BRITISH COLUMBIA
MINISTRY OF FORESTS

Cranberry Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective June 1, 1998

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Chief Forester

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Objective of this Document

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

Description of the TSA

The Cranberry TSA lies in the northwest part of British Columbia within the Prince Rupert Forest Region, and is administered from the Kispiox Forest District Office in Hazelton. It is located approximately 60 kilometres north of Kitwanga village and is bounded by the Nass TSA to the west, Tree Farm Licence (TFL) 1 to the south, and the Kispiox TSA to the north and east. The Cranberry TSA is the smallest provincial timber supply area, comprising a total of 76 751 hectares.

Of the 76 751 hectares, 60 444 hectares are productive Crown forest area according to the November 1997 timber supply analysis. A notable proportion of the productive Crown forest is not available for harvesting, due to factors such as uneconomical timber, environmental sensitivity or wildlife habitat concerns. Following the reductions for these, and other factors, as reported in the analysis, the current timber harvesting land base is 32 832, or about 55 percent of the productive Crown forest area.

The topography of the Cranberry TSA ranges from flat and gentle terrain at 300 metres in elevation, to the rounded Mount Weber at 2018 metres in elevation. Most of the Cranberry TSA is located in the mid and lower portions of the Cranberry River drainage. The TSA is bordered on the west by the Nass and Kiteen Rivers. The most significant river within the TSA boundary is the Cranberry River. The valley bottoms around the Cranberry River are characterized by floodplains and terraces, with some area with organic soils and wetlands. A very small area in the western part of the Cranberry TSA drains directly into the Nass River. The diverse terrain within the Cranberry TSA offers numerous opportunities for hiking, fishing, hunting, mountain biking, wildlife viewing, snowmobiling, cross-country skiing and other recreational activities.

The TSA contains both coastal and interior biogeoclimatic ecosystems, including parts of the Engelmann Spruce-Subalpine Fir, Mountain hemlock, Coastal western hemlock, Interior cedar hemlock and alpine tundra biogeoclimatic zones. The most common tree species are western hemlock, subalpine Fir, spruce and lodgepole pine. Other commercial species include western redcedar, cottonwood, birch, aspen, amabilis Fir and mountain hemlock.

The rural communities of Gitwangak, Gitanyow and New Aiyansh are located near the Cranberry TSA. The village of Hazelton and the New Hazelton district municipality, located about 40 kilometres east of Kitwanga, are the closest commercial, administrative and retail centres for the region. The forest industry provides an important source of revenue and employment to these communities. Recreation, tourism and the commercial harvesting of pine mushrooms are also important sources of economic activity in the area.

The Cranberry TSA is located within overlapping traditional territories of both the Nisga'a Tribal Council and the Gitanyow Nation. Members of these groups are employed to varying degrees in the forest industry.

At this time, the Nisga'a Tribal Council, the Government of Canada and the Province of British Columbia have signed the Nisga'a Treaty Negotiations Agreement-in-Principle, and are currently negotiating towards a Final Agreement. A portion of the wildlife management area, as outlined in the Agreement-in-Principle, is located in the Cranberry TSA. The name of the wildlife management area is currently planned to be changed in the Final Agreement to the Nass Wildlife Area.

The Gitanyow Nation is actively negotiating an Agreement-in-Principle with the Government of Canada and Province of British Columbia.

History of the AAC

In 1986 the northern portion of Tree Farm Licence (TFL) 1, covering 76 751 hectares, was separated and granted to Westar Timber Ltd. as TFL 51. The initial AAC for TFL 51 was determined to be 150 000 cubic metres. In 1987 this was raised to 220 000 cubic metres to facilitate the harvest of areas infested with mountain pine beetle. A further increment to 289 000 cubic metres was granted for 1988 and 1989 to continue salvage operations. In 1990 the AAC was lowered to 110 000 cubic metres in recognition of the end of the mountain pine beetle infestation.

In 1989 the licensee assigned TFL 51 to Westar Timber (Carnaby) Ltd. Four years later, on February 18, 1993, the licence was returned to the province, and redesignated as the Cranberry TSA. The boundaries of the Cranberry TSA are consistent with the previous TFL 51 boundaries. The current AAC for this TSA is 110 000 cubic metres and is apportioned by the Minister of Forests as follows:

	Cubic Metres
Forest Licence (1)	100 000
Small Business Forest Enterprise Program	10 000
Total = current AAC	**110 000**

C GED Forest Products Ltd. currently holds Forest Licence #A48704 granting them rights to harvest 100 000 cubic metres per year within the Cranberry TSA.

New AAC determination

Effective June 1, 1998, the new AAC for the Cranberry TSA will be 110 000 cubic metres.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

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

- Forest inventory planning file, British Columbia Forest Service (BCFS);
- Forest inventory manual, Volume 2, BCFS;
- Forest tenure administration system, BCFS;
- Integrated silviculture information system, BCFS;
- *Landscape Unit Boundary Rationale* and *Draft Biodiversity Emphasis Assignment*, Kispiox Forest District;
- Major licensee silviculture information system;
- Recreation inventory, 1993, Kispiox Forest District;
- Cranberry Floodplain Mapping, 1991, Westar Timber Limited;
- *Site Degradation Survey* (Kispiox Forest District), Baseline Prescription Ltd., 1995;
- Visual quality objective mapping, Kispiox Forest District;
- C GED Forest Products Ltd. 1997 - 2001 Forest Development Plan;
- *Cranberry Timber Supply Area Timber Supply Review Data Package*, May 1997;
- *Cranberry Timber Supply Area Information Report*, May 1997;
- *Cranberry Timber Supply Area Public Discussion Paper*, November 1997;
- *Cranberry Timber Supply Area Analysis Report*, November 1997;
- *Summary of Public Input: Cranberry Timber Supply Area Timber Supply Review*, February, 1998;
- *Kispiox Land and Resource Management Plan*, April 1996;
- *Environmentally Sensitive Areas on Tree-Farm Licence 51*, Lewis, T., 1987;
- Business re-evaluation report prepared for the Job Protection Commission—Mijo Management Ltd., September 1997;
- *Evaluation of Soil Degradation as a Factor Affecting Forest Productivity in British Columbia: A Problem Analysis (Phase 1).* FRDA Report 025. Utzig, G. and Walmsley, M, 1988;
- Geographic Information System (GIS) Analysis for the Kispiox TSA Timber Supply Review. Reports and Maps. Timberland Consultants, 1996;
- History of TFL 51: Working Plan #6, Harris, R, 1988;
- Letter from R. Harris to the Minister of Forests and Lands regarding the re-inventory of TFL 51, dated April 20, 1988**;**
- Requests for Proposals: Photogrammetric Transfer of Forest Inventory Polygons for TFL 51 Re-inventory, Westar Timber Limited, 1988;

- *Cranberry TSA Inventory Audit*, Resources Inventory Branch, April 1997;
- Standing Green Export Application (Supplementary Information Package), Cranberry TSA, Block A, C GED Forest Products Ltd., Forest Licence A48704, July 9, 1997;
- *A Preliminary Analysis of the Economic Importance of the 1994 Pine Mushroom Industry of the Nass Valley Area, British Columbia*, Meyer Resources Inc., February 1995;
- *Draft Interim Old Growth Site Index Adjustment Equations and Application Guidelines*, Research Branch, B.C. Ministry of Forests. February, 19, 1998;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives;
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives regarding visual resources;
- Letter from the Deputy Ministers of Forests and Environment, Lands and Parks, dated August 25, 1997, conveying government's objectives regarding the achievement of acceptable impacts of biodiversity management on timber supply;
- Technical review and evaluation of current operating conditions through comprehensive discussions with BCFS staff, notably the AAC determination meeting and helicopter tour of the TSA held in Hazelton on February 11 and 12, 1998, respectively;
- Information from a meeting between the chief forester, BCFS staff, and the Nisga'a Tribal Council on April 3, 1998;
- *Forest Practices Code of British Columbia Act*, July 1995;
- *Forest Practices Code of British Columbia Act Regulations*, April 1995;
- *Forest Practices Code Timber Supply Analysis*, BCFS and Ministry of Environment, Lands and Parks (MELP), February 1996; and
- Forest Practices Code of British Columbia Guidebooks, BCFS and MELP.

