

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Cassiar Timber Supply Area

**Rationale
for
AAC Determination**

effective January 1, 1996

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Table of Contents

Objective of this document	3
Description of the TSA.....	3
History of the AAC	4
New AAC Determination	5
Information sources used in the AAC determination	5
Role and limitations of the technical information used	6
Statutory framework	7
Guiding principles for AAC determinations.....	7
Consideration of factors as required by section 7 of the Forest Act	10
The role of the "base case":	10
Land base contributing to timber harvest	11
- roads, trails and landings.....	11
- economic and physical operability.....	12
- conventional / non-conventional harvesting methods.....	13
Existing forest inventory	14
- forest inventory classification.....	14
- volume estimates for existing stands	14
Expected rate of growth.....	15
- operational adjustment factors	17
- minimum harvestable ages	18
Regeneration delay.....	19
Not-satisfactorily-restocked (NSR) areas	19
Silviculture systems.....	21
Incremental silviculture	21
Utilization and compliance	21
Decay, waste and breakage	22
Integrated Resource Management (IRM) objectives	22
- environmentally sensitive areas	22
- forest cover requirements	23
- green-up requirements.....	24
- visually sensitive areas	25
- recreation and wilderness access	26
- biodiversity.....	27
- riparian habitat.....	27
- protected and designated study areas	28
Planning processes	28
Partitioned harvest	29
Alternative harvest flows.....	29
Timber processing facilities	31
Minister's letter	32
- local objectives.....	33
Unsalvaged losses	34
- insects and disease.....	34

- wildfire.....	34
Reasons for Decision.....	35
Determination.....	40
Implementation.....	40
Appendix 1: BC Forest Act, section 7.....	41
Appendix 2: BC Ministry of Forests Act, section 4.....	43
Documents attached.....	43
Appendix 3: July 23, 1994 letter from Honourable Andrew Petter, Minister of Forests, to former chief forester John Cuthbert.....	43
Appendix 4: Summary of Public Input.....	43

Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as Chief Forester of British Columbia in making my determination, under Section 7 of the *Forest Act*, of the allowable annual cut for the Cassiar Timber Supply Area (TSA). The document also identifies where new or better information is required for incorporation into future determinations.

Description of the TSA

The Cassiar Timber Supply Area (TSA) is situated in the very northwest corner of the province in the Prince Rupert Forest Region. The TSA is the largest in British Columbia at over 13.4 million hectares and covers approximately one-sixth of the province. It is administered from the Cassiar Forest District Office located in Dease Lake with field offices in Atlin and in Watson Lake, Yukon. The TSA's boundaries and area of administration are the same as those of the Cassiar Forest District except for the exclusion from the TSA of parks, ecological reserves and recreation areas that fall within the district boundaries. The TSA is bounded to the west by Alaska, to the north by the Yukon, to the east by the Fort Nelson and Mackenzie TSAs, and to the south by the Prince George TSA, Nass TSA, and, along a very short stretch, the North Coast TSA.

Approximately 70 percent of the Cassiar TSA is unforested tundra, rock and alpine areas, leaving less than 3.7 million hectares—about 27 percent of the total TSA land base—as forested area. After deducting environmentally sensitive areas and unmerchantable forested areas, there are only 393 755 hectares contributing to the timber harvesting land base, less than 3 percent of the total TSA land base.

The topography of the TSA is characterized by a series of rugged mountains and plateaus separated by wide valleys and lowlands. There are eight biogeoclimatic zones present in the TSA. The majority of the TSA is covered by three of these zones—the Alpine Tundra, the Boreal White and Black Spruce, and the Spruce-Willow-Birch zones (boreal forest types). The Spruce-Willow-Birch zone is the largest, covering almost 35 percent of the TSA, but the Boreal White and Black Spruce zone covers the majority of the timber harvesting land base.

The dominant tree species by area are lodgepole pine (found as the leading species on 53 percent of the timber harvesting land base), white and black spruce (20 percent), western hemlock (14 percent) and subalpine fir (13 percent). Pine stands are most common in the north, as boreal forest types, but tend to be less than 100 years of age because of frequent wildfires. The southern portion of the TSA has hemlock and subalpine fir stands over 150 years of age. This age discrepancy explains the fact that while lodgepole pine is found over a greater area, hemlock currently accounts for most of the volume on the timber harvesting land base (37 percent hemlock versus 29 percent pine).

As a result of the remote location, the distance from large commercial centres and the sparse road and transportation network within the Cassiar TSA, the population is small and scattered. A 1993 estimate placed the population at approximately 2500 people in summer, and 2100 in winter. The major communities are Dease Lake, Atlin, Iskut, Telegraph Creek, Good Hope Lake and Lower Post. Until 1992 the town of Cassiar was the largest community in the TSA, but the closure of the asbestos mine that year eliminated the town's primary economic foundation. Only a few people still live on the old town site, and Dease Lake has now assumed the role of the regional centre.

People from the Tahltan, Kaska Dena, Teslin Tlingit, Taku River Tlingit, and Champagne - Aishihik First Nations comprise approximately 55 to 65 percent of the total TSA population. These, along with First Nations based in the Yukon, have traditional territory within the Cassiar TSA. Most of the bands and councils are participating in treaty negotiation and have expressed the desire to have greater participation in local resource economies.

The mining industry is the most important source of employment and accounts for approximately 28 percent of jobs in the timber supply area. Other important employment sectors are tourism, guide outfitting, recreation industries, government services, accommodation, food and beverage services, and construction. The forest industry has been a minor source of employment with a short history to date.

Guide outfitting is active in the TSA during the spring, summer and fall months. Recreational tourism has grown significantly in recent years, as more people seek wilderness areas in which to canoe, raft, hike, fish, camp and view nature.

History of the AAC

The history of the Cassiar AAC started with the establishment of the TSA boundaries in 1980. The inventory data base was then compiled in 1983, and in 1984 the first AAC was determined at 140 000 cubic metres. Between 1990 and 1993, the average annual harvest was 87 000 cubic metres, with a peak of 116 248 cubic metres in 1992. To date, the annual harvest has been lower than the AAC, largely due to the previous lack of demand; as noted above, the forest industry in the past has not been a significant source of employment. As a result, until recently the Ministry of Forests has not addressed the planning and infrastructure requirements for managing a larger annual harvest.

The apportionment of the AAC for this TSA is unique in the province in that there are no replaceable forest licences. Only 26 percent of the AAC has been allocated to the Small Business Forest Enterprise Program. The remaining 74 percent is unallocated.

	Cubic Metres	% of AAC
Small Business Forest Enterprise Program	34 000	24.3
Woodlot License Program (no licences currently issued)	2 000	1.4
Subtotal (allocated)	36 000	25.7
Unallocated (Forest Service Reserve)	104 000	74.3
Total = current AAC	140 000	100

New AAC Determination

Effective January 1, 1996 the new AAC for the Cassiar TSA will be 400 000 cubic metres per year. This will remain in effect until a new AAC is determined, which must take place within five years of this determination. The new AAC is partitioned to the following components based on geographic harvest distribution:

- 240 000 cubic metres per year are attributed to the Iskut/Boundary timber supply blocks (*60 percent of total AAC*)
- 120 000 cubic metres per year are attributed to the Dease-Liard timber supply block (*30 percent of total AAC*)
- 40 000 cubic metres per year are attributed to the Atlin timber supply block (*10 percent of total AAC*)

The harvestable volume attributed to each geographic area is based on the total existing mature volume in each respective area, with forest cover requirements taken into account.

Information sources used in the AAC determination

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

- Forest inventory planning file, British Columbia Forest Service (BCFS);
- Silviculture history records, BCFS;
- *Cassiar TSA Timber Supply Analysis*, BCFS, August 1994;
- *Cassiar Timber Supply Area Socio-Economic Analysis*, Robinson Consulting & Associates Ltd. and Ms. Carla Blackner, November 1994;
- *Cassiar Timber Supply Area: Timber Supply Review Discussion Paper* BCFS, November 1994;
- Cassiar TSA Summary of Public Input, BCFS, April 1995,
- Letter from the Minister of Forests to the Chief Forester, dated July 28, 1994, stating the Crown's economic and social objectives;

- Letter from the Ministry of Environment, dated March 3, 1995
- *Begging Questions: The Cassiar Timber Supply Analysis & the ruin of BC's northwest wilderness*, a brochure published by BC Wild, February 1995;
- *Assessment of Cassiar Timber Supply Review from a Fish, Wildlife and Biodiversity Perspective*, an independent assessment of the Cassiar Timber Supply Review by Wild Stone Resources, commissioned by the Northwest Guide/Outfitters Association, February 1995;
- *A Critique of the 1994 Cassiar Timber Supply Review*, by Andison *et al*, UBC Faculty of Forestry, February 15, 1995;
- *A Systems Analysis of the Global Boreal Forest*, Cambridge University Press, 1992;
- *The Northwest Forest Industry: An Overview of Current Wood Fibre Supply, Consumption and Processing Capacity*, BCFS, 1993;
- Technical review and evaluation of current operating conditions through comprehensive discussions with Forest Service staff, particularly at a meeting in Dease Lake on April 5 and 6, 1995.

