roads, trails and landings averaged 6.9 percent of cutblock areas. Overall, a reduction of 5.4 percent was applied to the timber harvesting land base using the above figures and weighted averages.

The licensee critique submits that road rehabilitation is a common forest management practice and that this was not reflected in the BCFS analysis. District staff state that any rehabilitation within existing blocks was captured in the survey; however, any anticipated rehabilitation was not included. Nonetheless, although some of the impacts of rehabilitation may not have been fully accounted for in the BCFS analysis, such increases to the timber harvesting land base are small and will not affect timber supplies in the short term.

In examining the reductions for road, trails and landings, I find that the quantitative methodology applied in the Lakes TSA was well developed and I am satisfied with the results. As such, I have made no further adjustments to account for roads, trails and landings.

- archaeological areas

In the Lakes TSA, several traditional-use studies have been conducted and are being utilized at the operational planning stage. In addition, as part of the development work conducted to support the ongoing Lakes LRMP, an Archaeological Overview Assessment was conducted by contractors on behalf of the Ministry of Small Business, Tourism and Culture. To date, there has been considerable cooperation between local stakeholders and the BCFS to identify any special management considerations to ensure the maintenance of archaeologically significant areas.

District staff indicate that most sites having archaeological significance are located in areas where deductions from the timber harvesting land base have been applied to account for other values; thus, further deductions are not necessary to account for these areas.

Upon completion of the Lakes LRMP, management objectives and strategies for archaeologically significant areas will likely be more clearly defined. Until such time as the plan is completed, it is difficult to determine if there will be any specific timber

supply impacts. For now, these areas do not represent a serious risk to timber supplies in the short term and I am satisfied that additional reductions to account for archaeological areas are not required at this time.

Existing forest inventory

- general comments

A forest re-inventory of over 90 percent of the Lakes TSA was completed in 1993. As well as the re-inventory, most of the forest cover maps were updated to account for forest growth and depletions to the fall of 1993. Therefore, although the forest inventory was up-to-date in 1993, almost three years of new depletions and harvesting activity have occurred since the updates.

One public submission expressed concern that the forest inventory was out-dated and asserts that it is inaccurate. District staff are of the opinion that the inventory information is reliable for purposes of the BCFS analysis. As discussed below, under *volumes estimates for existing stands*, a volume-ratio sampling study is scheduled for 1996 that will provide further indication of the accuracy and reliability of the inventory information for the Lakes TSA. The results of this study were not available for this AAC determination, but I will consider the results in the next determination. As the inventory used in the analysis was completed according to provincial standards and procedures, and as I have no substantiated evidence to suggest this information is not reliable, I am satisfied that the inventory data used in the BCFS analysis is appropriate for this determination.

- age class structure and species profile

The predominant tree species in the Lakes TSA is lodgepole pine, covering about 77 percent of the timber harvesting land base. Lodgepole pine stands occur primarily at mid-to-lower elevations in the TSA and have generally become established after wildfires. Typically, in northern areas like the Lakes TSA, areas burned by wildfire regenerate naturally and result in even-aged pine forests. Other tree species include spruce, which occupies 21 percent of the timber harvesting land base, with the remaining two percent composed of sub-alpine fir and Douglas-fir.

Approximately 64 percent of the timber harvesting land base is covered by stands greater than 100 years of age. Two notable gaps in the age class distribution occur in the 30- to 50-year age range and in the 90- to 100-year age range. The gaps are a result of periods of fewer disturbances during those periods from events such as catastrophic insect, wind and fire damage. I am satisfied that the age class structure is not a limiting factor in the determination for this TSA. However, the mature and near-mature timber must be managed with appropriate harvest levels over time until second-growth stands become available.

- volumes estimates for existing stands

The BCFS analysis used the Variable Density Yield Prediction (VDYP) model to estimate volumes for existing mature stands. VDYP is based on information gathered from a large number of sample plots, and is generally accepted in British Columbia for predicting volumes in existing stands. Therefore, as a general rule in making AAC determinations, in the absence of statistically valid contradictory evidence for a particular area, I rely on VDYP estimates for existing stand volumes.

A sensitivity analysis indicates that in the short term, the base case harvest projection can still be maintained even if estimates of existing stand volumes have been over-estimated by 10 percent. Conversely, sensitivity analysis indicates that a 10 percent underestimation of existing stand volume could permit a 10 percent increase to the initial base case harvest level.

The licensee critique agreed that existing stand volume estimates used in the BCFS analysis are reasonable, based upon their examination of cruised volume summaries by cutting permit. While I recognize that these comparisons do not dispute the VDYP estimates, I am mindful that compared with volumes used in the analysis, the operational cruise and planning information is taken from a limited time frame and area. Because of this, the results could be influenced by other factors such as actual versus assumed utilization and differences in the sampled and overall average mix of species and sites to be harvested over time.

A district staff review of major licensee and Small Business Forest Enterprise Program cruise volumes for cutblocks logged between 1991 and 1994 also supports the estimates for existing stand volume as reflected in the BCFS analysis. However, district staff indicate that, based on field observation, the VDYP volume estimates for pine stands older than 180 years appear somewhat overestimated. Over-mature lodgepole pine stands are seldom found naturally, as pine is short-lived mostly due to frequent wildfires. I recognize that maintaining pine stands over 180 years of age may not be possible given the normal life span of such stands. However, in the BCFS analysis, the majority of stands over time are projected to be harvested at less than 120 years of age. Also, the field observations do not constitute a sufficiently rigorous, representative sample of the Lakes TSA to convince me that the timber volumes used in the BCFS analysis in fact overestimate existing stand volumes by a particular magnitude.

For the purposes of this determination I view the VDYP predictions in over-mature pine stands as an upper level that might possibly be reached. As discussed above, the base case harvest projection is not sensitive in the short term to reduced existing stand estimates and therefore any uncertainty brought about here does not introduce significant risk to short-term timber supplies. The volume-ratio study to be conducted later this year will help bring more certainty in this area and will be available for consideration in the next determination.

I am satisfied that, for the purposes of this determination, existing stand volumes were appropriately estimated in the BCFS analysis and as such, I have made no further adjustments.

Expected Rate of Growth of the Forest

- estimates of site productivity

Inventory data includes estimates of site productivity, which is the ability of a particular site to grow trees and is usually expressed in terms of site index. Site index is based on the height of a stand as a function of the stand age (typically at 50 years of age). The productivity of a site largely determines how quickly trees will grow and therefore affects expectations of the time seedlings will take to reach green-up conditions, the volumes of timber that will grow in regenerated stands, and the age at which those stands will reach merchantable size or minimum harvestable age. Accurately estimating site productivity in both young and old stands is difficult. 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 older stands, which have not been subject to density management, the trees measured may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. The BCFS is currently undertaking paired-plot studies across British Columbia to address this shortcoming.

In the Lakes TSA, a paired-plot study was initiated early in 1994 and was completed near the end of 1995. The Lakes TSA paired-plot study was a cooperative effort by the BCFS and the Lakes TSA licensees. Fifty six samples in the Lakes TSA were combined with 42 samples in the Morice Forest District and 12 samples in the Vanderhoof Forest District as a stronger site index relationship could be built with a larger number of samples in the same stratum. All samples were located in managed lodgepole pine stands in the Sub-Boreal Spruce (SBS) biogeoclimatic zone. The study indicated that the average site index for older, natural stands was 15.6 metres compared to the average site index of 20.1 metres for managed second-growth stands on the same sites. As current projections for second growth are derived from old growth, the study indicates that projections in the BCFS analysis may underestimate site index by an average of 4.5 metres for managed second-growth stands.