Role and limitations of the technical information used

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

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

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

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

Statutory framework

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

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. Two important ways of dealing with uncertainty are:

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

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

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

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

Although the Code is now fully implemented following the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

The impact on the timber supply of land-use decisions resulting from planning processes such as the Commission on Resources and Environment (CORE) process for sub-regional plans, the Protected Areas Strategy (PAS) or the Land and Resource Management Planning (LRMP) process is a matter often raised in discussions of AAC determinations. In determining AACs it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions that have not yet been taken by government. Thus I do not consider the possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made land-use decisions, it may not always be possible to analyze the full timber supply impact in AAC determinations. 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 fully assess the overall impact of the land-use decision. Where specific protected areas have been designated by legislation or by order in council, these areas are no longer considered to contribute to timber supply. The legislated requirement for five–year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

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

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

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

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

With respect to First Nations' issues, the AAC that I determine should not in any way be construed as limiting any obligations the Crown may have regarding aboriginal rights, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Cranberry TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply. Aboriginal rights will be taken into account as far as possible under Section 8(7) of the *Forest Act* and will be respected in the administration of the AAC determined.

I am also aware that there are implications for aboriginal title from the recent Supreme Court of Canada Delgamuukw decision. At this date the manner in which the Province will implement measures related to aboriginal title remains uncertain. However, with regard in particular to future treaty decisions, as with other land-use decisions it would be inappropriate for me 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 (MOF) as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the base case

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

For each AAC determination for a TSA, a timber supply analysis is carried out using an information package including data and information from three categories: land base inventory, timber growth and yield, and current management practices. Using this set of data and a computer model (FSSIM), a series of timber supply forecasts is produced, reflecting different decline rates, initial harvest levels, and potential trade-offs between short- and long-term harvest levels.

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

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

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

These adjustments are made on the basis of informed judgement, using current information available about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Forest Practices Code, or during the implementation of new policies, procedures, guidelines or plans.

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

The BCFS base case harvest projection for the Cranberry TSA was based on a current timber harvesting land base of 32 832 hectares or about 43 percent of the total TSA area of 76 751 hectares. The base case projection in the BCFS *Cranberry Timber Supply Analysis* shows that the existing AAC of 110 000 cubic metres per year could be maintained for nine decades, before declining at a rate of 8 percent per year for three decades, when, in decade 12, the long-term harvest level of 87 000 cubic metres per year is reached. This level is then maintained for the remainder of the planning period.

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

Section 8 (7)

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

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

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

Land base contributing to timber harvest

- *general comments*

The total area of the Cranberry TSA is 76 751 hectares. Non-productive areas within the TSA account for 16 307 hectares, for a total productive Crown forest land base of 60 444 hectares.

As part of the process used to define the timber harvesting land base—i.e., the land base estimated to be the economically and biologically available for harvesting—a series of deductions were made from the productive forest. These deductions accounted for all the factors that operate to reduce the productive forest area, for economic or ecological reasons. In timber supply analysis, assumptions and, if necessary, projections must be made about these factors prior to quantifying appropriate areas to be deducted from the productive forest area, in order to derive the timber harvesting land base. These factors are described in more detail below.

The productive land base will be further reduced due to construction of roads, trails and landings to access and harvest timber, resulting in a current timber harvesting land base of 32 832 hectares. Following current deductions, future deductions for roads, trails and landings are made, resulting in the long-term timber harvesting land base of approximately 32 385 hectares, or 42 percent of the total TSA.

- *economic and physical operability*

In the BCFS analysis, 2519 hectares were deducted from the productive forest area to account for areas classified as physically and economically unavailable for harvest for terrain-related or economic reasons.

Operability lines for TFL 51 (now the Cranberry TSA) were established in 1986 and 1987 based on 1985 conventional harvesting techniques and economic capability, and were approved by the Ministry of Forests and Lands at that time. The operability lines established for the TSA did not include cable harvesting, but the current five-year development plan (1997 to 2001) identifies 247 120 cubic metres of proposed cable harvesting. In addition, I am aware that some cable harvesting operations have recently

been undertaken within the TSA. However, district staff note that there are no proposed cutblocks in the five-year forest development plan that are located outside the current operability lines, and that therefore, even considering cable harvesting techniques, the current operability lines are reasonable. District staff anticipate a review of the operability lines prior to the next timber supply review, and this will reflect plans to undertake cable harvesting on an expanded land base.

District staff have confirmed that based on current performance and plans, the operability lines are appropriate. Therefore, for the purposes of this determination, I consider the operability assumptions used in the BCFS analysis to be acceptable.

- *low productivity sites and unmerchantable (problem) forest types*

In determining the timber harvesting land base, 4244 hectares with low timber growing potential were deducted from the productive forest area. In addition, 2320 hectares of unmerchantable stands, i.e. stands which are physically operable and exceed low site criteria, yet are not currently utilized or have marginal merchantability, were deducted from the productive forest area. These stands were identified by BCFS staff based on current forest management practices and recent harvesting performance in the TSA.

I have reviewed these factors and consider the reductions reasonable and reflective of current practice, and have made no further adjustments in my determination.

- *deciduous forest types*

Deciduous species in the Cranberry TSA are mainly aspen, cottonwood and birch. Stands with the highest proportion of these species are mainly found in areas that do not contribute to the timber harvesting land base, such as riparian areas or important wildlife habitat. In the BCFS analysis, high productivity cottonwood stands, and high productivity aspen and birch stands less than 40 years old were included in the timber harvesting land base. Approximately 6 percent of the timber harvesting land base has a deciduous species as the dominant species. Demand to develop and utilize these hardwoods has been sporadic and is dependent primarily on the market for wood chips. Consequently, deciduous trees are harvested only under infrequent market conditions, when prices are unusually high. Often the deciduous component from a mixed stand is left standing on cut-over areas which has benefits for wildlife habitat.

I recognize that deciduous-leading stands contribute in a small way (6 percent) to the timber harvesting land base. I note that from January 1994 to October 1997 only 1.4 percent of the total timber harvested in the TSA comprised deciduous species, and that no deciduous-leading stands were harvested, reflective of current market conditions. However, I am mindful that in the base case, it is not until the third and fourth decade, that they begin to contribute to the timber supply. Therefore in the short term, the base case is not dependent on the harvesting of deciduous-leading stands. This will allow time for district staff to clarify their management objectives for deciduous-leading stands—including full consideration of wildlife habitat and biodiversity requirements.

Given that the short-term timber supply is not dependent on the deciduous stands, and given that there has been occasional utilization of these stands, I find it reasonable that they should remain a part of the timber harvesting land base and I have made no adjustment to the base case for this factor.

- *estimates for current and future roads, trails, landings and dispersed disturbance*

In the BCFS analysis, 1780.5 hectares (about 3 percent) were removed from the productive forest land base to account for losses due to existing roads, trails, landings and dispersed disturbance. This area was deducted only from stands younger than 20 years, based on the assumption that the majority of harvesting in the TSA has occurred in the past 20 years. For future roads, trails, landings and dispersed disturbance, a reduction of 1.68 percent was applied to all areas older than 20 years of age, upon harvest of those areas. This resulted in 447 hectares (0.7 percent) being removed from the productive land base.