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 Cassiar TSA. The timber supply analysis is 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 problems such as AAC determination. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

In making this AAC determination, I have considered the unique features of the Cassiar TSA. The Cassiar TSA covers one-sixth of the province and includes a wide variety of site conditions. It also has a very short history of forest management from which to derive many of the factors used as inputs to timber supply analysis. I have therefore assessed

these unique limitations using additional expertise from staff who are knowledgeable about conditions in the Cassiar TSA, to ensure that I have adequately accounted for uncertainties in data assumptions. I will discuss this more fully under Guiding Principles, below.

As discussed earlier, some uncertainty always surrounds the data used to describe the forest resource and the forest management practices employed in an area. Descriptions of the physical forest resource are made using standard inventory techniques, and although there is still uncertainty, it normally falls within bounds that can be described statistically, and the purpose of the ongoing provincial inventory audit is to assess the accuracy of the forest cover data. Conversely, obtaining data to describe forest management requires an understanding of the range of existing forest values, including the objectives for them, and the opportunities and constraints that can reasonably be expected to apply during management. Furthermore, describing the management regime requires some knowledge of the impacts of management activities on forest ecosystems. Because of the short forest management history in the Cassiar TSA, there are greater limitations on the ability to describe the management regime and its impacts accurately, than in other areas in the province. This creates an unusually high level of uncertainty in the information used. In view of this uncertainty and the level of public concern raised, I have taken a very cautious approach in assessing the timber supply in the Cassiar TSA. With these precautions, I am satisfied that the technical 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. 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) avoiding unnecessary risk, and (ii) redetermining AACs frequently to ensure they incorporate up-to-date information and knowledge. The latter represents a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that section 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 (IRM) objectives beyond those articulated in current planning guidelines or the Forest Practices Code.

The impact of the Forest Practices 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 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. Preliminary studies in selected TSAs 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 the BCFS timber supply analyses for TSAs such as the Cassiar, which pre-date the Code. 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 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 or the Land and Resource Management Planning (LRMP) process is a matter often raised in discussions of AAC determinations (although this was not an issue in this TSA at this time). 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 impact in an AAC determination. In most cases, government's land-use decision 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 five-year AAC reviews will ensure such decisions are addressed.

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 review 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 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 "unextinguished non-exclusive 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 and it is 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)(a)(v) 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 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 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, starting harvest levels, and trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the "base case" forecast, 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, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

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

These adjustments are made on the basis of informed judgement, using current information available about forest management, which—particularly during the period leading up to, and now during the implementation of, the Forest Practices Code—may well have changed since the original data package was produced.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed.

Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. But once an AAC has been determined that reflects appropriate assessment of all the 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.

For the Cassiar TSA, I have examined the base case forecast which starts at a relatively steady harvest level of 842 400 cubic metres per year for 7 decades, and then increases to the long-term harvest level of 867 400 cubic metres per year. As I discussed above in **The role and limitations of technical information used**, due to the short history of forest management in this TSA there is a broader range than normal of uncertainty regarding many of the factors used as data inputs into the timber supply analysis. As discussed in that section, in many of my considerations I have therefore adopted the assumption within the associated range of uncertainty which produces the most cautious estimate of timber supply, and thus minimizes risk. In these considerations the base case has provided the essential reference for the many adjustments I have made to account for the uncertainty and risk associated with the various input assumptions.

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 Cassiar TSA is 13.4 million hectares. The land base that is considered available for timber harvesting (the "timber harvesting land base") is limited by economic and physical operability, environmental sensitivity, non-merchantable forest types, steep slopes and unstable soils, non-commercial forest cover types, and 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. The timber harvesting land base determined for the purposes of the BCFS analysis is 393 755 hectares or 2.9 percent of the total area

- roads, trails and landings

A reduction of 230 hectares was applied to account for existing roads, trails and landings. A future reduction of 7 percent, or 27 114 hectares for roads, trails and landings was assumed in the BCFS analysis. I am satisfied that these values are reasonable with respect to the normal range experienced in the Prince Rupert Forest Region.

- economic and physical operability

Two of the six timber supply blocks (divisions of the TSA)—the Alsek and the Kechika—are not considered as contributing to the timber harvesting land base. These two timber supply blocks are marginally forested, and are remote and inaccessible. These blocks cover a significant amount of the total area in the Cassiar TSA and contribute to supporting numerous plant and wildlife species.

The remaining four supply blocks; the Boundary, Iskut, Dease-Liard, and the Atlin were examined and only areas that were economically and physically accessible were considered as the timber harvesting land base.

The previous timber supply analysis, completed in 1983, included only the land immediately accessible along the highway corridor, and excluded pine on poor sites, hemlock, and subalpine fir. The difference from the 1983 analysis to the 1994 analysis was the inclusion of an additional 247 553 hectares, of which 27 percent was due to the expansion of the accessible area and 73 percent from the inclusion of pine on poor site, hemlock and subalpine fir stands. District staff have confirmed that since 1983 there have been examples of increased timber harvesting access into the expanded area. Changing market conditions have led to many previously excluded forest types now being considered to be economic.

At the request of 'The Friends of the Stikine', an assistant professor and three graduate students from UBC undertook a critique of the Cassiar timber supply analysis. The authors of the UBC critique suggest that the timber harvesting land base is likely overstated. District staff believe that, while there is some uncertainty regarding accessibility and merchantability (because of the lack of experience with harvesting in the Cassiar TSA), harvesting is achievable throughout the timber harvesting land base as currently defined in the BCFS analysis.

There may be a third point of view regarding the current timber harvesting land base which could suggest that due to changing economics, the timber harvesting land base in fact could be larger. In recognition of the uncertainty and in the interests of caution, I have directed the Cassiar Forest District staff to undertake and complete comprehensive operability mapping and terrain stability studies before any further increases to the timber harvesting land base are proposed or considered. This information will be fully incorporated into the next timber supply analysis. I am, however, satisfied that the economic and physical attributes used to define the timber harvesting land base in the BCFS analysis are appropriate for consideration in this AAC determination.

The UBC critique suggested a separate harvest level be established by timber supply block. I agree that, given the large area covered by the Cassiar TSA, distributing the harvest by timber supply block will eliminate the risk of unacceptable concentration of harvesting in any one area, and therefore I have

partitioned the harvest level (see Partitioned Harvest, below). Questions have been raised as to whether areas within the timber harvesting land base are economically harvestable using non-conventional harvesting systems, which I will discuss in the following section.

- conventional / non-conventional harvesting methods

During the short history of harvesting in the Cassiar TSA, the conventional harvesting method has been ground-based, wheeled skidders. While much of the timber harvesting land base in the TSA can be harvested with such conventional harvesting methods, some areas such as steep slopes can only be harvested using other methods such as cable harvesting or other non-conventional methods.

In the *Discussion Paper*, Cassiar District staff estimated that 10 to 30 percent of the timber harvesting land base could not be harvested with conventional harvesting methods. Subsequently, I requested staff to further examine the timber harvesting land base to better quantify the area associated with conventional and non-conventional harvesting methods. Upon further examination District staff estimate that up to 30 percent in the southern half (zone 1) and 5 percent in the northern half (zone 2) of the TSA's timber harvesting land base is not harvestable with conventional harvesting methods. Based on this examination, a sensitivity analysis, using the same harvest flow assumptions adopted in the BCFS analysis base case, indicates that a 30-percent decrease in zone 1 and a 5-percent decrease in zone 2 result in an 11-percent decrease in the initial harvest level of 842 400 cubic metres in the short-term, and a 14-percent decrease in the long-term timber supply.

Standard criteria were used to define the timber harvesting land base. These criteria routinely include some areas assumed to be operable by non-conventional harvesting methods. However, experience elsewhere shows that not all of the "non-conventional" areas so included can be considered as contributing to the timber harvesting land base, due to higher operating costs associated with non-conventional harvesting methods. Therefore, while economics have improved in the Cassiar TSA, the assumption that all the non-conventional areas identified using standard criteria will contribute to the timber harvesting land base is clearly not realistic, until more harvesting experience has been gained, and creates a level of risk. For this reason I have considered only the amended conventional land base as the timber harvesting land base. This constitutes a quantifiable downward pressure of between 11 to 14 percent on the short- and long-term harvest level as projected in the BCFS analysis. I have accounted for this in my determination.

Existing forest inventory

- forest inventory classification

The Cassiar TSA was inventoried between 1970 and 1975 for forest cover based on field surveys and aerial photography. This information was partially updated in 1986 to account for changes to the forest such as growth projections, harvesting and fire. During 1991 and 1992, a more recent inventory update was completed to reflect reclassification of not-satisfactorily-restocked areas resulting from wildfires. The inventory update also included mapping of environmentally sensitive areas for 39 mapsheets. In 1993 the remaining area was updated and growth attributes projected to 1993.