The appropriate application of this data to the Sub Boreal Spruce (SBS) biogeoclimatic zone within the IRM zone results in a quantified upward influence of 16 percent on the base case harvest projection (sensitivity analysis showed 18 percent; however, excluding the Sub-Boreal Pine-Spruce (SBPS) biogeoclimatic zone where the findings were inadvertently applied, proportionately lowers the upward pressure to 16 percent).

Concerns have been raised by the district staff, the public and the LRMP regarding the impact this information could have on the immediate harvest level, particularly given the uncertainty of the potential downward pressures from implementing the LRMP, from increasing the use of alternative harvesting systems and from new requirements under the Forest Practices Code for managing such values as biodiversity. While strategies such as these indeed could influence timber supplies, it remains likely that increases in estimates of site productivity could be applied in the Lakes TSA to offset some of these downward pressures.

In previous AAC determinations, I have discussed the potential for increases to timber supply as a result of more accurate estimations of site productivity for managed stands than is currently available. I have also stated that, based upon studies to date and my experience with BC's tree species, it is my understanding that the site productivity of some stands, particularly lodgepole pine, is likely underestimated. The quantification of this uncertainty and its related impact on volume estimates for managed stands, green-up ages and minimum harvestable ages have also been previously unproven. Now, with the recent completion of the Lakes paired-plot study, I have been presented with scientifically derived, statistically reliable evidence that lends a higher degree of precision to estimates of site productivity for this TSA and confirms the site index underestimations for managed lodgepole pine stands in this area.

Higher estimates of site productivity lends support to the fact that the operable land base could be larger in the future if lower productivity natural stands are brought under full management. As well, increased volume estimates for managed stands will reduce the minimum harvestable age, and reduce the green-up period. This new information will be discussed in a number of other sections in this determination; see *problem forest types*, *volume estimates for regenerated stands*, *minimum harvestable age* and *green-up*.

Given the evidence from the Lakes paired-plot study, I am mindful that estimates of site productivity for managed stands are higher for lodgepole pine than assumed in the BCFS base case—in the SBS biogeoclimatic zone in the Lakes TSA. However, I have also considered the concerns raised regarding the risks associated with its direct application in this determination as further discussed below, under "Reasons for decision."

- *volumes estimates for regenerated stands*

The BCFS analysis used the Table Interpolation Program for Stand Yields (TIPSY) to estimate volumes for regenerated stands. This program was developed by the Research Branch of the BCFS specifically to model yields from regenerated managed stands. TIPSY is generally accepted in BC as an appropriate model for these types of stands. Volume estimates of existing stands less than or equal to 20 years of age and all future regenerated stands were projected using TIPSY.

Where necessary, operational adjustment factors (OAFs) are applied to the TIPSY yield estimates in the BCFS analysis in order to account for the loss of timber productivity due

to particular conditions such as swamps and rock outcrops that were too small to be reflected in the inventory classification, as well as losses due to pests, decay, waste and breakage. A factor of 15 percent (OAF 1) was applied to account for incomplete stocking due to small unproductive sites, and a factor of 5 percent (OAF 2) was applied to reflect natural losses incurred by biotic forces, including disease, as stands mature.

On the basis of a comparison of existing and regenerated stand volume estimates, it is projected that, in general, given the same site productivity, managed stands are expected to yield approximately 20 percent more volume than natural stands. In addition, the Lakes paired-plot study, as discussed above, under *estimates of site productivity*, indicates that the site index of managed lodgepole pine stands in the SBS biogeoclimatic zone of the IRM zone is underestimated by an average of 4.5 metres, which, in essence translates into more regenerated volume being produced in less time. I have considered this factor below under "Reasons for decision."

- minimum harvestable ages

In the BCFS analysis, minimum harvestable ages were established at the point at which maximum average growth occurs, also known as culmination age. District staff confirm that the ages used in the BCFS analysis are reflective of current practice, although most stands are currently harvested at an age older than the culmination age, simply due to the abundance of older stands and their associated harvesting priority.

However, underestimating site indexes, as discussed under *estimates of site productivity*, could reduce minimum harvestable ages by about 30 years. The effects of this are discussed in conjunction with other factors under *estimates of site productivity*; *biodiversity, wildlife tree patches and old-growth*; and under "Reasons for decision."

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

Regeneration delay

Regeneration delay is the period of time between harvesting and when an area is occupied by a specified minimum number of acceptable well-spaced trees. In the Lakes TSA, 100 percent of all denuded areas are planted, which helps minimize the regeneration delay. Based upon a review of the Lakes TSA silviculture records for the past 8 years, district staff estimate that regeneration delays are typically 2 to 3 years, and these time delays were therefore assumed in the BCFS analysis. I consider the regeneration delays used in the BCFS analysis as appropriate for this determination.

Impediments to prompt regeneration

There are no significant impediments to prompt regeneration identified in the Lakes TSA; however, three minor impediments have been noted.

First, insect damage as a result of root collar weevil is known to occur throughout the TSA. Incidence is light, however, and does not seriously influence the ability of the stands to achieve projected volumes.

Second, blister rusts and mistletoe—diseases commonly associated with pine species—can impede stand development. Recent BCFS surveys in the TSA indicate, however, that occurrence frequencies are low. Incidences are continually monitored and recorded such that the appropriate treatments can be conducted to eradicate or minimize the effects of such disease agents. In addition, stand tending activities like spacing often remove infected trees leaving a healthy stand to grow on the site.

Third, brush competition can impede regeneration on some sites if remedial action is not taken. In order to mitigate brush impacts, site preparation following harvesting and prompt planting of large, vigorous seedlings are undertaken in areas identified with a potential brush hazard. In some special cases, where aspen is determined to be beneficial to wildlife and/or biodiversity values, the BCFS is incorporating limited levels of aspen stocking as acceptable species for the site. While I recognize that these special cases vary from what was assumed in the BCFS analysis, the extent of treatment is very low and does not represent a significant influence on future timber supplies.

Overall, there is a concerted effort among licensees and the BCFS to reduce the impacts of these impediments. I am satisfied that no adjustments are required in the BCFS analysis to account for regeneration impediments for this determination.

Not-satisfactorily-restocked areas

An area is classified as not-satisfactorily-restocked (NSR) if there is not a minimum number of acceptable well-spaced trees of preferred species as specified in BCFS stocking standards. There are a total of approximately 11 640 hectares of NSR, of which about 81 percent is current and 19 percent is backlog. Current NSR areas are expected to be regenerated within the delay periods assumed in the BCFS analysis.

The BCFS analysis assumed that 15 years would be required to restock the backlog areas. Based upon recent silviculture survey and inventory reviews, district staff anticipate that all the backlog NSR areas will be properly restocked within 5 years. Restocking sooner than projected in the BCFS analysis represents a very small upward influence on timber supplies in the mid to long-term. Somewhat offsetting this upward influence, however, is the fact that district staff anticipate lower than normal stocking levels may be accepted on up to 9 percent of the backlog areas to provide for important wildlife habitat. Altogether, I observe that these departures from the assumptions used in the BCFS analysis are only slight and do not introduce a risk to projections of existing or future timber supplies.