The reductions for existing road and trail lengths were based on GIS analysis; road and trail width estimates were obtained from district engineering staff. Productivity losses due to landings and dispersed disturbances were derived from a soil survey conducted in the fall of 1995. Based on this survey, losses due to landings were estimated to be 1.6 percent of the total gross logged area. From this same survey, and considering the Forest Resource Development Agreement (FRDA) report, *Evaluation of Soil Degradation as a Factor Affecting Productivity in B.C.: A Problem Analysis (Phase 1)*, losses due to dispersed disturbance were estimated to be 4.2 percent of the net logged area. Future roads, trails and landings estimates were extrapolated from existing roads, trails and landings estimates, based on an assessment by District staff that 80 percent of the land base currently has road access.

In considering the deductions for this factor, I am mindful that they appear small for the type of terrain and topography found in this TSA. However, after reviewing the detailed and thorough methodology used to calculate these reductions, I find them to be reasonable and acceptable for use in this determination. During the next analysis and determination for this TSA, I expect a similar method to be employed to estimate necessary deductions and that the assessments and assumptions used will be monitored for their appropriateness.

- *environmentally sensitive areas*

In the BCFS analysis, 10 178.5 hectares were identified as environmentally sensitive areas (ESAs). The following ESAs were identified on the inventory file: highly sensitive soils (Es1), moderately sensitive soils (Es2), difficult to regenerate areas (Ep1), and highly sensitive wildlife areas (Ew1). Sensitive wildlife areas will be discussed below under *wildlife habitat*. All Es1 and Ep1 areas were fully excluded from the timber harvesting land base, while 75 percent of Es2 and Ew1 areas were excluded. After accounting for overlaps with other areas excluded from the timber harvesting land base, 8419 hectares (13.9 percent) were deducted from the productive forest area to account for ESAs.

In 1997, district staff reviewed the methodology used to identify and classify ESAs, and also carried out field checks to verify information. Based on this review, district staff are confident that the current ESA classification and corresponding reduction factors are adequate and reflective of current practice.

From my review of the methodology applied, and on the basis of the acceptance by district staff of the estimates for environmentally sensitive areas used in the timber supply analysis, I consider these estimates to be appropriate and acceptable for use in this determination.

Existing forest inventory

- *age of the inventory*

The Cranberry TSA was last inventoried in 1990 (when it was TFL 51). At that time, Resource Inventory Branch standards and procedures were used to complete the inventory. When TFL 51 was surrendered to the Crown in 1993, the forest cover inventory files were updated for logging disturbances and silvicultural activities. The database files from the Resource Inventory Branch used in the timber supply analysis were produced in 1994 and are projected for growth and ageing to 1995. District staff note that since 1993 very few cutblocks have been harvested and little silvicultural activity has occurred on the TSA.

In 1995, the Resources Inventory Branch conducted an inventory audit of the Cranberry TSA. The results of the audit for the mature component of the inventory suggest that the inventory volume estimates are statistically acceptable. While results of the immature component of the inventory suggest that it may not be accurate in site index assessment for young stands, the Resources Inventory Branch pointed out that since the audit sampling design for the immature component was biased, this result must be viewed with caution. Branch staff pointed out that immature stands in the Cranberry TSA will be further examined. I have been mindful of this in making my determination. In addition, I note that district staff believe that the current inventory is reliable.

Since only a very small amount of harvesting and silvicultural activity that has occurred on the TSA is not reflected in the inventory, I accept that the present inventory is current enough for the purposes of this AAC determination, and that it represents the best information available at this time.

- *age-class distribution and species profile*

The BCFS analysis reports that 68 percent of the timber harvesting land base is covered by stands at or above the minimum harvestable age, (see *minimum harvestable ages*). There is significant variation around the average proportion currently older than the minimum harvestable age from each of the species groupings: 87 percent of hemlock stands, 89 percent of subalpine Fir stands, 60 percent of cottonwood stands, 27 percent of spruce stands and 14 percent of lodgepole pine stands. There are no aspen and birch stands older than the minimum harvestable age currently included in the timber harvesting landbase.

To maintain a steady flow of timber, the existing natural stands must be allocated for harvest over time until currently younger stands become old enough to harvest. The abundance of older stands provides the potential to harvest above the long-term harvest level in the short term, and the age-class distribution is not considered a limiting factor.

- *volume estimates for existing stands*

In the BCFS analysis, volumes for existing unmanaged stands were estimated using the Variable Density Yield Prediction (VDYP) model. VDYP is based on information gathered from a large number of sample plots and is generally accepted in British Columbia for estimating volumes in existing stands. As mentioned above in *age of the inventory*, the results of the audit for the mature component of the inventory showed that the difference between the mean inventory estimate for mature volumes and the audit estimate was not statistically significant. Therefore, the volume estimates for existing stands are on average accurate for the Cranberry TSA. For this determination, I accept the estimates of existing stand volumes as reported in the BCFS analysis as suitable for use in this determination.

Expected rate of growth

- *site productivity estimates*

Inventory data includes estimates, for each stand, of site productivity expressed in terms of a site index. A site index is based on the height, as a function of the age, of a particular stand of trees. The productivity of a site largely determines how quickly trees will grow, and therefore affects the time seedlings will take to reach green-up conditions, the volumes of timber that will grow, and the age at which stands will satisfy mature forest cover requirements and reach a merchantable size or minimum harvestable age.

Generally, stands between 30 and 150 years of age provide the most accurate measurement of site productivity. Site indices determined from both young stands (less than 30 years old), and older stands (over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density,

the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in other areas of the province where studies suggest that site productivity may be higher than indicated by data from existing mature forests. Currently, about 14 percent of the Cranberry TSA timber harvesting land base is covered by stands between 30 and 150 years old. Therefore a substantial area lies outside the age range that provides accurate estimates.

In the BCFS analysis, base case site productivity estimates were represented by Forest Inventory Planning (FIP) file site index values. However, district staff note that site index studies in the neighbouring Kalum and Kispiox TSAs both conclude that inventory file site index values underestimate productivity of regenerated stands for hemlock, spruce and pine species. Specifically, the Kalum TSA study results show increases in managed hemlock stand site indices of 11.3 metres, while Kispiox TSA results suggest increases in the order of 5 metres for hemlock, spruce and lodgepole pine stands. While no studies have been undertaken in the Cranberry TSA to examine site index estimates, district staff believe that the upward trend identified in these neighbouring TSAs reflects observed productivity in the Cranberry TSA.

I note that the Kalum TSA results are reflective of coastal biogeoclimatic units that do not exist in the Cranberry TSA and therefore the results are not directly applicable to this TSA. However, province-wide results (see *Draft Interim Old Growth Site Index Adjustment Equations and Application Guidelines*) indicate that hemlock site indices have been underestimated in the interior as well. The Kispiox TSA study further strengthens my belief that site productivity is higher in the area of the Cranberry TSA. However, the study does not provide sufficiently strong statistical evidence that I can accept the results as certain evidence of the degree of site index underestimation.

The evidence before me leads me to accept that site productivity of current old-growth sites in the Cranberry TSA is higher than indicated by the inventory. Given that the evidence is not specific to the area, I cannot accept that the specific study results apply directly to this area.