Concern was raised during the public input period that the forest inventory, which dated from the 1970s, was outdated. The provincial inventory program up to 1978 consisted mainly of unit surveys which were implemented on 10-year cycle. Land was classified based on aerial photographs in accordance with the provincial classification system and each major forest type was sampled on the ground. Many TSAs in the province were inventoried to provincial standards during that period, and the general methodology remains valid to the present day. Moreover, growth projections and disturbance updates were applied to the base inventory to account for changes over the last 25 years, in order to keep the information current and usable for consideration in this determination.

District staff submit that the high degree of site variation within the Cassiar TSA has not been reflected in the forest inventory. However, in my judgement, the amount of sampling for site variation does not introduce unnecessary risk in this determination. Many of the northern TSAs with similar biophysical characteristics have been similarly sampled for site variation, and while there may be site-by-site discrepancies, the inventory is designed to represent conditions at the TSA level (see also - *volume estimates for existing stands* below). The accuracy of the inventory information will be assessed by a volume-ratio audit in 1996. In the interim, I am satisfied that the 1991 -1993 updated and projected inventory information included in the data package for the Cassiar TSA analysis is the best available for use in this determination.

- volume estimates for existing stands

The BCFS analysis used the Variable Density Yield Projection (VDYP) growth and yield model to estimate volumes for existing mature stands. VDYP is generally accepted as the appropriate model for these types of stands. However, the accuracy of the resulting estimates has been questioned by the Cassiar District staff. This was raised as a critical factor in the *Timber Supply Review Discussion Paper* for this TSA.

Ministry of Environment, Lands and Parks (MELP) staff and BC Forest Service (BCFS) District staff submit that actual volumes may be less than in the BCFS analysis. The BCFS District staff submission is based on an operational timber cruise from a relatively small sample. The timber cruise comparison with volume estimates for existing stands by District staff is not conclusive. There are a number of reasons why the cruise volumes and the estimated volumes would not coincide. The results are influenced by factors such as different tree class codes, height assignments, sampling size and forest type stratification, to list a few.

MELP staff submit that due to under-sampling of site variables such as age, height and tree species, volume estimates are uncertain. They are concerned that a proper error analysis consistent with statistical theory was not available. However, I note that volume estimates are based on the attributes of forest inventory polygons which are stratified and of which thousands are sampled. Furthermore, although greater precision might be gained by waiting for the results of further and costly field analysis, the volume estimates by order of magnitude are, in my professional judgement, well within the bounds of expectation given the species and growing conditions which characterize the Cassiar TSA.

Nonetheless, I have discussed this concern in detail with BCFS inventory staff, who confirm that the Ministry of Forests' Inventory Branch expects to complete a statistical "volume-ratio sampling audit" (in which timber volumes estimated using field data are compared to volumes estimated using inventory data) for the Cassiar TSA in 1996.

At present the VDYP volume estimates represent the best available information for use in this determination, but given the outstanding concerns and the early developmental nature of this TSA, the risk associated with this factor causes me to view the timber supply projection with caution and conservatism. Given the overall cautious approach I have taken in reviewing the Cassiar TSAs' timber supply (see **Reasons for Decision**, below), I conclude that there is little risk associated with waiting a year or two for the results of the volume-ratio sampling audit.

Expected rate of growth

- Site productivity estimates

Inventory data includes estimates of site productivity, which are usually expressed in terms of "site indexes". Site indexes are based on tree height as a function of the age of a particular forest stand. The productivity of a site largely determines how quickly trees grow, and therefore affects the amount of time seedlings will take to reach green-up conditions, as well as 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.

The accuracy of estimates for timber growth was raised as a critical factor in the *Timber Supply Review Discussion Paper* for this TSA. Subsequently there were many public submissions expressing concern that the BCFS does not understand how boreal forests function. From my previous knowledge of the area as Regional Manager, I am familiar with the climatic limitations of the northern boreal forests and have taken careful consideration of these limitations. As I will discuss later (see Regeneration delay below), boreal forests are not without a long history of forest management within Canada and elsewhere in the world.

The BCFS Prince Rupert Forest Sciences staff examined field data on growth rates in the cooler zones of the region and advised that although predictions of site productivity used in the BCFS analysis are reliable for pine, the site indexes for spruce, subalpine fir and hemlock are optimistic. Field data suggest that the yield projections made in the BCFS analysis may overestimate site productivity on the immature poor and medium sites (for spruce, subalpine fir and hemlock) by approximately five to ten percent. With the harvest profile (oldest first) assumed in the base case, this potential uncertainty affects both the short- and long-term harvest level.

During the review of timber supply in other areas throughout the province, I have received concern that estimates of site productivity in the province are generally too low. However, while this matter remains unproven one way or the other, it should be noted that exactly the opposite argument has been put forward for specific areas within the Cassiar TSA.

Several studies are underway that will improve the estimation of site productivity. Resources Inventory Branch is undertaking a paired plot study throughout the province comparing the site indexes measured on adjacent stands--one old-age and the other young--to examine any discrepancies in measurements. Another study, conducted by Research Branch and known as an "Ecological Approach to Forest Level Yield Analysis", is being piloted in the Telkwa drainage in the Bulkley TSA. This study is developing a biogeoclimatic-based site index by calibrating the relationship between estimated site-growth potential and variables related to soil, moisture and climate, rather than relying on the height and age of existing stands. Regional Research staff are also collecting data on early growth and site productivity over the range of ecosystems in the Cassiar TSA. I expect the results of these studies to be available for the next timber supply analysis for the Cassiar TSA.

The non-declining harvest flow pattern examined for the Cassiar TSA results in both short- and long-term impacts from any change in estimates of site productivity. Sensitivity analyses presented in the BCFS analysis show that if either existing or regenerated stand volumes are actually 10 percent lower than assumed in the base case, the initial harvest level would be 5 or 7 percent lower, respectively.

Based on the information presented to me, I accept that site productivity estimates used in the BCFS analysis may not adequately reflect current growth rates for some of Cassiar's boreal forests. Lower site productivity estimates also increase the amount of time expected to be required for stands to reach minimum harvestable age and green-up, which lowers short- and long-term timber availability with the harvest flow (non-declining) assumptions adopted in the base case. Since the boreal forests encompass the largest portion of the timber harvesting land base, in my judgement it is reasonable to assume that there is a 5- to 10-percent overestimation in site productivity in the boreal forest and that this could result in as much as a 7-percent lower projected initial harvest level, which I have accounted for in my determination.

- operational adjustment factors

In predicting growth for future regenerated stands, the BCFS analysis used the Table Interpolation Program for Stand Yields (TIPSY). TIPSY initially projects yields based on an assumption of full site occupancy and optimal tree growth. Operational adjustment factors (OAFs) are therefore applied to TIPSY yield predictions for regenerated stands in order to account for less than full site occupancy and less than optimal tree growth. These less than optimal conditions are normally found in the field because of such factors as openings in stands, pests and diseases.

The authors of the UBC critique submit they were 'not at all confident that TIPSY projections for regenerated stands have been adequately (if at all) calibrated for northern conditions' and that overall potential is likely overestimated.

To account for operational conditions of less than full site occupancy, a reduction of 15 percent (OAF #1) was applied to all regenerated stand volumes. The reduction of 15 percent is recommended if no site specific information is available. Yields were further reduced in regenerated stands by another 5 percent (OAF #2) to account for decay, waste and breakage.

District staff submit that OAF #1 should have been increased (i.e. beyond 15 percent) to account for unique conditions in the Cassiar TSA—particularly in boreal forested areas—such as a short growing season, severe climate and soil limitations. Such an increase would lower estimates of regenerated volumes. Sensitivity analyses presented in the BCFS analysis show that if regenerated stand volumes are actually 10 percent lower than assumed in the base case, the initial harvest level would be 7 percent lower. With the harvest flow assumptions adopted in the BCFS analysis, there is a correlation between the regenerated stand volumes and the initial harvest level. In the long term, a 10-percent reduction in regenerated stand volumes lowers the harvest level by 10 percent.

Thus, while I have already accounted for the risk of lower site productivity, I recognize that northern conditions have a significant impact on regenerating stands, and I am mindful of the importance of calibrating for these conditions. Therefore in the interests of caution, I have accounted for an additional increase of 5 percent to OAF #1 for these conditions in the Cassiar TSA, which results in a less than 5 percent downward pressure on the initial harvest level as projected in the base case.

- minimum harvestable ages

Minimum harvestable age is the time required for forest stands to grow to a harvestable condition. For the Cassiar TSA, the minimum harvestable ages were based on the time required to reach a minimum volume of 140 cubic metres per hectare and a minimum average of 17.5 centimetres diameter at breast height (dbh), except for pine which has a minimum average of 12.5 centimetres dbh. The projected ages at which these conditions are attained range from 60 - 140 years for existing forest stands, and from 44 to 123 years for regenerated stands.

District staff believe that minimum harvestable ages may be overstated because the growth rates assumed for the Cassiar TSA may underestimate the time required to reach a harvestable condition in northern boreal forests (see - *site productivity estimates* above).