(iii) silvicultural treatments to be applied to the area;Alternative silvicultural systems

Largely as a consequence of a history of wildfires in the area, the Lakes TSA is primarily forested with lodgepole pine, a species ecologically suited to even-aged forest management. Therefore, clearcutting has been the primary silvicultural system with limited application of alternative systems. Partial cutting is increasingly being used in riparian management areas and in a few areas of scattered mountain pine beetle infested trees. The riparian management areas have implications for timber supplies not already accounted for in the BCFS analysis, as discussed below, under *riparian areas*.

Although the use of alternative systems has historically been low in this TSA, I expect selection systems will play an increasingly important role in the future. Requirements for the maintenance of biodiversity, visual quality, riparian areas and critical wildlife habitat will likely necessitate an increase in the use of systems other than conventional clearcutting. Currently, understanding of the impacts of such practices on timber supplies in the Lakes TSA is incomplete. As such, I expect district staff to examine the use of alternative silvicultural systems in the Lakes TSA with a view to understanding the short-to long-term timber supply implications. I will return to this point under "Implementation of decision."

For the purposes of this determination, with the exception of partial cutting in riparian management areas, as discussed under *riparian areas*, I am generally satisfied that the BCFS analysis adequately reflects the timber supply implications of the silvicultural systems currently applied in this TSA.

Incremental silviculture*- spacing and pruning*

As noted in the *Lakes TSA Discussion Paper*, in some circumstances, incremental silviculture treatments such as fertilization along with juvenile spacing can increase tree growth and therefore affect timber supplies. Between 1987 and 1994, approximately 3900 hectares were incrementally spaced. Currently there is little fertilization occurring.

Incremental silviculture activities may increase as the district plans to treat approximately 600 hectares per year in the future under the Forest Renewal Plan. However, in the absence of a definite plan for this TSA, I will not speculate on the scope of activities that might occur. Therefore, because of the limited activities currently taking place and uncertainty regarding specific Forest Renewal Plan activities, I have made no specific allowance for incremental silviculture in my determination.

- commercial thinning

Approximately 11 percent of the pine forests within the timber harvesting land base are between 40 and 80 years old and may be candidates for commercial thinning. However, to date very little commercial thinning has occurred in the Lakes TSA. Currently, only a few experimental commercial thinning projects have been conducted. Recently, one licensee had a commercial thinning cutting permit approved as part of their five-year development plan, with operations scheduled to commence in 1996. District staff intend to identify strategic objectives for commercial thinning in the TSA so that a plan can be formulated for future thinning opportunities. While one-entry commercial thinning regimes will not likely increase volume yields on a specific site, they may provide opportunities to harvest timber in areas where clearcut harvesting is not compatible with other resource objectives, such as visual quality, and this could be beneficial to the timber supply.

The BCFS analysis did not reflect any commercial thinning activity. With the existing abundance of mature timber, the inclusion of small scale commercial thinning operations would not have any significant impact on short-term harvest levels. Given the currently limited commercial thinning activity in the Lakes TSA, I have made no allowance for commercial thinning in my determination.

(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 and compliance

Utilization standards define the species, dimensions (stump height and minimum diameter), and quality of trees that must be harvested and removed from an area during harvesting operations. The utilization standards are incorporated into the BCFS analysis to estimate minimum merchantable stand volume. BCFS records indicate that the standards are being met in the Lakes TSA, with some licensees operating at higher standards than required.

In the BCFS analysis, the minimum diameter at breast height for sub-alpine fir was assumed to be 15.0 centimetres when in reality, the minimum diameter is 17.5 centimetres. This represents a small overestimation of sub-alpine fir volumes in the TSA as less than 5 percent of the existing TSA volume is sub-alpine fir. Since this would not make a significant difference to the total TSA timber supply, it is my view that this small overestimation exists but is not significant in this determination and will not be further referenced in this determination.

Overall, I am satisfied that the utilization standards assumed in the BCFS analysis are reasonable for this determination.

Decay, waste and breakage

For existing stands, the standard decay, waste and breakage factors based on samples for the general area were used in the generation of VDYP volume tables. The standard 5 percent OAF 2 reduction used in TIPSYP accounted for estimated decay, waste and breakage in regenerated stands. I consider these estimates to be reasonable for use in this determination.

- (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 (IRM) objectives

The Lakes TSA timber harvesting land base is divided into seven resource emphasis zones based upon specific management objectives for the areas. Each zone has a unique forest cover requirement and green-up height. In many areas the management zones overlap, and so, for the purposes of the analysis, the zones were ranked on the basis of their primary management objectives first and then in order of the most to the least constraining forest cover requirements. The integrated resource management zone is the largest of all seven, covering approximately 63 percent of the timber harvesting land base. Areas with retention and partial retention visual quality requirements are the next largest, covering approximately 24 percent. The Sutherland Valley, riparian complexes, the caribou migration corridor and wildlife winter range zones make up the remaining 13 percent.

- cutblock adjacency

In order to protect resources such as wildlife, water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks, and prescribe minimum green-up requirements (the period required following harvesting for a stand of regenerating trees to reach a desired condition such as a specified height). This provides for a distribution of harvested areas and retained forest cover across the landscape and, as such, takes into account the impact of several forest management requirements. Cutblock adjacency guidelines are commonly expressed in terms of the number of harvesting entries, or "passes," required for harvesting operations to cover an area while meeting IRM objectives.

District staff have indicated that, in many areas, first pass volume objectives may not be achievable as a result of historic harvesting patterns and the corresponding adjacency requirements. This difficulty can be traced back to the early 1970's when large-scale harvesting began in the TSA. Areas were developed based upon short-term plans that did not fully consider longer-term development patterns and IRM objectives. To compound this, harvesting in many of the undeveloped areas has been avoided which has intensified harvesting activity in the developed areas (see below, under "Log-arounds/deferrals/delays"). As a result, there is some evidence to suggest that a more restrictive 4- or 5-pass regime may better reflect the number of harvest passes required in some areas. A sensitivity analysis indicates, however, that a 4- or 5-pass entry system on

areas currently assumed to be managed on a 3-pass system will not affect short-term timber supplies in the Lakes TSA. Sensitivity analysis shows that it is not until requirements are increased to reflect a 6-pass harvesting regime that reductions to the base case are projected.

This stability in timber supply provides cause for optimism that local management objectives can be achieved without causing significant timber supply disruptions. I am reasonably satisfied with the adjacency requirements as represented in the BCFS analysis and consider them to adequately represent current practice in the Lakes TSA. Further, planning processes such as the ongoing Lakes LRMP will help address some of the uncertainty, such as in log-around areas, and I expect that this will lend more certainty to adjacency requirements for the next determination.

- *green-up*

Green-up is a stand condition that must exist on a reforested site before timber on an adjacent area may be harvested. As discussed above, the green-up requirement reflects the period of time following harvesting for a stand of regenerating trees to reach a desired condition such as a specified height. In order to reflect current practice in the Lakes TSA, green-up requirements were varied according to the resource management emphasis zone.