A sensitivity analysis was conducted to examine how timber supply would change if current data underestimated or overestimated actual site indices for all stands by 5 metres. If current data underestimated actual site indices by 5 metres, the harvest forecast shows that it would be possible to increase the harvest level immediately to 137 850 cubic metres per year (an approximate 20 percent increase over the initial base case harvest level), which could be maintained throughout the short, medium and long terms. If site indices are actually 5 metres less than estimated in the base case, the current AAC could still be maintained for 4 decades before declining to a long-term harvest level of 54 000 cubic metres per year. Therefore, uncertainty about site productivity dramatically affects long-term timber supply. If site productivity is higher than currently estimated from the inventory, even the short-term timber supply may be affected.

With respect to the relation between the sensitivity analysis and the site productivity studies, I recognize: (i) the general nature of indications of site index underestimation; (ii) uncertainties about the degree of applicability of results to the Cranberry TSA; and (iii) applicability of site index adjustments to only a portion of forests in the unit (slightly over 50 percent of the forests in the Cranberry TSA are older than 140 years). Given these considerations, an overall 5-metre adjustment appears at this time to be optimistic. Therefore, I accept that the sensitivity analysis indicates the trends in timber supply in the Cranberry TSA associated with higher site index, but I cannot be certain about the specific magnitudes.

In my determination I have allowed for an unquantified upward pressure in the base case harvest level on the long-, medium- and possibly short-term timber supplies, as noted in "Reasons for Decision."

Before the next AAC determination, it is essential that efforts go towards validating an appropriate site index adjustment for the Cranberry TSA, for both single and mixed species stands.

- *volume estimates for regenerated stand volumes*

The BCFS analysis used the Table Interpolation Program for Stand Yields (TIPSY) to estimate volumes for regenerated coniferous stands. This program was developed by the BCFS specifically to model yields from regenerated stands. TIPSY is generally accepted in British Columbia as an appropriate model for these regenerated stands. In the timber supply analysis, the coniferous component of all stands harvested over the last 10 years, some stands harvested between 10 and 20 years ago, and those that will be harvested in the future, are assumed to grow according to managed stand yield estimates from TIPSY. Deciduous components in coniferous stands were modeled using VDYP. To account for the expected loss of timber productivity due to incomplete site occupancy and unproductive areas, e.g. swamps, rock outcrops, an operational adjustment factor (OAF) of 15 percent (OAF1) was applied; for pests, decay, waste and breakage a 5 percent reduction factor (OAF2) was applied.

Standard OAFs were applied to the TIPSY yield estimates as they were considered the best information available. District staff noted that no studies specific to the Cranberry TSA have been undertaken which suggest values different from the standard OAFs should be incorporated.

Sensitivity analysis showed uncertainty about regenerated stand volume estimates has a proportional impact on the long-term harvest level projected in the base case, and affects the medium-term timber supply as harvesting transfers from predominantly older stands to younger, regenerated stands. Uncertainty about regenerated stand yields does not affect the projected short-term timber supply.

I accept that the best information available was used to estimate OAFs, but note that uncertainty still exists regarding the most appropriate OAFs for the Cranberry TSA. In order to address this uncertainty in future determinations, district staff, in consultation with Research Branch staff should work to define area-specific OAFs for the Cranberry TSA. In the interim, considering that uncertainty in regenerated stand yields does not affect short-term timber supply, I accept the volume estimates for regenerated stands as suitable for use in this determination.

- *minimum harvestable ages*

A minimum harvestable age is an estimate of the earliest age at which a stand has grown to a harvestable condition. Changing the minimum harvestable age mainly affects when second growth will be available for harvest and, accordingly, how quickly existing stands may be harvested. In practice, many forest stands will be harvested at much older ages than the minimum, due to constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the BCFS analysis, minimum harvestable ages were established based on a minimum volume per hectare. In addition, minimum harvestable ages were examined to ensure that minimum diameter at breast height (dbh) criteria were met. In the base case, these minimums were as follows: for poor site quality spruce, lodgepole pine, western hemlock, and subalpine Fir stands, volumes must be at least 200 cubic metres per hectare and have a minimum dbh of 17.5 centimetres; for medium and good site quality spruce, western hemlock, and subalpine Fir stands, volumes must be at least 300 cubic metres per hectare; and for medium and good lodgepole pine stands, volumes must be at least 250 cubic metres per hectare. These criteria result in minimum harvestable ages between 65 and 157 years. In addition, for stands dominated by aspen, birch and cottonwood with a conifer component, the minimum harvestable age was assumed to be 80 years.

District staff consider the minimum harvestable ages used in the BCFS analysis reasonable and reflective of estimates of future harvesting practices. In addition, sensitivity analysis shows that increasing or decreasing minimum harvestable age by ten years has no impact on harvest levels. In considering this factor, I am also cognizant that a significant portion of the TSA is comprised of older stands and therefore minimum harvestable ages is not an issue in the short or medium term—the base case shows that for 110 years few stands are harvested at the minimum harvest age. I accept that the minimum harvestable ages assumed in the BCFS analysis are reasonable for use in this determination.

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

Regeneration delay

Regeneration delay is the period between harvesting and the time at which an area becomes occupied by a specified minimum number of acceptable, well-spaced seedlings. The BCFS analysis assumed a regeneration delay of two years for all regenerating stands. This estimate is comparable to current performance in the TSA. The weighted average time taken to regenerate harvested areas in the TSA—between 1990 and 1996—is 1.7 years. In addition, all planted seedlings are at least one year old when they are planted, and approximately 20 percent of all cutblocks require fill planting (a second planting done to make up for mortality after the first planting). On balance, I consider the regeneration delay assumptions used in the BCFS analysis appropriate for use in this determination.

Not-satisfactorily-restocked areas

Not-satisfactorily restocked (NSR) areas are those where timber has been removed through harvesting or natural causes, and where a stand of suitable species and stocking has yet to be established. Areas where the standard regeneration delay has not elapsed are considered "current" NSR. Where a suitable stand has not been regenerated and the site was harvested prior to 1987, the classification is "backlog" NSR.

In the BCFS base case analysis, the total area of NSR on the Cranberry TSA was identified as 1142 hectares, and was assumed to be restocked within 10 years. However, after further consideration of NSR areas within the Cranberry River floodplain area, district staff have reduced the area considered as NSR in the timber harvesting land base to 527.2 hectares, and reduced the time for restocking to 5 years. Specifically, 440 hectares of NSR land were removed from the timber harvesting land base by the removal of riparian areas within the Cranberry River floodplain (see *riparian habitat*). In addition, 185 hectares of area previously considered to be unsatisfactorily restocked are now considered sufficiently stocked as a result of reclassification of minimally stocked land using a specific set of criteria for backlog sites known as the backlog rule or by considering mixed coniferous/deciduous stocking standards for stands in riparian management zones. The remaining 527.2 hectares classified as NSR in the Cranberry TSA is summarized as follows: current NSR—110.5 hectares; backlog NSR—236.1 hectares; NSR treated since 1995 and awaiting free growing status—180.6 hectares.

I accept the district's reanalysis of NSR areas and their conclusion that NSR was overestimated in the base case. I also note that district staff have indicated that 366 hectares of NSR will reach green-up height sooner than assumed in the base case, resulting in a very small upward pressure on timber supply. However, in my view this will be more than offset by the loss of timber harvesting land base attributed to the

Cranberry River floodplain, the impact of which is discussed below under *riparian habitat*.

Therefore, I consider that recent reductions in NSR area, and losses to floodplain activity work to both increase and decrease timber supply, to uncertain degrees. In the absence of more definitive information, I believe they offset one another and have made no adjustment to timber supply for this factor.