As a result of the aggregation procedures used in the Cassiar timber supply analysis, concern was raised regarding some inconsistencies in the minimum harvestable ages. I have examined this issue in detail with respect to the concerns raised, and I am satisfied that any imprecision is insufficient to affect minimum harvest ages to an extent that would alter the timber supply, particularly in the short term. Sensitivity analyses presented in the BCFS analysis show that if minimum harvestable ages are actually 20 years older, the initial harvest level would only decrease by 2 percent in the short term. This indicates there is little impact to the base case as a result of changing the minimum harvestable ages. There is little impact because the older stands were modelled as harvested first, thereby allowing the younger stands to mature well past the minimum harvestable age as a result of the existing age class structure of the forests in this TSA.

From the foregoing I am satisfied that the minimum harvestable ages used in the BCFS analysis provide the best information available at this time. I conclude that minimum harvestable ages do not exert a significant upward or downward pressure on the short-term harvest levels projected in the timber supply analysis and hence do not introduce a significant risk due to uncertainty in interpreting the base case forecast.

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

Regeneration delay

The timber supply analysis assumed an average regeneration delay of four years in the southern part (zone 1) and five years in the northern part (zone 2) of the TSA. This regeneration delay was applied to the current harvested area (3,048 hectares). District staff verify that this is reasonably consistent with current practice although survey records indicate that harvested areas are actually reforested within two to three years in some cases, while others sometimes require closer to 5 years to regenerate.

The UBC critique submits that 27,268 hectares of not-satisfactorily-restocked area in the TSA suggests 'that forest regeneration cannot be taken for granted, and that basic silviculture objectives may be difficult to achieve...'. However, I note that 24,422 hectares of the 27,268 hectares are the result of a past history of wildfires. District staff expect that as a result of the field surveys scheduled over the next five years, many of these sites will be reclassified as satisfactorily stocked.

On the areas denuded by past wildfires (24,422 hectares) within the timber harvesting land base, the timber supply analysis assumed the areas would regenerate naturally within 10 to 20 years on the good and medium sites, and up to 30 years on the poorer sites. Cassiar Forest District staff believe that some older wildfire sites could have a reduced regeneration delay period if sites are planted instead of naturally regenerated. However, current plans are for natural regeneration on the older wildfire areas because of difficult access and management objectives for bear habitat. The problem with some of the burned-over areas may in fact be future overstocking, rather than insufficient re-stocking, as 80 percent of the areas are expected to regenerate to dense young pine stands.

The Cassiar TSA has a long history of wildfire disturbance and some recent logging history which illustrate that forest regeneration does occur within the range assumed in the timber supply analysis. Forest inventory for the Cassiar TSA accounts for regeneration delays on areas historically subjected to wildfires. This is further examined under Not-satisfactorily-restocked areas below.

For the purposes of this determination I have considered that the regeneration delay for managed stands used in the BCFS analysis is appropriate.

Not-satisfactorily-restocked (NSR) areas

As noted in the previous section, there are 27,268 hectares of not-satisfactorily-restocked area in the TSA, of which 24,422 hectares are the result of wildfires. Local communities are concerned that these wildfire areas are not satisfactorily

stocked or are regenerating to very scrubby forests. My review of these concerns has revealed that many of these older wildfire areas are classified as brush or non-commercial forest; they are therefore outside of the timber harvesting land base and hence are excluded from this determination. These non-commercial areas are natural occurrences that are not projected to be managed for timber harvesting.

Staff of the Ministry of Environment, Lands and Parks (MELP) expressed concern that reforestation of boreal forests in northern latitudes involves increased regeneration problems. I note that timber harvesting to date has not occurred on all the various sites within the Cassiar TSA. With little experience in managing the harsher sites—which are characterized by cold, short growing seasons, poor nutrients, thin soils, deep organic layers, and high water tables—it is difficult to fully show evidence of regeneration ability given the short history of forest management in the Cassiar TSA. However, even with little experience, the risk of increased regeneration problems is bounded by the experience gained from other jurisdictions. By way of context, therefore, it is noted that boreal forests have a long history of forest management. Within northern portions of the Prince George Forest Region, several communities are currently supported by harvesting of boreal forests. Regeneration of these forests has been reasonably successful, although I recognize that climatic differences exist between the two areas. It is noteworthy that a large portion of the initial harvest will occur in the southern portion of the Cassiar TSA, south of the boreal forests.

Other jurisdictions across Canada include boreal forests that are currently being managed for timber production. Also boreal forests in Sweden, Finland, and Norway have been successfully managed and are often put forth as world class examples of productive forested areas that are managed for much higher yields than projected for the Cassiar TSA.

Nonetheless, to further reduce any potential risk associated with this determination, I have asked staff to monitor developments and initiate research as required to ensure that site quality is not adversely affected by harvesting. Any new information will of course be fully considered in the next timber supply review.

On the basis of the District's experience with reforestation to date and also in consideration of the outcomes of managing northern forests in other jurisdictions, I am confident that the data assumptions in the BCFS analysis regarding not-satisfactorily-restocked areas are appropriate for this determination.

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

Silviculture systems

Currently less than 1 percent of the AAC in the Cassiar TSA is harvested using silviculture systems other than clearcutting. However, the use of alternative silviculture systems such as seed tree and selection systems will likely increase in the future.

Alternative silviculture systems are not modelled in the BCFS analysis, and their implications for timber supply are uncertain. Development is underway for timber supply models that simulate these silviculture systems, as is the research of growth and yield information for these systems. For this determination I have no information to suggest that current levels of use of alternative silviculture systems will affect short-term harvest levels. However, as new research information becomes available it will be reflected in future timber supply analysis for this TSA.

For this determination, I am satisfied that the timber supply model and the data assumptions reflect the dominant silvicultural systems in use within this TSA, and provide a satisfactory basis of information for use in my determination.

Incremental silviculture

District staff plan to survey 4600 hectares for juvenile spacing and fertilization projects over the next 5 years. Since the yield curves used in the BCFS analysis are already based on well-spaced, fully stocked stands, juvenile spacing is not anticipated to increase timber supply beyond that projected in the base case. If undertaken, fertilization may increase growth rates and it is expected that future analyses will be able to evaluate the success of this planned activity and its impact on timber supply harvest levels.

(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 and compliance

The standard of timber utilization defines the species, dimensions and quality of trees that must be cut and removed during harvesting operations. The Cassiar TSA analysis assumed utilization standards of 12.5 centimetre diameters at breast height (dbh) for pine, and 17.5 centimetres (dbh) for other species. The maximum stump height is 30 centimetres with a minimum top diameter of 10 centimetres.

Public input raised a concern that harvesting small (12.5 cm dbh) diameter northern forests may be an uneconomic assumption. Current practices indicate that in fact the economics of harvesting in northern forests have changed and many of the timber sales sold recently include small diameter trees. This trend has

verified both competitive economic interests in the small diameter stands in general and the acceptability of the utilization standards.

I am satisfied that the standard of utilization in the timber supply analysis adequately represents the standards practiced in the TSA.

Decay, waste and breakage

The Variable Density Yield Projection (VDYP) which estimates volumes for existing stands incorporates a reduction for volumes lost to decay as a percentage of the gross volume. Waste and breakage factors, expressed as a percentage of the net volumes, are used to further reduce projected yields. The Table Interpolation Program for Stand Yields (TIPSY) which estimates volumes for regenerated stands also utilizes an adjustment factor (see - *operational adjustment factors*, above) to reflect volumes lost to decay, waste and breakage.

The allowances for decay, waste and breakage have been applied at provincially approved levels in accordance with normal provincial methodology. In the absence of any other available information, I consider these factors to have been appropriately applied and to form a reasonable basis for consideration 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

As provided in the *Ministry of Forests Act*, the purpose and function of the Ministry of Forests is to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources to ensure production and harvesting of timber and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives constrain the timber supply must be considered in AAC determinations.

- environmentally sensitive areas

The *Timber Supply Review Discussion Paper* for the Cassiar TSA suggests that reductions for non-timber resources may not be adequate in the BCFS analysis, and concern about this issue was also expressed during the public input process.

During 1991 -1992, 39 mapsheets in the southern part of the Cassiar TSA (district total of 1183 mapsheets) were inventoried for environmentally sensitive soils, avalanche areas, regeneration problems, and wildlife habitat. Based on the 39 mapsheets, a proportionate percentage of environmentally sensitive area was developed for the remainder of the Cassiar TSA. The result of the proportionate

application was the exclusion from the timber harvesting land base of one third of the (550 095 hectares).

In the absence of more detailed information, I consider the exclusion of one third of the accessible productive forest land base to be an appropriate methodology for accounting for non-timber values. This reduction for environmentally sensitive area is unusually high compared to other areas in the province, and it is my judgement that this reduction recognizes features which are distinct to this area and serves to reduce risks associated with alleged uncertainties in this factor. This is particularly true when considered in conjunction with the cautionary measures taken in regard to other IRM objectives as discussed below.