In the BCFS analysis, four zones—the IRM, Sutherland Valley, caribou corridor, and the winter range zone—had a minimum green-up height of 3 metres. The riparian zone and VQO zones had different assumptions and are discussed below, under *visually sensitive areas* and *riparian areas*.

I am satisfied that the green-up assumption of 3 metres for the four zones, as mentioned above, are appropriate and reflective of current practice in the Lakes TSA. However, the Lakes paired-plot study (as discussed above, under *estimates of site productivity*) indicates that the expected time for stands to reach a tree height of 3 metres could be less than projected in the BCFS analysis. I have considered the results and impact of the Lakes paired-plot study, as discussed below, under "Reasons for decision."

- *visually sensitive areas*

One of the resources the *Ministry of Forests Act* requires the Forest Service to manage is outdoor recreation, which is defined under the *Forest Act* to include scenic features. Visual landscape foresters in BC, in collaboration with specialists from around the world, have developed procedures for identifying and managing visually sensitive areas. These procedures incorporate both biophysical and social factors—including visual sensitivity ratings, numbers of viewers and their perceptions, and others—and provide recommended visual quality objectives (VQOs) for visually sensitive areas.

To meet these objectives, constraints must be placed on timber harvesting, road building and other forest practices in the sensitive areas. These constraints are based on research,

experience and public preferences and acceptance of degrees of alteration of visual landscape. The constraints are expressed in terms of "forest cover" requirements that relate to the maximum allowable percentage of a viewscape that can have visual disturbance at any one time, and to "visually effective green-up," i.e., the stage at which regeneration is perceived by the public to represent a newly established forest.

The analysis of visual resources in the Lakes TSA was conducted according to the "Procedures for Factoring Recreation Resources into Timber Supply Analysis," BCFS, 1993, and includes special recognition of the Highway 16 corridor and all lakes over 10 hectares. As a result, in the BCFS analysis approximately 24 percent of the timber harvesting land base has visual quality requirements modelled with a green-up height requirement of 6.5 metres. Of the 24 percent, approximately 4 percent was modelled as retention, and the remaining 20 percent as partial retention.

Recently, the Minister of Forests has asked that management constraints applied to meet visual quality objectives be re-examined when setting AACs in order to ensure that they do not unreasonably restrict timber supplies when considered in conjunction with requirements to manage riparian habitats and biodiversity under the Code (see below, under "Minister's letter and memo").

The importance of visual quality appears to be increasing in the Lakes TSA however, I note that the assumptions of a 6.5 metre green-up requirement applied to 24 percent of the timber harvesting land base is more constraining in comparison to other parts of the province with similar visual sensitivity. Nonetheless, I recognize the significant number of recreational lakes in the TSA, and until there is more certainty to any potential changes to the current VQO mapping for the Lakes TSA as a result of the LRMP, which considers overlapping Code requirements and new policy directions, I consider the VQO assumptions as applied in the BCFS analysis as appropriate for this determination.

- riparian areas

To account for riparian and streamside management, the BCFS analysis applied a forest cover constraint rather than an area reduction. The forest cover constraint assumed that no more than 33 percent of the forested areas associated with large wetland complexes (about 2.6 percent of the timber harvesting land base) could be less than 5 metres in height (on average 25 years old) and no less than 50 percent be under 120 years old. The net result of this constraint is that 1.5 percent of the timber harvesting land base was made effectively unavailable for harvest in the base case harvest projection to account for riparian areas.

District staff now submit that the assumptions in the BCFS analysis are inadequate for riparian areas, given requirements for the Forest Practices Code Riparian Regulations and Guidelines. This was confirmed in the Code impact assessment, *Forest Practices Code Timber Supply Analysis*, BCFS, February 1996.

In the Code impact assessment, assumptions were applied based on average interior stream length figures. However, in order to address concerns that the average interior stream length figures would underestimate the actual area of riparian reserves for the Lakes TSA—because of the large number of lakes and wetlands—a separate estimate of the area of lakeshore and wetland reserves was calculated. The estimated area of lake and wetland reserve was then added to the average interior stream length figures and resulted in a total area of riparian reserve equal to 5 percent of the timber harvesting land base. In addition, to adequately account for volume that will remain unharvested in riparian management zones, a 2 percent reduction was applied to all volume yield curves.

In general, the licensee critique asserts that no further impacts beyond the constraints applied in the BCFS analysis are necessary to account for new standards required by the Forest Practices Code because many of the inputs into the BCFS analysis have already included similar considerations from the "Interim Harvesting Guidelines for the Interior Portion of the Prince Rupert Forest Region." While I accept that there are similarities, I do not consider the interim guidelines to reflect the full accounting of riparian requirements under the Forest Practices Code. Under my direction, the above noted assessments were conducted by a team of specialists from the Ministry of Forests and the Ministry of Environment. The results reflect best professional judgement regarding how the new riparian management practices under the Code will affect timber supplies when compared to the pre-Code practices as reflected in the BCFS analysis.

For this determination, I have accounted for additional considerations for riparian areas than were assumed in the BCFS analysis. The additional constraints represent a quantified downward pressure on the base case projection of 5 percent to the timber harvesting land base and 2 percent to the volume yield curves, as I have discussed below, under "Reasons for decision."

- biodiversity, wildlife tree patches and old growth

Provisions for biodiversity, as required under the Forest Practices Code, provide objectives for managing structural diversity, wildlife trees, wildlife corridors, and maintaining forests with a mix of ages including old growth.

In the BCFS analysis, there was consideration for biodiversity objectives. In the riparian zone, 50 percent of the area was expected to be maintained with stands older than 120 years, and in the winter range zone, 35 percent of the area was assumed to be maintained with stands older than 100 years. As well, areas deducted for low productivity, non-merchantability and deciduous will also contribute to biodiversity.

At the stand level, however, requirements for the retention of wildlife tree patches under the Forest Practices Code have been assessed and are additional to the assumptions in the BCFS analysis. District staff estimate a reduction in available timber of 4.5 percent, based upon the assumption that 50 percent of the wildlife tree patch requirements will be met by other non-timber requirements such as riparian areas and VQOs. A similar

method was applied in the "Forest Practices Code Timber Supply Analysis" study referred to above in *riparian areas*. However, this study assumed that 75 percent of the required area of wildlife tree patches will be provided by areas already excluded from the timber harvesting land base, resulting in a 3 percent reduction to the volume yield curves in existing and regenerated stands. Given the requirement to maintain wildlife tree patches and drawing on the analysis work which was done, I consider objectives for stand-level biodiversity to represent a downward pressure between a range of 3 to 4.5 percent on timber supplies as projected in the BCFS analysis. I will return to this point below under "Reasons for decision."

In addition to stand-level objectives, landscape-level objectives include important attributes such as structural diversity, wildlife corridors, and the maintenance of forests with a mix of ages, including older seral stages. The forest stands in the Lakes TSA, have generally been maintained by wildfire disturbances, and discussed above, under age class structure and species profile, approximately 64 percent of the timber harvesting land base is covered by stands greater than 100 years of age.

Given that the majority of the TSA is dominated by lodgepole pine stands, older seral stage requirements for landscape-level biodiversity, are expected to be largely satisfied by the minimum harvestable age constraints, as assumed in the BCFS analysis. However, it is unclear at this time what impact lowering the minimum harvestable age (as was discussed above in *minimum harvestable ages* and *estimates of site productivity*) might have on meeting biodiversity objectives by maintaining a mix of ages, including old growth. As such, district staff will be investigating the biodiversity implications of younger minimum harvestable ages.