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

Silvicultural systems

The dominant silvicultural system practised in the Cranberry TSA is clearcutting, and this is assumed in the BCFS analysis. In-block retention for stand level biodiversity was modeled in the base case as an average of 2.5 percent over the timber harvesting land base. This is discussed below under *stand-level biodiversity.*

Clearcutting and clearcuts with reserves are likely to remain the only silvicultural systems on the TSA in the foreseeable future; no other silvicultural systems are shown on the 1997 to 2001 forest development plan. While non-clearcut systems will likely appear in the future, primarily in riparian management areas, this is not current practice.

With the exception of cutblocks with reserves—as discussed below under *stand-level biodiversity*, where I have considered the impacts of more reserve volumes left on cutblocks, I am satisfied that the assumptions for silvicultural systems are appropriate. I will consider any changes as a result of implementing alternative systems in future determinations.

Incremental silviculture

For the purposes of the timber supply analysis, incremental silviculture is divided into three categories: density management, pruning and fertilization. However, pruning and fertilization were not included in the BCFS base case, which is reflective of current practice—no extensive fertilizing nor pruning has been undertaken on the TSA in the past, and none is planned in the short term. Density management is assumed in the base case for all stands 10 years old and younger and for all future stands by reducing stand density to 1200 to 1600 stems per hectare by age 15. In addition, a proportion of stands between 11 and 20 years old were also assumed in the timber supply analysis to be density controlled.

Current practice on the TSA is that stands which meet free-growing standards without the need for brushing are maintained at conifer densities of up to 5000 stems per hectare without spacing—this may occur on 10 to 20 percent of harvested areas in the future. The remaining 80 to 90 percent of areas are spaced simultaneously with obligatory brushing operations.

I am satisfied that the BCFS analysis modeled incremental silvicultural practices appropriately and did not assume future treatments that may not be undertaken. I recognize that potential opportunities for increased timber supply may be realized in the future through more intensive silviculture treatments. If and when these potential treatments become standard practice, their implications will be reviewed in future AAC determinations.

- *commercial thinning*

The BCFS analysis did not incorporate provisions for commercial thinning, which is reflective of current practice. However, opportunity for commercial thinning may increase in the future as managed stands move into more appropriate age ranges in future decades. For example, district staff noted that some areas with spruce understory 2 to 6 metres high which are dominated by cottonwood overstory of 25 metres tall are candidate stands for cottonwood commercial thinning in the next 10 to 20 years. However, they pointed out that these areas are located adjacent to riparian areas, and it is uncertain if these stands will be harvested in the future. In addition, they noted that few stands harvested between 1977 and 1986 would be commercial thinning candidates because they are characterized by high stocking density and low average stem growth rates.

As no commercial thinning was assumed in the timber supply analysis and this is reflective of current practice, I have made no adjustment to the base case projection for the present determination. If and when commercial thinning becomes standard practice, this will be considered in future AAC determinations.

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

Utilization standards

Utilization standards define the species, dimensions (stump height and minimum diameter) and quality of trees to be harvested and removed from an area during harvesting operations. The normal interior utilization standards were assumed in the BCFS analysis: all conifers in a cutblock with a diameter at breast height of 17.5 centimetres (12.5 centimetres for lodgepole pine) must be harvested, and once felled, all wood up to a top diameter of 10 centimetres must be removed from the site, leaving a stump no higher than 30 centimetres. Deciduous utilization is optional.

Records show that licensee compliance with utilization standards is good. Waste and residue billings made up on average only 0.8 percent of the volume charged to the AAC in 1996. The BCFS analysis assumptions reflect current practice and are appropriate for use in my determination.

Decay, waste and breakage

The Variable Density Yield Prediction (VDYP) model used in estimating volumes in existing unmanaged stands incorporates standard provincial reduction factors to account for decay, waste and breakage. These factors constitute the best available information, and are fairly accurate over large areas, although at the stand level there is a degree of variability. I accept that these factors were modeled appropriately and are therefore suitable for use in this determination.

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

Integrated resource management objectives

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

- *green-up and adjacency*

To manage for resources such as water quality, wildlife habitat and aesthetics, current harvesting practices limit the size and shape of cutblocks and maximum disturbances (areas covered by stands of less than a specified height), and prescribe minimum green-up heights required for regeneration on harvested areas before adjacent areas may be harvested. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

To account for green-up requirements in the BCFS analysis, forest cover constraints were applied to specific management zones as follows: for the fisher management zone, a maximum of 30 percent may be under cover of stands that are less than 3 metres tall, i.e. under 15 years old; for the goshawk management zone (nesting habitat), a maximum of 30 percent may be under cover of stands that are less than 3 metres tall, i.e. under 17 years old; for the grizzly bear management zone, a maximum of 30 percent may be under cover of stands that are less than 3 metres tall, i.e. under 20 years old; for partial retention VQO management zones, a maximum of 4.8 percent may be under cover of stands that are less than 6 metres tall, i.e. under 26 years old; and, for the integrated resource management (IRM) zones, a maximum of 25 percent may be under cover of stands that are less than 3 metres tall, i.e. under 20 years old. The different green-up ages corresponding to the same height are due to differing average site conditions.

Sensitivity analysis was conducted examining the effect of increasing and decreasing the maximum amount of allowable disturbance by 10 percentage points for the wildlife and IRM zones. If the amount of allowable disturbance was decreased by 10 percent, the

timber supply in the medium term would be significantly decreased, with no change in the short-term and only a very slight change in the long-term timber supply. There was no change to the base case timber supply when the amount of allowable disturbance was increased by 10 percent.

Sensitivity analysis was also conducted to examine the impact on timber supply of both increasing and decreasing the green-up ages by 5 years. Decreasing green-up ages by 5 years relative to the base case would result in no change in the short- and medium-term harvest levels and a very small increase in the long-term timber supply. If green-up ages were increased by 5 years, timber supply would be decreased slightly in both the medium and long term relative to the base case, but would be unaffected in the short term.

I note that while there is some uncertainty about the green-up ages and allowable disturbances used in the BCFS base case, the analysis incorporates the best information available. In addition, sensitivity analysis indicates that any risks associated with this factor are low in the short term. Therefore, I consider the BCFS approach to modeling these requirements acceptable and suitable for use in this determination.

- *visually sensitive areas*

Careful management of scenic areas near recreational sites and highways is an important IRM objective and is part of the BCFS mandate to manage the recreation resource. "Recreation resource" is defined in the Forest Practices Code to include a "scenic or wilderness feature or setting that has recreational significance or value." In order to manage such scenic features, visual landscape foresters in British Columbia, 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 (VQO) for these visually sensitive areas. The objectives limit the amount of visible disturbance that is acceptable in these areas.

To meet these objectives, constraints must be placed on timber harvesting, road building and other forest practices in the sensitive areas. The constraints are based on research and experience and on public preferences and acceptance of degrees of alteration of visual landscapes. The constraints are expressed in terms of forest cover requirements that relate to the maximum allowable percentage of a viewshed that can be harvested at any one time, and to visually effective green-up—that is, the stage at which regeneration has been perceived by the public in focus tests to be visually satisfactory.

In the Cranberry TSA, viewscapes along Highway 37 and the Nass Forest Service Road have recommended VQOs and are known scenic areas under the Forest Practices Code. District staff note that although the VQOs for these two areas have not been formally established under the Forest Practices Code, they are operationally managed for VQOs. These known scenic areas were accounted for in the BCFS analysis—332 hectares of productive forest within the Cranberry TSA were excluded from the timber harvesting land base to account for preservation VQOs. Retention and partial retention zones were modeled as partial retention areas since there are only approximately 30 hectares of retention VQOs within the TSA which is insignificant and would not influence the analysis. For the partial retention VQO zone, totaling approximately 2905 hectares in the timber harvesting land base, at any one time, no more than 4.8 percent of the total forested area in the zone may be under 6 metres in height (or 26 years old).