- forest cover requirements

To manage for resources such as wildlife, water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks, and prescribe minimum green-up ages (see - *green-up requirements*, below) for adjacent cutblocks. This provides for a distribution of harvested areas and retains forest cover in a variety of age classes across the landscape. Cutblock adjacency is commonly expressed in terms of the number of harvesting entries, or 'passes', required to remove the mature timber from the timber harvesting land base.

The Ministry of Environment, Lands and Parks (MELP) submits that the three- and four-pass harvesting system as assumed in the BCFS analysis for the Cassiar TSA introduces the risk of detrimental effects on certain species of wildlife. Some of these are red- and blue-listed species, i.e. species which are endangered, threatened or at risk. MELP also submits that to protect habitat for caribou, grizzly bear and boreal forest fur bearers, adequate forest cover must be maintained and forest fragmentation minimized by managing on a five- or six-pass system with limited road access to minimize such activities as traffic and poaching. MELP staff provided information on fish and wildlife in the Cassiar TSA, their habitat requirements, and relevant knowledge gaps.

Another concern raised in a number of submissions was that some existing wildlife study information was not incorporated into the BCFS analysis, particularly the research on migrating caribou completed 15 years ago by the Spatsizi Association for Biological Research. Research indicates that caribou spend up to 6 months a year wintering within lodgepole pine stands. These stands are critical for winter foraging and protection from predators. Another factor raised by BCFS staff is that these specific migrating caribou are terrestrial-lichen foragers in zone 2 and that terrestrial lichen is generally only found in mature forests. Another study indicates that 60 to 80 years are needed after timber harvesting for terrestrial lichens to regenerate and provide forage for caribou.

Given the importance of wildlife and the concerns expressed by MELP and also in the public input about habitat requirements in the Cassiar TSA, I examined the combined impact of a five-pass harvesting system and an increase in green-up height to five metres. Sensitivity analyses presented in the BCFS analysis show that under a non-declining harvest flow, a five-pass harvesting system would result in a 13-percent decrease in the projected harvest level. Increasing green-up heights to five metres could bring the impact up from 13 percent to a 20-percent decrease. Further increases to the number of passes would have further timber supply impacts.

Although I have examined the impact of a five-pass harvesting system and a five-metre green-up, it is not likely that both objectives will be required across the timber harvesting land base in all habitat types all of the time. Operational plans will reflect the achievement of forest cover at a landscape level. Nevertheless, my examination of the increased forest cover requirements serves to illustrate their direct impact on timber supplies and provides an indication of the range of uncertainty associated with this factor.

Based on the information presented to me by BCFS and MELP staff, I believe that increasing the number of passes beyond those used in the base case will serve to reduce the risk associated with the concerns as expressed. The resulting more cautious projection at this time will better account for forest cover requirements for critical wildlife habitat and sensitive predator/prey dependency in the Cassiar TSA. This increases limitations on the projected initial harvest level, which indicates that the BCFS base case is too high. A combination of further planning, operational experience and future research will assist in defining future options associated with managing these habitats.

Further to forest cover requirements, I have discussed access management below under *- recreation and wilderness access*. I have accounted for habitat requirements greater than those modelled in the BCFS analysis and I accept that this represents up to a 20-percent downward pressure on the initial harvest level projected in the BCFS base case. Again, given the concerns expressed, I believe it is appropriate to introduce this level of caution into my decision at this time.

- green-up requirements

The 'green-up' period is the time required for an area to reach a desired condition, usually defined in terms of the height of regenerated trees, after harvest. Adjacent stands cannot be harvested until this condition has been satisfied. In the Cassiar TSA, current practices require that a given area cannot be harvested until the regenerated forest on adjacent, previously harvested areas is at least three metres tall.

A BCFS research silviculturist estimates that the ages to reach green-up heights for spruce, subalpine fir, and hemlock are underestimated by 10 years in the Cassiar TSA. This estimate is based on a review of research data showing height and age relationships for certain sites and species in the timber supply area. Since the pine stands are generally fast-growing in their early years, the age at green-up height for pine seems reasonable. As discussed above in - *site productivity estimates*, concerns were raised regarding site productivity or growth rates. This was identified as a factor which could potentially increase the time to reach green-up, and thereby decrease timber availability.

Sensitivity analyses presented in the BCFS analysis show that if green-up ages are increased by 5 years, the base case harvest level would decrease by 6 percent in the short term. As previously stated, the assumed time to reach green-up for pine is reasonable, but the spruce, subalpine fir and hemlock stands could take up to 10 years longer to achieve an average stand condition of 3 metres, which would result in an average short-term impact of up to 6 percent. In considering this downward pressure, I have accounted for the existing areas of pine stands and for the fact that most analysis units are regenerated with a substantial portion of pine.

While I have previously discussed and accounted for risks associated with site productivity and operational adjustment factors, I am mindful that these factors do overlap. However, given the information provided, I consider the underestimation of the time required to reach green-up to be an additional risk. This information is not fully conclusive but certainly serves to bracket the range of uncertainty between the new information and the base case.

In consideration of the above findings, I conclude that green-up requirements associated with current practices have up to a 6-percent additional downward influence on the initial harvest level projected in the BCFS base case. Given my concern regarding the lack of forest management history in this TSA, for the purposes of this determination I have assumed the downward influence of this factor to be 6 percent.

- *visually sensitive areas*

Forest resources managed by the BCFS include recreation resources. 'Recreation resource' is defined in the *Forest Practices Code of British Columbia Act* to include 'scenic or wilderness features or settings that have recreational significance or value'. In order to manage such scenic features, visual landscape foresters in B.C., in collaboration with specialists in other parts of the world, have developed procedures for identifying and managing 'visually sensitive areas'. These procedures incorporate both biophysical and social factors—including visual sensitivity ratings based on topography, slope and other biophysical factors, and social factors such as numbers of viewers and their perceptions—and provide

recommended visual quality objectives (VQOs) for visually sensitive areas. These objectives limit the amount of visible disturbance that is acceptable in such areas.

For the Cassiar TSA, recommended visual quality objectives have not yet been assigned. Instead, for the purposes of this determination, a buffer of 500 metres was mapped along both sides of Highway 37 to reflect current practices within priority areas, resulting in a 27 000 hectare preservation zone. Also, a buffer of 150 metres was assumed along navigable rivers, such as the Iskut and the Dease, resulting in a 28 725 hectare preservation zone.

The UBC critique states that an additional 80 000 hectares should be removed from the timber harvesting land base to account for riparian and visual quality requirements. Although riparian buffers along fish-bearing streams are not assumed in the analysis to contribute to the timber harvesting land base, not all visually sensitive areas are so excluded, since not all visually sensitive areas are preservation zones. Depending on the degree of visual sensitivity, a forest cover requirement can be applied which allows some harvesting but limits the amount of visible disturbance on a landscape.

The buffer zones as applied in the BCFS analysis indicate a reasonable accounting for visual quality objectives. However, the highway buffer will need to be translated into a management plan for visual quality objectives. This process should incorporate public input. District staff anticipate that visual quality objectives will be identified prior to the next AAC determination.

As discussed in - *forest cover requirements* above, I have examined forest cover requirements additional to those modelled in the BCFS base case. However, as visual quality objectives overlap with forest cover requirements, I have made no further adjustment for VQOs in determining the initial harvest level.

- recreation and wilderness access

A number of concerns were raised by the public regarding the lack of adequate protection of back-country wilderness, forest recreation and tourism interests. Many were concerned that more industrial forestry would detract from the attractions of the wilderness in the Cassiar TSA. In the BCFS analysis less than 3 percent of the total area is considered as the timber harvesting land base, while the remaining 97 percent is not considered as supporting harvesting activity. However, in the future, I expect that the Cassiar TSA will experience increased pressure from a variety of resource uses.

I am mindful of the concerns raised regarding increased road access and forestry activities associated with an increase in the harvest level. I expect that District staff will be reviewing and completing road access management plans and

deactivation plans which will consider concerns regarding increased industrial disturbances and year-round access to wilderness areas.

Furthermore, it is clear to me that much planning work must be undertaken to refine development plans, to translate the allowable annual cut into operational activities, and to do so in a manner which is sensitive to, and integrates the concerns of, the wilderness and recreation interests in the area.

- biodiversity

The Ministry of Environment, Lands and Parks (MELP) submits that the BCFS analysis did not account for Cassiar's many unique features, such as distinct older forest types, seral stages, and connectivity patterns. MELP staff also state that given the 3 percent timber harvesting land base, there is a need for a spatial plan that addresses concerns for biodiversity. This type of plan would overlap with and address critical habitat issues such as forest fragmentation, as well as biodiversity.

The Cassiar TSA analysis assumed the maintenance of a minimum requirement of 12-percent old growth for biodiversity management in each analysis unit within the productive forest land base. Because the timber harvesting land base is only 10 percent of the total 27 percent productive forest land base, the minimum requirement was met without constraining the timber supply.