I recognize that there may be future downward influences on timber supplies in order to achieve landscape-level biodiversity objectives. However, until such time as landscape unit plans are developed with biodiversity objectives, it would not be appropriate for me to speculate on what those impacts might be. Nonetheless, given the stability of the timber supply projection for the Lakes TSA, for this determination I am satisfied that this factor does not represent a serious risk to the short-term harvest level. The next determination will consider any new information which is developed on this factor.

- *caribou corridor*

The Tweedsmuir-Entiako caribou herd is considered to be provincially significant and it has been identified by Ministry of Environment as one of three provincial priorities for management within the southern and central interior. In 1992, interim management guidelines for the migration corridor were approved by the Lakes TSA district manager and formed the basis of the assumptions for the caribou corridor in the BCFS analysis. Thus, the BCFS analysis assumed that in the caribou corridor zone (29 000 hectares, or about 4.5 percent of the timber harvesting land base) no more than 12.5 percent of the zone is permitted to be less than 18 years of age, which equates to an 8-pass harvest regime.

This year, a migration study of radio-collared animals was completed, and the results indicated that the area used by the caribou herd is larger than was assumed in the BCFS analysis. Based on these findings, the proposed guidelines, currently under review by the Lakes LRMP, indicate that, of the 29 000 hectares in the caribou corridor zone, 18 000 hectares should continue to have the same constraints as applied in the BCFS analysis, but the remaining 11 000 hectares (about 1.7 percent of the timber harvesting land base) might be recommended for exclusion from any harvesting activity. Beyond this, the findings also indicate that an additional 19 000 hectares, currently located in the IRM zone, could have constraints applied which would allow a maximum of 40 percent of the area to have forests less than 40 years old, and which would require a minimum of 16 percent of the area to be greater than 80 years old, and a minimum of 11 percent of the area to be maintained with forests greater than 140 years old.

Although a reduction of 11 000 hectares would be approximately 1.7 percent of the timber harvesting land base, I note that the area already has some constraints applied and there is some overlap with VQOs. Therefore, the net impact would be about 1 percent. The additional 19 000 hectares represents 5 percent of the IRM zone and the proposed forest cover requirements are equivalent to a 6 percent decrease to timber supply for that area. This would result in a net reduction to timber supply of 0.3 percent (6 percent times 5 percent). The combined impact of the proposed guidelines relative to the BCFS analysis would be an additional reduction to the timber supply of 1.3 percent.

District staff indicate that there is general agreement among local stakeholders regarding the requirements of the proposed guidelines. District staff state that the proposed guidelines are being implemented in the field. Therefore, I consider the guidelines to be reflective of local practices required to meet integrated resource management objectives for the area. However, the 11 000 hectare no-harvest area will require final approval by the Lakes LRMP and designation by Cabinet before it can be considered as not contributing to the timber harvesting land base. As the Lakes LRMP is not yet complete, it is unclear whether or not the designation of this area will receive final approval. As such, it would be inappropriate for me to account for the removal of this area prior to Cabinet's approval of the higher level plan (LRMP). Nonetheless, there are indications that the proposed guidelines will be implemented in the future. The impact would be mid- to long-term in nature, likely bringing about a harvest level decline somewhat earlier than the 70 years projected in the BCFS analysis.

Therefore, while I do not consider this to be a downward pressure on the harvest level in the short term, I note that there is a risk to future timber supplies in an order of magnitude of approximately 1 percent, if this area is ultimately excluded from the timber harvesting land base. Until such time, I am mindful of this risk and also of the fact that current plans recognize the new management objectives for a portion of the IRM zone which causes a 0.3 percent reduction in timber supply. I will return to this point below, under "Reasons for decision."

- *caribou winter range*

In addition to the areas identified above as the caribou corridor zone, an important area for caribou winter range has been well studied with management recommendations calling for at least partial protection (*Management strategy and options for the Tweedsmuir-Entiako caribou winter range*, Cichowski, D.B. and A. Banner, BCFS, 1993). Recommendations state that in 84 percent of the caribou winter range (approximately 40 000 hectares or 6.4 percent of the timber harvesting land base), there should be no harvesting permitted.

Current forest management for the winter range area, known as the Tetachuck-Entiako caribou winter range in the Lakes TSA, is restricted to harvesting for mountain pine beetle control. Due to difficult road access and a relatively high proportion of marginal stands, the area is only marginally economic to harvest.

Planning processes under the Lakes LRMP are currently developing recommendations as to the appropriate designation of this area; in the interim there is some uncertainty regarding its designation. Until the final land-use designation is approved by government, it would be inappropriate for me to account for this area at this time, as discussed above, under "Guiding principles for AAC determinations."

However, to examine the risk this may have on timber supply, a sensitivity analysis shows that reducing the timber harvesting land base by 5 percent results in reducing the time to decline from 7 decades to 5 decades from now. Therefore, the sensitivity analysis illustrates there is sufficient flexibility in the timber supply to indicate that a 5 percent reduction to the timber harvesting land base would not necessitate an immediate reduction to the initial harvest level. This reduces the risk of this uncertainty for this determination; however, I am mindful of the uncertainty that the caribou winter range introduces relative to future harvest levels, and I have discussed this below, under "Reasons for decision."

- *moose and deer winter range*

In 1993, intensive mapping of the moose and deer winter range for the Lakes TSA was completed. As a result, in the BCFS analysis, the prime winter habitat for moose and deer was placed in the winter range zone to reflect the management regime for the area. This zone covers 5 percent of the timber harvesting land base and has forest cover constraints that permit a maximum of 33 percent of the area to be less than 3 metres in height and a minimum of 35 percent must be older than 100 years.

In the BCFS analysis, the areas identified within the timber harvesting land base as prime winter range are considered adequate by BCFS staff, with the exception of the need to provide connective corridors between the winter range areas. However, connective corridors are expected to overlap with riparian complexes, and it is uncertain if more area is required for moose and deer corridors. Until there is more certainty regarding the

connective corridors, I am satisfied with the accounting for moose and deer winter range in this determination.

(vi) any other information that, in his opinion, relates to the capability of the area to produce timber;

Log-arounds/deferrals/delays

In several areas, including the Sutherland Valley, the Cheslatta First Nations area, and the Flemming study areas, harvesting is being deferred until land use and management regimes are clarified. In the BCFS analysis, the Sutherland Valley—approximately 4650 hectares, less 1 percent of the timber harvesting land base—was assumed to be unavailable for harvesting for 10 years.

In addition to the above noted deferral areas, there are other areas where harvesting has been delayed. In order to protect the integrity of these areas until land-use decisions are finalized, the areas are managed on an interim basis as informal log-arounds, whereby the planning of new harvesting is delayed in contentious areas until conflicts are resolved. These areas include the Tetachuck-Entiako caribou winter range and portions of the migration corridor, Red Hills, Uncha Mountain, Boer Mountain and Burns Lake South. These areas total approximately 99 700 hectares, or 15.7 percent of the timber harvesting land base.