The Nisga'a Tribal Council raised a concern that visual quality values be recognized along Highway 37 and the Nass Forest Service Road. As noted above, these two areas are being operationally managed for visual quality objectives, and this was accounted for in the BCFS analysis.

District staff note that the Derrick and Bonus Lakes recreation sites are known scenic areas under the Forest Practices Code, but were not included in the BCFS analysis**.** However, they indicated that these areas are relatively small (maximum of 200 hectares) and will have a minimal impact on timber supply (these areas would have been modeled as partial retention VQOs).

Sensitivity analysis was conducted examining the effects of moving areas from a more restrictive to a less restrictive class and vice versa—specifically, changing requirements for partial retention VQO areas to retention VQO levels, and from partial retention VQO areas to IRM zone levels. Results show that timber supply is sensitive to VQO classification—whether less or more restrictive—in the mid to long term. If more rigorous constraints were applied, the projected initial harvest level could be maintained for 7 decades, not 9 decades as shown in the base case. Similarly, if less rigorous constraints were applied, the projected initial harvest level could be maintained for 10 decades, not 9 decades, as shown in the base case.

In order to help meet the social and economic objectives of the Crown as expressed by the Minister of Forests in his memorandum of February 26, 1996, regarding VQOs (attached as Appendix 4), the BCFS will soon be releasing a policy aimed at giving practitioners guidance in achieving VQOs in a manner that is less constraining to the province's timber supply—ranging from using better landscape design techniques, to considering the potential benefits of fertilization in reducing green-up ages. District staff indicated that they are working with licensees to implement different landscape design techniques, and if this strategy proves unsuccessful, staff would then work towards formally establishing VQOs under the Forest Practices Code.

It appears that the district has a reasonable management strategy in place for known scenic areas and is working towards meeting the minister's social and economic objectives regarding VQOs. At the present time it is not possible to predict the nature of any future changes that may result from the meeting of VQOs in the TSA with less, rather than more, restriction on the timber supply than was modeled in the base case. However, considering that there is not an overly large amount of area (approximately 2905 hectares) within retention or partial retention VQO zones, and considering that the timber supply analysis showed little short-term sensitivity to changes in VQO requirements, there is relatively little timber supply to be gained from managing VQOs in a less restrictive manner. Therefore, in this determination I have accepted VQOs as modeled. I would also encourage the district to complete the mapping for the Derrick and Bonus Lakes scenic areas in order to ensure these are included as visually sensitive areas in future timber supply analyses.

- *wildlife habitat*

The biodiversity and riparian provisions of the Forest Practices Code are intended to provide for the needs of most wildlife species. However, some wildlife species "at risk" require special management practices. The Identified Wildlife Management Strategy, which has recently undergone public review**,** will provide direction for managing critical habitat for identified wildlife species (usually red- or blue-listed) when implemented. This strategy includes two Guidebooks: "Species and Plant Community Accounts for Identified Wildlife"; and "Procedures for Establishing Wildlife Habitat Areas". Also included is the document entitled "General Wildlife Measures for Identified Wildlife" which will outline the requirements for practices within wildlife habitat areas. Seven species associated with forest habitat on the Identified Wildlife Candidate lists (volumes one and two) are present in the Cranberry TSA (grizzly bear, fisher, northern goshawk, mountain goat, trumpeter swan, bull trout and tailed frog).

Wildlife objectives for the Cranberry TSA, as identified by MELP staff, are to maintain sufficient habitat for species identified 'at risk' in the Identified Wildlife Management Strategy such as the grizzly bear, fisher and northern goshawk, and also to maintain sufficient habitat for other identified wildlife species on the TSA, including the trumpeter swan, mountain goat, bull trout and tailed frog.

Approximately 1194 hectares of highly sensitive (Ew1) wildlife areas are located in the Cranberry TSA. In the base case, 75 percent of Ew1 areas were deemed unavailable for timber harvesting.

The impact of managing grizzly bear, fisher and northern goshawk was assessed by modeling forest cover requirements for these species. MELP staff indicated that these three species were specifically identified as they are most affected by the amount of older forests remaining on the landscape. For these species, forest cover requirements were established to ensure a minimum amount of older forests is maintained and to limit the amount of young forest in areas with the highest habitat value.

For the fisher zone, which comprises 7761 hectares, or 23.6 percent of the timber harvesting land base, at least 15 percent of the area currently occupied by deciduous species must be maintained in stands that are 100 years or older. In addition, at least 10 percent of the area with coniferous stands in this zone must be maintained at 140 years or older, and no more than 30 percent of the forest in the fisher zone can be less than 3 metres in height, i.e. 15 years old.

For the grizzly bear foraging zone, which comprises 2785 hectares, or 8.5 percent of the timber harvesting land base, at least 10 percent of the area must be maintained in stands that are 100 years or older, and a maximum of 30 percent of the area can be less than 3 metres in height, i.e. 20 years old.

For the northern goshawk nesting zone, which comprises 12 724 hectares, or 38.8 percent of the timber harvesting land base, at least 4 percent of the stands must be maintained in stands that are older than 140 years, and a maximum of 30 percent of the forest in the zone can be less than 3 metres in height, i.e. 17 years old. Since the timber supply analysis was conducted, MELP staff have refined the northern goshawk nesting zone to better reflect northern goshawk habitat capability. As a result, the size of the goshawk management zone has been underestimated in the base case. Thus, MELP staff assert that some areas modeled as IRM zone in the analysis should have been modeled with goshawk habitat forest cover requirements. However, information provided to me after the completion of the analysis indicates that if goshawk management zone is increased, timber supply is unaffected, given the management regime represented in the analysis.

Sensitivity analysis was conducted examining the implications to timber supply if the requirements for old forest in the wildlife management zones (grizzly bear, fisher and northern goshawk) are either removed or increased by 20 percentage points. Results indicate that uncertainty in older forest requirements does not have an impact on short-term timber supply, and only impact medium- and long-term timber supply if they are made significantly more stringent than in the base case.

I note that these management zones were established for use in the timber supply analysis by the MELP Forest Ecosystem Specialist (FES) located in the Kispiox Forest District, and that there are no clear definitive management objectives formally established for these zones—the FES undertook to approximate, to the best of his ability, management zones within the TSA with a goal to provide habitat requirements for the fisher, grizzly bear and northern goshawk. Sensitivity analysis indicates that the timber supply has flexibility to absorb these constraints in the short and medium term. I recognize that until government finalizes the Identified Wildlife Management Strategy, and designated authorities define wildlife habitat areas and associated management regimes under the Forest Practices Code, that there is uncertainty about the impacts of identified wildlife management.

For the purposes of my determination, I accept that there are uncertainties regarding the total area that will eventually be required to manage wildlife habitat for the Cranberry TSA, and that at this time it is impossible to quantify the extent of the total area that may be required. However, considering the extensive methodology undertaken to assess the implications of managing wildlife habitat on the TSA—netdowns for Ews and wildlife habitat management zones—and considering that landscape level biodiversity is accounted for and that netdowns for riparian/floodplain areas will also provide wildlife habitat area, I am satisfied that potential timber supply impacts associated with this factor can be accommodated for the duration of the effective period of this AAC within the initial harvest level projected in the base case analysis and without introducing unacceptable levels of risk to the management of important wildlife habitat.

In making my decision, I am also mindful that government has made a commitment to limit the impacts of managing identified wildlife species to one percent of the provincial timber supply. As the province clarifies its strategy for the management of regionally significant and threatened and endangered species, I expect the implications to be refined and reflected in future timber supply analyses for the Cranberry TSA and these will be taken into account in future AAC determinations.