Further studies incorporating the requirements of the *Forest Practices Code* are clearly needed to properly assess the impact of biodiversity; I urge both BCFS and MELP staff to pursue these studies. I am also aware there is uncertainty regarding the overlap between forest cover requirements, VQOs, and biodiversity. These factors are interrelated, and it is unlikely that their impacts on the timber supply are entirely cumulative. I have made no further adjustment for biodiversity in this determination.

- riparian habitat

The TSA contains numerous fish-bearing streams, lakes and waterways. To account for the current management of riparian habitat in the timber supply analysis, District staff made assumptions regarding stream classifications and applied buffers on both sides of rivers, streams and around large lakes to correspond with the appropriate classification. No further buffers were applied to the numerous wetlands areas or smaller lakes. However, where these occur adjacent to rivers and streams, the riparian deduction may partially overlap and account for these areas.

In all, 86 711 hectares were deducted from the productive land base to meet riparian management requirements. Department of Fisheries and Oceans staff expressed satisfaction with the adequacy of the riparian buffers.

Concern was raised in a number of submissions that riparian values were not adequately accounted for in the analysis. Given that the *Forest Practices Code* is now implemented, and that preliminary studies indicate that the constraints on timber supply from riparian management under the Code are expected to be greater than those assumed in the BCFS analysis, I expect there will be further downward impacts on timber supply.

I acknowledge that impacts from riparian and wetland habitat management may be larger than assumed in the BCFS analysis but there is no analysis before me to specify the additional impacts at this time. Accordingly, my judgement of the degree of risk represented by this factor is guided by my familiarity with analysis work undertaken on riparian management elsewhere in the province. (For reference, this factor is expected to have on average about a 2-percent short-term impact on provincial timber supplies.) As such, this represents a small unquantifiable additional downward pressure on both the short- and long-term timber supply. I have directed staff to examine riparian and wetland habitat to ensure that these areas are identified and not adversely affected by harvesting activity.

- protected and designated study areas

The Cassiar TSA has a number of large parks and recreational areas with additional areas under consideration for designation as protected areas. Examples of the existing protected areas are Atlin Park and Recreation Area, Mount Edziza Park and Recreation Area, Spatsizi Plateau Wilderness Park, Stikine River Recreation Area and Tatshenshini-Alsek Wilderness Park (part of the largest protected area in the world). These areas are not considered to contribute to the Cassiar timber supply. When any additional areas are designated, their impacts on timber supply will be considered at that time.

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

Planning processes

A number of public submissions strongly recommended the implementation of a planning process for the Cassiar TSA prior to any further consideration of an appropriate AAC for the area. In considering this, I am fully supportive of two key points: 1) that planning processes assist in careful consideration of resource values in forest planning and resource management, and 2) that where plans exist, they address risk and introduce certainty into AAC decisions. However, in the case of the Cassiar TSA and my legislated obligation under Section 7 of the *Forest Act*, I must redetermine an AAC every five years. As I have stated above under **Guiding principles**, AAC determinations cannot anticipate planning recommendations or be postponed until after planning processes are complete.

Nevertheless, because the AAC is redetermined every 5 years it will incorporate approved decisions in a relatively timely manner.

Due to the need for careful planning in the Cassiar TSA, a formal planning process is recommended in the near future. Since the Cassiar TSA is too large and diverse to be managed adequately by one planning process, there is a need to develop more than one process. Moreover, given the expressed public interest in this area, it is important that any planning process initiated must incorporate public input.

I am mindful that due to planning processes such as Land and Resource Management Planning (LRMPs), timber volumes available for harvesting may be reduced from initial expectations. Planning results must be carefully analysed and incorporated into future timber supply reviews as more experience is gained through local planning processes.

Partitioned harvest

The harvest level established in 1984 was comprised of specified percentages by timber supply block; the Iskut contributed 61 percent, Dease-Liard 29 percent and Atlin the remaining 10 percent of the total AAC. The 1994 timber harvesting land base includes another timber supply block, the Boundary which is grouped with the Iskut in this determination. As discussed earlier (see - *economic and physical operability* above), distributing the harvest by geographic area will alleviate the potential for concentrating the harvest in any one part of the Cassiar TSA. This will address many public concerns, as dispersing the timber harvesting minimizes the risk of unplanned outcomes in any given area .

In keeping with the existing geographically distributed components of the harvest level and based on the 1994 timber supply analysis, I have specified a 60-percent partition of the total AAC for the Iskut/Boundary timber supply blocks, a 30-percent partition for the Dease-Liard timber supply block, and a 10-percent partition for the Atlin timber supply block.

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

Alternative harvest flows

The Cassiar TSA is one of only a few TSAs in the province that does not require a harvest flow transition strategy from a higher short-term harvest level down to a steady long-term harvest level. Instead, the BCFS analysis for the Cassiar TSA shows that due to a low current harvest level and a relatively balanced age class distribution, the harvest level can increase in the short term, and still remain steady over the long term. The BCFS analysis base case shows a projected initial harvest level of 842 400 cubic metres per year, maintained for 7 decades, then increasing further to the long-term harvest level of 867 400 cubic metres per year.

The BCFS analysis also examined a number of alternative harvest flows. The analysis shows that *without considering the additional constraints on timber supply as considered in the sections 7 (3) (a) and (e)*, it is possible to harvest at an initial rate 30 percent higher than the base case and then to decline in three steps of 10 percent per decade to the base case harvest level. The BCFS analysis also shows an initial harvest rate of 140 000 cubic metres per year, with incremental increases over 5 decades up to the long-term harvest level. The alternative harvest flows indicate to me that there is a great deal of flexibility in determining the initial harvest level for the Cassiar TSA.

With respect to the socio-economic impacts of alternative harvest flows, I have reviewed the socio-economic analysis (SEA) report for the Cassiar TSA, which examines the community impacts associated with two different harvest level scenarios of 240 000 and 640 000 cubic metres per year. Community impacts in the SEA highlight the effects of higher levels of forestry employment, such as more jobs and services, with less likelihood of an outflow of job-seekers. I have considered the information presented, along with local objectives as discussed in 7 (3) (d), below. A number of submissions were received which provided information additional to the SEA, and I have considered these in my determination.

Ministry of Environment, Lands and Parks (MELP) staff provided information indicating higher estimates for wilderness-based employment and income than those presented in the SEA. In particular, the estimates of the economic value of guide outfitting and the numbers of individuals engaged in fishing and trapping are higher than those reported in the SEA. Staff of the BCFS Economic and Trade Branch agree that the SEA likely underestimates these activities.

Another point raised by MELP was the suggestion that the socio-economic analysis failed to explicitly consider that wilderness-based activities could be negatively affected by a higher harvest level. Although the SEA does acknowledge the guide outfitters' opposition to an increase in harvest levels, examining the relationship between higher levels of harvesting and impacts on other businesses and wilderness-based lifestyles involves complex assessment and comparative analysis of human values and social acceptability. Given the difficulties inherent in such an analysis, in determining an appropriate AAC I have taken guidance from the understanding I have gained from reviewing the SEA, the critiques of the SEA, the strong views expressed in public input, and the input from the Minister of Forests under section 7 (3) (d) of the *Forest Act* regarding social and economic objectives of the Crown.

In considering this important issue, I have striven to find an AAC that is not indifferent to, or unbalanced in its recognition of, the needs of all who use the forest. I am mindful of the fact that activities based on the Cassiar's wilderness

attributes currently comprise a significant part of the local economy and underlie the social characteristics and values of the residents of the Cassiar TSA. However, with only less than 3 percent of the Cassiar TSA contributing to the timber harvesting land base, it is reasonable to consider that both the current wilderness-based activities and an increased harvest level can co-exist.

A number of the submissions received suggested that the existing harvest level of 140 000 cubic metres per year should be maintained for a variety of reasons. A few submissions suggest a moderate increase in the existing harvest level could offer an opportunity for increased employment, services, stability and diversity within the area. Others were concerned that because of the reported lack of information, all harvesting should stop until further information is gathered.

Ministry of Environment, Lands and Parks staff submit that, due to undocumented natural variation and significant data gaps, an increased AAC could cause environmental damage within a relatively short period. I acknowledge MELP's concern, but as Chief Forester, I expect the *Forest Practices Code* to ensure that forest practices will not result in environmental damage regardless of the AAC determined.

In summary, my evaluation of the BCFS timber supply analysis for the Cassiar TSA indicates that the TSA is unusual in its flexibility in terms of the wide range of alternative harvest flows available for consideration. Under these circumstances, from the considerations presented throughout this document, I conclude that it is appropriate at this time to consider some increase in the AAC for this TSA, as discussed in detail in *Reasons for decision*.

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

Timber processing facilities

There are five small active sawmills in the Cassiar TSA, with three located in Atlin. These sawmills operate intermittently to meet local demands. There are no major timber processing facilities within the Cassiar TSA, but 12 facilities outside the TSA to the south either purchase or trade logs harvested from the Cassiar TSA.

Concern was raised by Cassiar residents that most of the economic benefits from any increase in timber harvesting in the Cassiar TSA would accrue to communities and timber facilities outside the area. The UBC critique submits that it is inappropriate to consider any expansion of timber activity in the Cassiar TSA since there is a proven lack of demand and no infrastructure to support an expansion.