The deferral and log-around strategies have been successful up to now in protecting contentious areas from development until land-use decisions can be made. However, these strategies now present two serious problems, related to (1) increasing difficulty in locating available wood supply to meet licence requirements, and (2) the potential for concentrated harvesting in some areas that could eventually start to compromise integrated resource management objectives in order to meet the AACs, as outlined below:

The first of these problems is that these strategies have, in-effect, made significant volumes of timber unavailable for harvest. The unavailability of these volumes is already affecting the ability of District staff to find sufficient wood elsewhere in the TSA, as was noted above, under *cutblock adjacency*.

The second problem related to these strategies is that legislation requires the Chief Forester to determine an AAC based on the productivity of the timber harvesting land base including the deferral and log-around areas, not on a reduced area reflecting expectations about land-use decisions that may be made in the future.

As mentioned, the deferral and log-around strategies avoid harvesting in certain areas in the TSA. Thus, for harvesting to continue in the TSA, it must be concentrated in the remaining areas to make up for the lack of harvesting in the avoided areas. This could cause these remaining areas to reach adjacency and green-up thresholds more quickly, thereby reducing the amount of available timber locally. Continuing this strategy may at

some point reduce the flexibility to meet integrated resource management objectives in some areas.

I note that the proportion of area currently under observed log-arounds and deferrals in the Lakes TSA is one of the highest in the province and poses a fundamental uncertainty that needs resolution. I am hopeful that current planning processes such as the ongoing Lakes LRMP will clarify local objectives for these areas.

However, if the District Manager feels that existing forest management objectives cannot be achieved if harvesting continues at current levels, the district has the option of proposing the specification of these areas as designated areas in order to enable a temporary AAC reduction under Part 15 of the *Forest Act*.

Lakes Land and Resource Management Plan

Since early 1994, a Land and Resource Management Planning process has been underway in the Lakes TSA. The LRMP committee will be making recommendations to Cabinet on a number of key concerns, such as new resource management objectives and strategies—for example, visually sensitive areas, wildlife habitat, and land-use designations for protected areas.

A number of concerns were raised during the public input period regarding the timber supply review process conflicting with the current LRMP process. Some individuals were concerned that the LRMP recommendations should have been accounted for in this determination; others submitted they should not be factored into this determination.

I acknowledge that the LRMP will lead to key recommendations on land use, resource management objectives and strategies. However, as I have discussed above under "Guiding principles for AAC determinations," it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions that have not yet been approved by government. Thus, I do not consider the 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.

Nonetheless, district staff have advised me that the LRMP is currently reaching consensus on a number of key recommendations that will likely affect timber supply. Therefore, given that there is a potential to increase the harvest level as a result of the recent examination of site productivity, I have carefully examined the appropriateness of an increase to the AAC at this time, as discussed further in "Reasons for decision."

When Cabinet approves the LRMP, changes to current resource management practices will be phased in. The legislated requirements for five-year AAC reviews will ensure that these practices are considered in future AAC determinations. Nonetheless, if the District Manager finds that the implementation of the approved LRMP significantly impacts

short-term timber supply, I am prepared to revisit the AAC determination before the end of the legally required five-year period.

(b) the short and long term implications to the Province of alternative rates of timber harvesting from the area;

Harvest flow alternatives

The economy of the Lakes TSA is currently highly dependent upon the forest industry. About 37 percent of the total TSA employment is provided by the forest sector.

The Lakes TSA Socio-Economic Analysis (SEA) examined the social and economic impacts of the base case projection and alternative harvest projections. This examination was meant to provide some perspective regarding the impacts of different harvest levels over varying periods of time. Three different scenarios were identified.

For the first scenario discussed—the base case harvest projection as described above in "Role of the base case"—employment is expected to remain unchanged until the eighth decade when a decrease in the harvest level will bring about a corresponding decrease of 118 person-years and a related income loss of about \$3.4 million. In the ninth decade, as timber supplies decline once more, another 32 person-years of employment and an associated \$0.95 million in income could be lost. It is clear that the local economies in the Lakes TSA are sensitive to decreases in harvest rates. However, with a harvest level decline forecast in 80 years, there is significant uncertainty about whether or not the current level of dependence on the forest industry will remain static this far into the future.

A second scenario considers the implications of raising harvest levels above the current AAC. It begins with an increased allowable harvest of 1 650 000 cubic metres (about a 9 percent increase) for the first five decades of the projection. The harvest then drops back to the current AAC for one decade before declining again by 9 percent in the sixth decade and a further 3 percent in decade seven to 1 310 000 cubic metres per year. The harvest is then projected to remain at this level for ten decades before increasing 10 percent to a long-term harvest level of 1 441 000 cubic metres per year. In this scenario, employment is expected to increase immediately by 116 person-years with a corresponding employment income increase of \$3.4 million. Later, as timber supplies decline, employment levels are projected to decrease by 116, 118 and 32 person-years for decades six, seven and eight, while employment income will decrease by \$3.4 million, \$3.44 million and \$0.95 million, respectively.

The third scenario examined in the SEA presents the impacts of reducing the harvest level quickly. It begins with a maximum allowable harvest of 1 441 000 cubic metres per year for the first decade, about 4 percent below the current AAC. This level is maintained for a total of 13 decades when the harvest level fluctuates somewhat before reaching the long-term harvest level of 1 441 000 cubic metres per year 180 years from now. Immediate job losses totalling about 47 person-years and an employment income decrease

of approximately \$1.37 million are projected. These job losses are expected to have a small downward effect on the TSA population in the short term.

Local First Nations who participated in the SEA—the Burns Lake, Broman Lake, Lake Babine and Skin Tyee bands—indicated that interests including trapping, the fisheries resource and cultural or historical values are often considered to be in direct conflict with timber harvesting. Input received from First Nations representatives indicated that the second scenario will inflame existing conflicts over these non-timber resources while the third scenario could help reduce them.

I have reviewed the impacts described in the SEA conducted for the BCFS, as well as carefully considered other comments received through the public input process. I am satisfied that the SEA conducted for the BCFS provides a useful and reasonably reliable indication of the socio-economic implications of alternative rates of harvest in the Lakes TSA. I recognize the importance of forestry in the TSA and will return to this point under the discussion of the social and economic objectives of the Crown.

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

Timber processing facilities

In the Lakes TSA there are two large sawmills, two small sawmills and three value-added producing facilities, all of which are linked to various forms of licence agreements to access Crown timber supplies. Approximately 85 to 90 percent of these mill's input requirements are met by timber harvested within the TSA, making them highly dependent upon local timber supplies. About 65 percent of the AAC harvested in the Lakes TSA is manufactured within the TSA, while the remaining 35 percent is exported mainly to the adjacent Vanderhoof Forest District in the Prince George TSA. In addition to Crown timber supplies, local mills supplement their fibre requirements from private sources within the TSA as well as from other areas as far away as the Yukon. I also note a further demand for timber within the TSA from numerous smaller mills, many of which do not have licence agreements to access Crown timber supplies.

I am mindful of the significant demand for timber in this TSA and recognize that TSA volumes will become increasingly important if alternative sources of fibre diminish. Also, secondary and tertiary manufacturing would help to derive additional economic benefit from existing timber supply sources. In making my determination, I recognize the importance of all of these factors in generating the economic and social benefits experienced in the area.