- *riparian habitat*

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian management reserves that exclude timber harvesting, and riparian management zones that restrict timber harvesting in order to protect riparian and aquatic habitats. To account for protection of riparian and stream values within the Cranberry TSA, 4561 hectares were excluded from the timber harvesting land base.

The riparian analysis was conducted by both BCFS and MELP staff using TRIM water coverage (1:20 000 scale mapping) with GIS database information. Streams identified as S1 included the Cranberry, Kiteen and Nass Rivers and some larger tributaries. S1 streams had a 50-metre reserve zone and a 20-metre management zone applied in the analysis. S2 and S3 streams were identified and assigned both 20-metre wide reserve zones and management zones. However, the *Riparian Management Area Guidebook* recommends a 30-metre reserve for S2 streams. District staff noted that due to the difficulty in distinguishing some of the S4 streams from S2 and S3 streams, it is possible that some S4 streams were classified for the timber supply analysis as S3 streams. Since S4 streams do not require a reserve zone, and since some of the S4 streams were classified as S3 streams, the normal S2 reserve zone buffer of 30 metres was decreased to 20 metres for the purposes of the timber supply analysis. Smaller S5 and S6 streams did not have specific prescriptions applied in the timber supply analysis. All lakes and wetlands over 5 hectares were identified and a 10-metre reserve zone, and a 40-metre management zone width assumed.

The *Riparian Management Area Guidebook* recommends maximum overall levels of basal area retention within riparian management zones for each class of stream, wetland

and lake. These are 50 percent for S1 to S3 streams, 25 percent for S4 and S5 streams, 5 percent for S6 streams, and 25 percent for lakes and wetlands. However, for the purposes of the timber supply analysis, it was assumed that on average, one-half of this maximum value would be retained across the land base in riparian management zones. An exception to this was S4 to S6 streams, as these classes of streams—except a few S4 streams that may have been misclassified as S3 streams—were not included in the timber supply analysis. District staff indicate that this approximates current management practices on the TSA. Therefore, to approximate the timber supply implications of this level of retention, 25 percent of the area in riparian management zones of S1 to S3 streams and 12.5 percent of the lakes and wetlands management zone was considered unavailable for timber harvesting. This resulted in 856 hectares being removed from the timber harvesting land base. In addition, I note that further land base should have been removed to account for S4 to S6 streams. However, as these areas are presently unmapped it is unknown how much area is being managed for riparian habitat around these streams.

The Nisga'a Tribal Council expressed concern regarding the ability of licensees to obtain Special Use Permits near riparian areas. They are concerned that licensees operating in and around riparian areas could impact stream/river habitat and possibly also cause fisheries damage. These concerns can be addressed by the district manager in the application of the operational planning regulations.

BCFS District and MELP staff noted that field verification of floodplain mapping for the Cranberry River showed that the riparian reserve zone has been underestimated. In addition, district staff noted that according to the *Riparian Management Area Guidebook*, the entire active floodplain area should be either reserved from timber harvesting or that heavy constraints be applied to any harvesting that does occur. An extension of the reserve would result in an additional 644 hectares being removed from the timber harvesting land base.

Subsequent to the AAC determination meeting on February 11, 1998, I have confirmed that the Cranberry River floodplain meets the criteria of an "active floodplain" under the Forest Practices Code—the entire floodplain is subject to flooding on at least a 5-year interval and the stream channel is very unstable. High water tables, frequent ponding and a complex network of sidechannel and backchannels create a very sensitive landscape for harvesting and a challenge for silviculture. In the *Riparian Management Area Guidebook*, the recommended prescription for an active floodplain area is to reserve the entire floodplain area, and definitely that no more than a 30 percent basal area removal using selection methods should occur. Further, roads are highly discouraged on these sites, so helicopter harvesting or complete deactivation of temporary roads is required.

Considering that silvicultural problems have been identified on the floodplain area (see *not satisfactorily-restocked areas*), and also that this floodplain area is a unique ecological area within the Cranberry TSA that has been heavily modified from past harvesting practices, I support the district manager's decision to remove the entire Cranberry River floodplain area from the timber harvesting land base.

The Nisga'a Tribal Council expressed concerns about previous logging in riparian ecosystems (including the Cranberry River floodplain area) and believe that these areas should be 'restored'. District staff state that areas which do not receive annual flooding or beaver dam activity have been regenerated with species mixtures that historically were located on these riparian areas. The areas with annual flooding and beaver dam activity are not considered suitable for restoration due to the environmental issues regarding fisheries and water quality. In addition, the Nisga'a Tribal Council noted that the Cranberry River floodplain is prime moose habitat. As mentioned above, I am assuming the entire Cranberry River floodplain area does not contribute to timber supply; this exclusion should address moose habitat requirements in this area.

The land base impacts of the additional floodplain area (644 hectares) represent a reduction to the timber harvesting land base of approximately 2 percent. In addition, management zones for S4 to S6 streams were not included in the timber supply analysis, resulting in a further downward pressure to timber supply. While no sensitivity analysis was provided specifically for riparian management, the sensitivity analysis examining uncertainty in the land base available for harvesting does apply. If the timber harvesting land base were in fact 5 percent smaller than in the base case, the current harvest level could be maintained for the next 70 years. Harvest levels would have to decline to a long-term harvest level of 82 700 cubic metres, approximately 5 percent lower than the base case long-term harvest level.

In conclusion, I accept that riparian management areas for S1 to S3 streams were accounted for appropriately in the timber supply analysis. However, the reduction for riparian management should have been slightly larger because riparian management zones for S4 to S6 streams have not been accounted for in the timber supply analysis. Further, the riparian reserve zone should include the entire active floodplain area for the Cranberry River. These factors would indicate an underestimation of the area that should be retained in riparian management areas in the TSA. The land base impacts of the additional floodplain area represents 2 percent of the timber harvesting land base. Therefore, in my determination, as discussed in "Reasons for decision", I have allowed for a downward pressure on timber supply of at least 2 percent in the mid and long term.

Given the high ecological values associated with the Cranberry River floodplain area—now and in the past—I expect district staff to re-examine and clarify management objectives for this area.

- *botanical forest products*

Some botanical forest products such as berries and medicinal plants within the TSA are gathered by local residents and First Nations. In addition, the commercial gathering of mushrooms in the Cranberry TSA has become a significant activity and source of income to the area over the past 10 to 15 years. The main crop harvested is the pine mushroom. Picking of pine mushrooms has become an important source of income for many First Nations, local residents and, increasingly, for non-local pickers (harvesters have come from as far away as Ontario and the United States). Other mushrooms harvested include morels, brain mushrooms and boletus.

The Nisga'a Tribal Council expressed concern regarding the need to seek resolutions to conflicts between the harvesting of timber and growing of pine mushrooms, and also the conflicts over the distribution of economic benefits arising from the harvesting of pine mushrooms. They specified that they were looking for cooperation between all stakeholders to resolve outstanding issues, including regulations governing the harvesting of pine mushrooms, ways to promote further research on pine mushroom growing and the effects of harvesting of timber on mushrooms. In addition, the Nisga'a Tribal Council would like to see objectives clarified with regard to managing for botanical forest products, particularly pine mushrooms. At the same time, they noted the importance to the Nisga'a of ensuring that they are able to continue harvesting pine mushrooms in the Cranberry TSA.