A BCFS report, *The Northwest Forest Industries: An Overview of Current Wood Fibre Supply, Consumption and Processing Capacity*, concludes that in 1993, lumber processing capacity for the northwest exceeded sawlog supply by

approximately 1 million cubic metres per year. Both as the previous Prince Rupert regional manager and currently as chief forester, I have received many submissions which support the report's conclusion and which express interest in the Cassiar timber supply to supplement timber requirements for established timber processing facilities. As timber supplies are decreasing in other areas of the province such as the Kalum and Nass TSAs, there will be increased interest in the Cassiar TSA.

BCFS staff indicate that they have observed a 32 hour, one way, logging truck haul from the Yukon to southern BC mills, resulting from changing economics. In the past, this was unheard of and is clear testimony both to out-of-area demand and to rapidly changing economic conditions in the logging and manufacturing industries. It is reasonable to expect that an increase in the Cassiar TSA's harvest level will likely be utilized, although District staff indicate there will be a transition period required for increased administration requirements.

An increased harvest level could either support the establishment of timber processing facilities in the Cassiar TSA or it could offset currently decreasing timber supplies flowing to mills in other TSAs. However, decisions on apportionment and tenures are not within my jurisdiction; these decisions rest with the Minister of Forests.

- (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

The Minister of Forests has expressed the economic and social objectives of the Crown for the province (letter to former chief forester John Cuthbert dated July 28, 1994, attached as Appendix 3). I have reviewed the letter and although it was presented against the backdrop of the provincial trend of decreasing harvest levels, the letter is also applicable to the Cassiar TSA, where timber supply is projected to increase. The government's objectives are consistent with the objectives stated in Forest Renewal Plan and include forest stewardship and a stable timber supply. The Minister placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. The Minister also noted that improving economic conditions may make it possible to harvest timber which has typically not been used in the past, and I have considered this in my determination.

- 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, where these are consistent with government's broader objectives. Input received during the public input period indicated there are significant concerns regarding a number of important issues which I have discussed and considered in this document.

First Nations expressed the following social and economic objectives: an increase in First Nations' employment, no further development within traditional territories until land claims are settled, and tenure opportunities in the area. It is possible that increased harvesting will result in increases in First Nations' employment. Under the *Forest Act* I am required to redetermine AACs every 5 years, and I am unable to wait until land claims are settled. However, an AAC determination should not be construed as limiting the Crown's obligations respecting aboriginal rights. Finally, decisions on tenures are not within my jurisdiction; these decisions rest with the Minister of Forests.

Other public input on social and economic objectives suggests that an expansion of the forest industry is undesirable since it will detract from existing wilderness-based economic activities which are of considerable local importance. The input also suggests that any increased harvest level would negatively impact the quality of life in the Cassiar TSA.

There was also public input supporting an increase in the AAC, citing the expected benefits of increasing employment, community stability and economic diversification within the Cassiar TSA.

I have read all the submissions received for the Cassiar TSA. I am mindful of the many views brought forward and where possible I have attempted in this rationale to respond briefly to the views expressed. This input has provided valuable assistance in identifying uncertainty in the timber supply additional to that considered in the BCFS analysis. My consideration of the numerous concerns raised has contributed to my cautious overall approach in reviewing the timber supply in this determination.

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

Unsalvaged losses

- insects and disease

A number of endemic insect infestations and diseases are present in the Cassiar TSA, such as deciduous defoliators, balsam bark beetles, spruce beetles, needle rusts, mountain pine beetle, voles and porcupines. Some endemic, unsalvaged losses are accounted for in growth and yield projections, as they are measured along with the other attributes at the time of field sampling. The BCFS analysis reports that the unsalvaged losses from damage by insect and disease are fully accounted for in volume estimates. However, since the release of the BCFS analysis, based on field data, District staff submit that approximately 4 000 cubic metres per year are additionally lost and are not accounted for in the analysis. I have accounted for this additional downward pressure in my determination.

- wildfire

Records show that over the last 10 years there have been wildfires annually on about 600 hectares of the Cassiar timber harvesting land base. (Larger fires have occurred in the TSA, but these have been outside the timber harvesting land base.) The timber on the burned areas has not been salvaged. This is reflected by the 7 600 cubic metres per year of unsalvaged fire losses in the BCFS analysis.

However, new information suggests that this estimate of timber loss due to wildfire may be low. The standard methodology in the BCFS analysis is to consider the fire history from only the last 10 years, to reflect current fire suppression levels. No large fires occurred during this period, and had a longer period been chosen, it would have included large wildfires. The UBC critique submits that the likelihood and importance of fires is underestimated in the BCFS analysis. BCFS staff quoted a study which reported that catastrophic fire losses are closer to 3 000 hectares (total land base) a year and that fire return is on a 150-year cycle.

After reviewing the information presented, I conclude that the rate of unsalvaged timber losses due to wildfire as assumed in the BCFS analysis is low and that this estimate was hampered by lack of information. Infrequent large wildfires will likely continue to occur, as they have in other areas of the province, even with present levels of fire suppression. This introduces a risk that the base case has overestimated the timber supply, and I have taken this into account in my determination.

Reasons for Decision

In reaching my decision on an AAC for the Cassiar TSA there are many unique features to be considered. The area covers one-sixth of the province and hence includes a diversity of site conditions. The Cassiar TSA also has a short history of forest management from which to derive many of the factors used as inputs to timber supply analysis.

As discussed earlier in **The role and limitations of the technical information used**, the short management history has resulted in unusually high levels of uncertainty in the information used in the analysis for this TSA. Therefore, although the original data inputs may well be reasonable, given the widespread concern expressed about uncertainty in the timber supply analysis, I have sought additional assistance from expert staff. These staff were knowledgeable about conditions in the Cassiar TSA and were able to assist in my assessment of technical factors and to aid in the evaluation of risk and uncertainty.

The Cassiar TSA is also unusual in that it is one of only a few TSAs in the province that does not require a transition strategy from a higher short-term harvest level down to a steady long-term harvest level. Instead, the BCFS analysis for the Cassiar TSA shows that, due to a low current harvest level and a relatively balanced age class distribution, the harvest level can increase in the short term, and still remain steady over the long term.

In my provincial review of other timber supplies, it has become apparent that harvest levels are decreasing in many areas of the province. This decrease in harvest levels along with higher timber prices has created a positive economic climate for Cassiar's timber supply and it is now viable to harvest in previously uneconomic areas within the Cassiar TSA. Thus the upward pressures on timber supply in this TSA are twofold; increasing economic opportunities within the TSA, and the opportunity to provide timber supplies to processing facilities outside the TSA. There may be even greater pressures in the future to increase harvest levels in the Cassiar TSA.

The economic and social objectives for the province as outlined in the Minister's letter (attached as appendix 3) confirm the importance of protecting non-timber values in conjunction with social and economic considerations. The Minister also noted that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. As well as provincial objectives, the Minister has asked that I consider important local social and economic objectives derived from public input to the extent that these are consistent with broader provincial objectives.

Throughout my consideration of the information leading up to this determination, I have recognized that the local input from the guide outfitting and tourism industry, the local government, a locally sponsored academic submission, and local interest groups, all have raised numerous concerns regarding the level of risk associated with the information for the Cassiar timber supply. I concur with many of these concerns. In reviewing all the information presented to me, I have sought to refine the range of uncertainty regarding the

downward pressures resulting from information that was not available for incorporation into the base case analysis, and to reduce any unnecessary risk that these may introduce.

The BCFS analysis base case indicates that the current AAC of 140 000 cubic metres per year could be increased to 842 400 cubic metres per year for 7 decades before increasing to a long-term harvest level of 867 400 cubic metres per year. In my considerations I have identified a number of limitations which exert significant downward pressure on the initial projected harvest level of 842 400 cubic metres per year as described as the base case. These factors were not fully accounted for in the base case projection, due to changes in forest practices, and to new information that has become available since the analysis—particularly regarding risks and uncertainties associated with certain data assumptions.