- (d) **the economic and social objectives of the Crown, as expressed by the minister, for the area, for the general region and for the Province; and**

Minister's letter and memo

The Minister has expressed the social and economic objectives of the Crown for the province (letter to Chief Forester dated July 28, 1994, attached as Appendix 3, and memo to Chief Forester dated February 26, 1996, attached as Appendix 4) and I understand these to apply to the Lakes TSA. They 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 continuity of employment.

The Minister also stated in his letter 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 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. The latter would likely require the use of alternative harvesting systems, and to encourage this the Minister suggested consideration of

partitioned AACs. This is also consistent with the Minister's request that the attainment of visual quality objectives be innovatively achieved and carefully balanced with economic impacts.

The employment and community impact issues are discussed in detail in the SEA, and I am familiar with the varying impacts of different harvest levels (see discussion above, under "Harvest flow alternatives"). The use of commercial thinning has been discussed earlier under "Alternative silvicultural systems," where I concluded that while commercial thinning may be used to alter the schedule of timber availability, there is limited opportunity and no performance or strategy in place to undertake commercial thinning activities at this time. Therefore, I am not considering the effects on timber supply from commercial thinning in this determination.

I have reviewed harvesting performance and concluded that generally there are no further opportunities to establish an AAC partition at this time. Any future consideration of the inclusion of currently inoperable areas in the timber harvesting land base will require careful consideration of economic and environmental factors.

Finally, the Minister most recently has asked that constraints applied to timber supplies in order to meet visual quality objectives be re-examined when setting AACs in order to ensure that they do not unreasonably restrict timber supplies when considered in conjunction with other requirements under the Forest Practice Code. I have discussed this matter above, under *visually sensitive areas*.

- local objectives

The Minister's letter suggests that I should consider important local social and economic objectives that may be derived from the public input in the timber supply review. During the public input period, many individuals attended the information sessions and the open houses. The written comments received are summarized in the attached *Summary of Public Input*.

I have considered the public input and I am mindful of the many views which were brought forward. Where possible I have attempted in this rationale to respond briefly to many of those views, and this information has been thoroughly considered in this determination.

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

Unsalvaged losses

An annual loss of 39 000 cubic metres is assumed in the BCFS analysis to account for losses due to insect damage, wildfire and windthrow.

The mountain pine beetle is the major pest currently causing losses in the Lakes TSA. Since the TSA contains an abundance of mature lodgepole pine, a significant portion of the TSA is at risk to catastrophic beetle outbreaks. An aggressive management program has held losses to near endemic levels although losses have increased significantly in recent years. Augmenting this risk is the increasing possibility of beetle ingress from the adjacent Tweedsmuir Provincial Park. District staff are currently examining management options for mountain pine beetle control in view of this increasing risk. Current unsalvaged losses to mountain pine beetle were estimated at 1000 cubic metres per year in the BCFS analysis.

Net losses due to wildfire have been low, given successful fire protection and salvage efforts. Annual gross losses are estimated to be about 9 800 cubic metres per year, with approximately 7 000 cubic metres (about 71 percent) successfully salvaged, leaving about 2 800 cubic metres going unsalvaged.

District staff estimate losses due to catastrophic wind damage averaged about 25 000 cubic metres per year over the past ten years. In addition, district staff conducted a survey in 1994 that quantified losses along cut-block boundaries between 1985 and 1990 to be approximately 10 000 cubic meters per year. In total, some 35 000 cubic metres per year are projected as unsalvageable losses due to wind damage in spite of ongoing salvage efforts. Access limitations are the primary reason much of this volume is rendered unsalvageable.

I agree with public input received that while forest cover constraints applied to mature and overmature forests to meet non-timber requirements such as VQOs may increase the risk of future losses due to fire and insects, the use of innovative harvesting systems such as heli-logging could reduce the levels of unsalvageable losses, subject to economic limitations. Overall, having carefully reviewed the evidence presented, and considering my knowledge of the Lakes TSA, I find the estimates used in the BCFS analysis to be a reasonable representation of current practice for this determination.

Reasons for decision

In reaching my decision on an AAC for the Lakes TSA, I have considered all of the factors presented above and have reasoned as follows.

Under current management assumptions and practices, the BCFS analysis indicates an annual harvest level of 1 500 000 cubic metres per year—the existing AAC—could be maintained for another 70 years without declining.

However, my considerations have identified a number of factors that exert upward or downward influences on the base case harvest forecast, due to changes in practice or information since completion of the timber supply analysis in June 1995.

Three factors that have a downward influence on timber supply relative to the base case:

- *riparian*: requirements under the Forest Practice Code are more stringent than those modelled in the BCFS analysis. It is estimated that riparian habitat reductions to the timber harvesting land base and volume estimates will result in a quantified downward pressure on the base case of 5 percent to the timber harvesting land base and 2 percent to the volume estimates.
- *stand-level biodiversity*: the BCFS analysis did not incorporate Forest Practices Code requirements for stand-level biodiversity. Under the Code, retention of wildlife tree patches is required to meet stand-level biodiversity objectives. Several management practices will overlap with stand-level biodiversity objectives such as management of riparian habitat, protection of environmentally sensitive areas and maintenance of visual quality. After considering the overlap, I expect this requirement to represent a downward pressure between a range of 3 to 4.5 percent on timber supplies as projected in the BCFS analysis.
- *caribou corridors and winter range*: as a result of recent habitat studies, practices have changed in a portion of the IRM zone to better integrate habitat requirements for caribou with respect to harvesting activities. This change in practices beyond what was modelled in the BCFS analysis results in a 0.3 percent reduction to timber supply and as such is not overly significant.

However, of more significant concern, the studies also identified two separate areas—11 000 hectares of a migration corridor and approximately 40 000 hectares of winter range—both of which are very sensitive to development and for which some Ministry of Forests and Ministry of Environment scientists are recommending exclusion from harvesting. Concerns have been expressed regarding the need to manage mountain pine beetle outbreaks in these areas and the associated risk this poses to the health of adjacent stands.

The magnitude of the area proposed for no-harvest signals such a fundamental change in the use of the area without any potential for timber production that I consider this to be a matter

beyond my jurisdiction, and requiring a land-use decision from Cabinet. Nevertheless, for this determination, I am mindful of the risk to timber supply associated with this uncertainty and I will return to this point in context with socio-economic risks later in this decision.

Factors that have an upward influence on timber supply relative to the base case:

- *environmentally sensitive areas*: a reduction of 90 percent of ESAs for recreation is more appropriate than the 100 percent applied in the BCFS analysis as some harvesting is expected to occur in these areas. As there are approximately 4000 hectares of recreation ESAs, a lower reduction would increase the timber harvesting land base by about 400 hectares. I have considered this as a very small upward pressure on the base case harvest projection.
- *deciduous forest types*: approximately 1000 hectares of aspen and conifer mixed stands less than 21 years old were removed as part of the deciduous reduction. Although these stands have a major component of deciduous species, they do meet coniferous species stocking and free growing standards. District staff submit that these stands should be included in the timber harvesting land base. I consider the inclusion of these stands to represent a very small (0.2 percent) quantified upward influence on the base case harvest projection in the mid to long term.
- *problem forest types*: some pine stands considered as non-merchantable in the BCFS analysis, especially mature lodgepole pine stands less than 19.5 metres in height (class 2 lodgepole pine), are now likely merchantable. Also, a correction to the base case resulted in the addition of 5832 hectares of stands with leading sub-alpine fir to the timber harvesting land base. These two factors represent a small upward pressure of less than 4 percent on the timber harvesting land base.
- *estimates of site productivity*: results of the Lakes paired-plot study indicate that the BCFS analysis underestimates site productivity by an average of 4.5 metres for second growth stands. The appropriate application of the paired-plot study represents a significant increase in regenerated stand performance and, as such, could affect estimates of the operable land base, regenerated stand volumes, minimum harvestable ages, and green-up. This represents a potential upward pressure of up to 16 percent on the initial harvest level projected in the base case.