Factors identified as downward pressures relative to the projected base case include the following:

- **Conventional timber harvesting land base:** Standard criteria were used to define the timber harvesting land base. These criteria routinely include some areas assumed to be operable by non-conventional harvesting methods. However, experience elsewhere shows that not all of the "non-conventional" areas so included can be considered as contributing to the timber harvesting land base, due to the higher operating costs associated with these methods. Therefore, while economics have improved in the Cassiar TSA, until more harvesting experience has been gained, the assumption that all the non-conventional areas identified by standard criteria will contribute to the timber harvesting land base is not realistic, and creates a level of risk. A sensitivity analysis of the impact of excluding the non-conventional areas indicates a quantifiable downward influence of between 11 and 14 percent on the short- and long-term harvest level as projected in the BCFS base case.
- **Site productivity:** BCFS staff and the public raised the concern that current estimates of site productivity as assumed in the BCFS analysis do not adequately reflect northern growth rates for the boreal forests of the Cassiar TSA. The BCFS Prince Rupert Regional staff provided field data which show that the BCFS analysis overestimates site productivity for stands on immature poor and medium sites (for spruce, subalpine fir and hemlock) by approximately 5 to 10 percent. It is my assessment that the field data results verify that site productivity is overestimated. Since the boreal forests encompass the largest portion of the timber harvesting land base, in my judgement it is reasonable to assume that there is a 5- to 10-percent overestimation in site productivity in the boreal forest and that this constitutes a downward pressure of up to 7 percent on the projected initial harvest level as indicated in the base case.
- **Operational Adjustment Factors:** While I have already accounted for the risk of lower site productivity, I recognize that northern conditions have other

significant impacts on regenerating stands. Operational adjustment factors (OAF # 1 and 2) were applied to yield curves in order to account for such factors as openings in stands, and pests and diseases. However, after reviewing yields, I have accounted for up to an additional 5 percent to OAF #1 to account for further risks of overestimation associated with unique northern conditions, such as a short growing season, severe climate and soil limitations. This represents less than a 5 percent downward pressure on the initial harvest level as projected in the base case.

- **Forest cover requirements:** Ministry of Environment, Lands and Parks (MELP) submits that a three- and four-pass harvesting system as assumed in the BCFS analysis for the Cassiar TSA, does not provide for adequate protection of wildlife, some of which are red- and blue-listed species, i.e. species which are endangered, threatened or at risk. There is limited information upon which to determine whether a greater number of passes is required to manage wildlife habitat. However, based on critical habitat requirements in northern ecosystems and the information presented to me by BCFS and MELP staff, I believe that the BCFS analysis does introduce a risk of not adequately accounting for forest cover requirements for wildlife habitat in the Cassiar TSA. An appropriate combination of management strategies to reduce this risk substantially reduces the initial harvest level, by up to 20 percent.
- **Green-up:** A BCFS research silviculturist estimates that the ages to reach green-up heights for spruce, subalpine fir, and hemlock were underestimated by 10 years. Sensitivity analyses presented in the BCFS analysis show that if green-up ages are increased by 5 years, the base case harvest level would decrease by 6 percent in the short term. While I have previously discussed and accounted for risks associated with site productivity and operational adjustments factors, I consider that there are further risks associated with green-up. In my judgement, the green-up ages for pine are reasonable but those for spruce, subalpine fir, and hemlock are underestimated. The impact of this underestimation is up to a 6-percent downward influence on the initial harvest level projected in the BCFS analysis.
- **Riparian habitat:** The BCFS analysis deducted 86 711 hectares from the productive land base to account for riparian habitat requirements. Concern was raised in a number of submissions that riparian values were not adequately accounted for in the BCFS analysis. Now that the *Forest Practices Code* has been implemented, preliminary studies indicate that the constraints on timber supply from riparian management under the Code are expected to be greater than those assumed in the BCFS analysis. (For reference, this factor is expected to have on average about a 2-percent impact on provincial timber supplies.) As such, this represents a small but unquantifiable additional downward pressure on both the short- and long-term timber supply.

- **Insects and disease:** District staff estimate that an additional 4000 cubic metres per year lost to insects and disease were not accounted for in the analysis. I have directed that a more comprehensive assessment of endemic, unsalvaged losses be incorporated into the next determination. In determining this AAC, I have accounted for additional unsalvaged losses, due to damage from endemic insects and disease, of 4000 cubic metres per year.
- **Wildfires:** The UBC critique submits that the likelihood and importance of fires is underestimated in the BCFS analysis. After reviewing the information presented, I conclude that the rate of unsalvaged timber losses due to wildfire as assumed in the BCFS analysis is low, and that this estimate was hampered by lack of information. Infrequent large wildfires will likely continue to occur, as they have in other areas of the province, even with present levels of fire suppression. This introduces a risk that the base case has overestimated the timber supply in both the short and long terms, and my determination accounts for this overestimation.

As discussed earlier (**Role and limitations of the technical information used, and The role of the base case**) in considering the risks associated with the above factors, I have adopted the assumption within the associated range of uncertainty which produces the most cautious estimate of timber supply, and thus minimizes risk.

Applying this approach to my review of the downward influences on timber supply associated with each of the above factors—i.e.: conventional timber harvesting land base; site productivity; operational adjustment factors; forest cover requirements; green-up; riparian habitat; insects and disease; and wildfires—I find that the resulting total impact on timber supply amounts to approximately one half of the initial harvest level projected in the BCFS analysis base case.

This large cumulative downward influence on timber supply provides compelling reasons for concluding that the base case forecast of 842 400 cubic metres per year would not be an appropriate AAC for the Cassiar TSA at this time, and that the AAC must be set at a significantly lower level. However, even with this cautious approach, I believe there is sufficient flexibility in the BCFS analysis to establish an AAC above the current level of 140 000 cubic metres per year.

Future study should serve to reduce the uncertainty and confirm an improved assessment of the data assumptions for use in future determinations. BCFS staff will be undertaking studies to better quantify the information on forest inventories, site productivity, forest regeneration, green-up requirements and unsalvaged wildfire losses for the Cassiar TSA. Also, more experience with harvesting over the next few years will assist in better identifying areas that can be considered as part of the timber harvesting land base. These studies and further experience will provide an improved basis for future timber supply analyses and will undoubtedly be more reflective of management practices for riparian

habitats, wildlife habitats, biodiversity, and other forest practices. This information will enable the next timber supply analysis and AAC determination for the Cassiar TSA to be better positioned to assess the risks and benefits of a higher harvest level.

BCFS staff further advise me that although little past interest has been shown in the Cassiar timber supply, nevertheless an increase in the harvest level will now likely be utilized. District staff indicate a transition period will be required for increased administration requirements.

A number of resource management objectives and strategies will require further review and approval through public planning processes, and therefore a formal planning process is recommended in the near future. Since the Cassiar TSA is too large to be considered in one planning process, there may need to be more than one process to accommodate the diversity of the area.

Furthermore, given that this AAC determination is based on less than 3 percent of the total area of the Cassiar TSA, and because I have purposefully exercised caution and minimized risk, I am satisfied that the determination represents a conservative approach to increasing the harvest level from 140 000 cubic metres per year for the Cassiar TSA. In addition, I am partitioning this AAC, which will even further reduce risks by ensuring activities are dispersed rather than concentrated in particular areas on the landscape.

In developing the cautious approach I have taken in determining this AAC, I have been assisted greatly by the input from the public, and by the knowledge of experienced staff. I am satisfied that this approach has resulted in appropriate recognition of a total downward risk in the order of magnitude of more than 50 percent from the projected base case of 842 400 cubic metres per year. With the downward risks satisfactorily accounted for, given the biophysical potential of the area, the improved economic feasibility of harvesting in the TSA, and the increased demand for timber, I am satisfied that a geographically partitioned, long-term harvest level of 400 000 cubic metres per year can be maintained.

It is therefore my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that provides for anticipated constraints during the implementation of the Forest Practices Code, that ensures longer-term integrated resource objectives can be met, that meets provincial objectives and that avoids disruptive shortfalls in future timber supply, can best be achieved in this TSA at this time by establishing the AAC at 400 000 cubic metres.

Determination

Effective January 1, 1996 the new AAC for the Cassiar TSA will be 400 000 cubic metres per year. This will remain in effect until a new AAC is determined, which must take place within five years of this determination. The new AAC has the following components based on geographic harvest distribution:

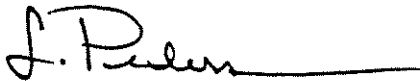
- 240 000 cubic metres per year are attributed to the Iskut/Boundary timber supply blocks (*60 percent of total AAC*)
- 120 000 cubic metres per year are attributed to the Dease-Liard timber supply block (*30 percent of total AAC*)
- 40 000 cubic metres per year are attributed to the Atlin timber supply block (*10 percent of total AAC*)

The harvestable volume attributed to each geographic area is based on the total existing mature volume in each respective area, with forest cover requirements taken into account.

Implementation

During the early part of the next determination period, the Cassiar Forest District, in conjunction with headquarters staff, will attempt to resolve uncertainty with respect to the following factors:

- any discrepancy between actual harvested volumes per hectare and projected volumes per hectare;
- estimates of site productivity;
- operability mapping and terrain stability studies;
- road access management plans that address issues regarding critical wildlife habitat, poaching, recreation, tourism and fire protection;
- evaluation of unsalvaged insect, disease and blowdown losses;
- the potential impacts and the likelihood of occurrence of catastrophic fires.



Larry Pedersen
Chief Forester

October 26, 1995

Appendix 1: BC *Forest Act*, section 7

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: BC *Ministry of Forests Act*, section 4

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: July 23, 1994 letter from Honourable Andrew Petter,
Minister of Forests, to former chief forester John Cuthbert**
re: economic and social objectives of the Crown

Appendix 4: Summary of Public Input.



File: 10100-01

JUL 23 1994

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

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

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

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

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

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

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

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

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

Yours truly,



Andrew Petter
Minister