From my review of the downward and upward influences on the projected timber supply for the Lakes TSA, it is my judgement at this time that the harvest level is stable. Furthermore, after studying the base case, the numerous sensitivity analysis in the BCFS analysis and after careful weighing of all of the factors assessed in the course of my evaluation, it is very clear to me that the upward factors are so extraordinarily persuasive and of such a magnitude that they more than off-set the falldown projected in the base case.

With regard to the possibility of increasing the AAC, the BCFS analysis indicates that notwithstanding the site productivity adjustment, under the management regime assumed in the base case, an increase in the initial harvest level is possible. However, there are a number of

factors that suggest to me that this would not be appropriate at this time. The factors that have been identified as having a downward influence on timber supplies may work to decrease the amount of merchantable timber available for harvest. While these influences are not large enough to cause me to consider reducing the AAC for this determination, they do create a risk of future timber supply disruptions or the need for a more rapid decline to the long-term harvest level. Particularly when considered in conjunction with emerging issues associated with managing wildlife habitats in this TSA, as previously discussed.

Nevertheless, I am persuaded that the upward factors in fact outweigh the downward factors and therefore, I conclude that the timber supply in this TSA is extraordinarily stable and could be increased. However, it is not fully obvious that an increase at this time could be maintained into the future without having to decline again at some point. This is notwithstanding the possible outcomes of further consideration which is expected for certain wildlife habitats.

Increasing an AAC also implies acceptance of a higher degree of social adjustment over time than does the base case. In establishing a suitable base case harvest forecast, certain assumptions were adopted. Under these harvest flow assumptions, if an opportunity arises to add to the timber supply in the short term, then I believe it is preferable to use the additional available volume to reduce any harvest level instability over the medium and long term rather than elevate the initial harvest level at this time, at the expense of future harvest level stability. This principle is consistent with the social and economic objectives expressed by the Minister for the province, as it acts to minimize AAC reductions now and in the future.

Any increase above the current AAC will reduce flexibility for managing in response to foreseeable change. For instance, until there is increased understanding of the implications of the paired-plot study, the Code, and the harvesting of problem forest types, it is premature to increase the AAC. Also the current log-around and deferral strategy may likely have consequences for timber supply if the trend for harvest delays continues. To this end, I encourage the district to seek opportunities to reduce the uncertainty this strategy introduces. As well, current guidelines and land-use designations under review by the Lakes LRMP for caribou habitat may also result in impacts to timber supply in the mid to long term, if they are approved and implemented.

Thus, while I accept that available volumes of timber do support the option of increasing the AAC to some degree at this time, it is evident that significant uncertainties exist and that an AAC increase would heighten foreseeable management risks associated with those uncertainties. I am also very aware of the significant demand for timber supply in this area. However, it is my view that the socio-economic consequence of increasing the AAC now, only to have it decline again at a future date—which is a very real possibility given the outstanding land use questions in the TSA—would not be a responsible decision. While I am not speculating on the possible outcome of the Lakes LRMP and subsequent Cabinet approvals, I do expect that many of these matters will be fully clarified prior to the next AAC determination, and I consider it prudent to await those outcomes.

I have therefore determined that any additional timber supply should not be used to increase the AAC, but would be best used to bolster the existing harvest level until some of the uncertainties can be reduced by studies and implementation of the Forest Practices Code and the Lakes LRMP.

Determination

It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that provides for requirements implemented as part of the Forest Practices Code, that ensures longer-term integrated resource objectives can be met, that meets provincial objectives and that avoids severe curtailment of locally established patterns of social and economic activity based on timber harvesting, and that avoids disruptive shortfalls in future wood supply, can best be achieved in this TSA at this time by the maintenance of the existing AAC of 1 500 000 cubic metres (excluding allocated woodlot licences).

Implementation of decision

This determination comes into effect on September 1, 1996, and will remain in effect until a new AAC is determined, which must take place within five years of this determination.

During the interim, and in preparation for the next AAC determination, I am directing district staff to examine several issues:

1. With the completion of the Lakes paired-plot study, staff should now undertake further examination of problem forest types and identify areas that have potential for rehabilitation or that may be economical to harvest. The examination of these resources must be viewed with full consideration for environmental and IRM requirements.
2. District staff should undertake further review of the management objectives for the small diameter, height class 2 lodgepole pine stands. Also included in this examination should be an assessment of site productivity (e.g. mean annual increment) on these sites with a view to clarifying understanding of long term productivity. Finally, this examination should look carefully at and clearly identify the range of merchantability and lower limits for development of these stands.
3. District staff should review their current approach to assigning forest cover requirements within VQO zones. An evaluation of the potential impacts of this policy on TSA level planning and operations should be completed as part of this review. Such a review could either confirm or vary the approach depending on what method best reflects actual performance.

A handwritten signature in black ink, appearing to read "J. Pedersen", with a long horizontal flourish extending to the right.

Larry Pedersen
Chief Forester

July 16, 1996

Appendix 1: Section 7 of the *Forest Act*

Section 7 of the *Forest Act* reads as follows:

Allowable annual cut

7. (1) The chief forester must determine an allowable annual cut before December 31, 1996, and after that determination 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 and woodlot licence areas, and
- (b) each tree farm licence area.

(1.1) If, after the coming into force of this subsection, the minister

- (a) makes an order under section 6 (b) respecting a timber supply area, or
- (b) amends or enters into a tree farm licence to accomplish the result set out under section 33.1 (1) (a) to (d),

then, with respect to that timber supply area or tree farm licence area, as the case may be, the chief forester is not required to make the determination under subsection (1) of this section before December 31, 1996, or within 5 years after the last determination, but is required to make the determination

- (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.

(1.11) If

- (a) the allowable annual cut for the tree farm licence is reduced under section 7.1 (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 7.1 (6).

(1.12) If the allowable annual cut for the tree farm licence area is reduced under section 7.1 (3), the chief forester is not required to make the determination under subsection (1) or (1.1) of this section at the times set out in subsection (1) or (1.1) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 7.1 (2).

(1.2) [Repealed 1994-39-2.]

(1.3) In determining an allowable annual cut under this section 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 Province, the federal government, or both.

(2) The regional manager or district manager shall determine a volume of timber to be harvested under a woodlot licence during each year or other period of its term, according to the licence.

(3) In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 10, shall 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) silvicultural treatments to be applied to the area;
- (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area;
- (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production; and
- (vi) any other information that, in his opinion, relates to the capability of the area to produce timber;
- (b) the short and long term implications to the Province 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 Crown, as expressed by the minister, for the area, for the general region and for the Province; and
- (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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

Section 4 of the *Ministry of Forests Act* (consolidated 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 Input**