Management of botanical forest products was not explicitly accounted for in the BCFS base case analysis. However, for pine mushrooms, two sensitivity analyses were conducted examining the timber supply implications of limiting the amount of harvesting in stands that are prime pine mushroom producing areas. These stands include all hemlock and pine-dominated stands with a poor timber growing potential within the Interior Cedar-Hemlock moist-cool biogeoclimatic subzone. Results from the first sensitivity analysis indicate that if harvesting was limited or prohibited in stands that meet these criteria until after they reach 150 years of age (the age at which it is assumed the production of pine mushrooms decreases or stops), the short- and medium-term timber supply is unaffected compared to the base case. The long-term harvest level would be decreased slightly (0.3 percent) to 86 750 cubic metres per year. Delaying the availability of these stands for harvesting does not have a significant impact on timber supply in this case because the stands are still available for harvesting in the long-term.

The second sensitivity analysis examined the implications if all existing stands that are prime pine mushroom producers are permanently excluded from timber harvesting. These stands cover approximately 3400 hectares of timber harvesting land base in the base case. Results indicate that the initial harvest level projected in the base case can still be maintained for 6 decades before declining to the long-term harvest level, which would be reduced by about 5 percent compared to the base case.

In considering these sensitivity analyses, I am mindful that district staff are not totally confident that the factors used in the sensitivity analyses are accurate reflections of the actual pine mushroom high production areas, but at present, the criteria and analysis reflect the best information available.

The commercial gathering of mushrooms in the neighboring Kispiox TSA is also a significant activity and source of income for the area. The Kispiox Land and Resource Management Plan (LRMP), while acknowledging the existence of pine mushrooms as a resource and expressing sustainable harvesting as an objective, does not suggest strategies any more specific than that harvesting should be monitored, and that the mushroom resource should be considered at landscape and operational planning levels.

I expect that when landscape unit planning is undertaken, it will have the capacity to consider this resource, and I encourage district staff to use this planning approach as an opportunity to minimize conflicts and ensure the mushroom resource is recognized and integrated into plans at an appropriate level. I am mindful that right now, primarily because of an abundance of old-growth on the TSA, both mushrooms and timber can be managed with minimal conflict. I am also mindful of the sensitivity analyses indicating that if harvesting were limited or prohibited in stands which are expected to be the most prolific producers of mushrooms, the short-term timber supply is unaffected. If more information is available in time for the next AAC determination, I will take it into account at that time. Before the next determination, I am asking district staff to prepare a strategy and clarify management objectives for pine mushrooms. In the meantime, I am satisfied that objectives for this resource can be accommodated within the established harvest level.

- *cultural heritage*

Cultural heritage values include archaeological values that pre-date European influence and more recent historic values. Cultural heritage resources are defined in the *Forest Act* and include archaeological sites, traditional use sites and culturally modified trees (CMTs). Archaeological sites and CMTs that predate 1846 are protected under the *Heritage Conservation Act.* The nature and extent of the protection of archaeological sites is detailed under this legislation.

The Kispiox Forest District has a District Manager Policy in place to determine when an Archaeological Impact Assessment is required. District staff indicate that some archaeological sites have been identified in the Cranberry TSA, and of these, most are within riparian management zones—in particular, within management reserve zones and management zones of the Cranberry River. In addition, I am also aware that some First Nations are undertaking detailed Traditional Use Studies (TUSs) within their traditional territories. However, no specific accounting for these areas was included in the BCFS timber supply analysis.

The BCFS analysis removed 620 hectares from the timber harvesting land base for that portion (36 kilometers) of the “grease trail” that runs through the Cranberry TSA.

District staff noted that they removed this trail as it is a well known heritage trail and because the license holder has removed 100 percent of the length and width of this trail from their forest development plan. However, I am advised by staff of the Archaeology Branch, Ministry of Small Business, Tourism and Culture, that the grease trail is not a designated heritage trail, nor is designation currently being considered under the *Heritage Conservation Act*; however, it certainly could be considered a candidate for future designated status.

I am mindful that the BCFS and major licensee recognize the historical importance of the grease trail—in particular, this reflects the major licensee's current practice, where they have indicated in their management plan that they will not be harvesting timber within the grease trail area (100-metre buffer on each side of the trail, for a total buffer of 200 metres). While I believe it is appropriate to have a buffer to manage this grease trail, a 200-metre buffer, and the consequential removal of 620 hectares from the timber harvesting land base is a significant amount of area to be excluded from contributing to timber supply. Considering that this grease trail is not a designated heritage trail, there is nothing that validates to me that the grease trail (620 hectares) should be excluded entirely from contributing to timber supply. I am also mindful that it may well be that partial cut or crown thinning activities would enhance certain aspects or viewscapes along this historic grease trail. Therefore, at the present time, and until management objectives for the grease trail are defined, it is not clear how much of this grease trail should be excluded from contributing to timber supply, and what the resultant timber supply impacts would be. Therefore, I do not believe it is appropriate to remove the entire 620 hectares for the grease trail.

Since the timber supply analysis made no accounting at all for cultural heritage sites, (reflecting a possible overestimation of timber supply in the base case), and considering that 620 hectares were removed from the timber harvesting land base for the grease trail, (reflecting a possible underestimation of timber supply in the base case), I have determined that these factors work to both increase and decrease timber supply to uncertain degrees and that I will take this factor into account in a very general way, in association with other factors, as discussed in "Reasons for Decision."

As noted above in "Guiding Principles...", I fully expect that areas of cultural or archaeological significance and traditional uses will be considered by the district manager in his administration of the AAC determined for the Cranberry TSA. This is reflected in the District Manager Policy for the Kispiox Forest District office. As inventories are completed, and when the management objectives for the grease trail are refined i.e. when it is determined if the grease trail will become a designated heritage trail under the *Heritage Conservation Act*, a better accounting of land base impacts will be available for consideration in future AAC determinations.

- *recreation areas*

In the BCFS analysis, 50 percent of all recreation areas identified in the recreation inventory as having a high importance to the Kispiox Forest District recreation program (B1 areas) were excluded from the timber harvesting land base—a total of 380 hectares. I am satisfied that the assumptions for recreation areas are reflect current practice, and have made no further adjustments regarding this factor in this determination.

- *biodiversity*

Biological diversity, or biodiversity, is defined as the full range of living organisms, in all their forms and levels of organization, and includes the diversity of genes, species and ecosystems, and the evolutionary and functional processes that link them. Under the Forest Practices Code, biodiversity in a given management unit is assessed and managed at the stand and landscape levels.

- *stand-level biodiversity*

Stand-level biodiversity is managed by retaining reserves of mature timber or wildlife tree patches within cutblocks to provide structural diversity and wildlife habitat. Kispiox Forest District staff indicate that in all management zones within the TSA, wildlife tree patches larger than 2 hectares in size will be retained in an undeveloped state within a cutblock boundary. There was no specific information available for the Cranberry TSA to approximate the amount of area affected by wildlife tree patches. However, from sampling of wildlife tree patches conducted within the neighboring Kispiox TSA, district staff estimated that wildlife tree patches reduced available volume by 2.5 percent. For the Cranberry TSA analysis, wildlife tree patches were represented by a 2.5 percent reduction to the timber harvesting land base. Therefore, 799 hectares were removed from the productive forest to account for stand level biodiversity.

However, further research conducted by district staff after the completion of the timber supply analysis indicates that a 2.5 percent reduction is insufficient to meet stand level biodiversity objectives as recommended in the *Biodiversity Guidebook*. District staff examined the major licensee's 1997 to 2001 development plan and assessed cutblocks in which wildlife tree patches are to be left. This study showed that approximately 11 percent of the cutblock area is left for wildlife tree patch purposes. A separate analysis for the adjacent Kispiox TSA showed that about 10 percent of the cutblock area is left for wildlife tree patches. However, since only one half of all cutblocks are estimated to have wildlife tree patches, this finding equates to about a 5 percent reduction over all harvest units. Given the similarity in forest conditions, I am of the opinion that it is reasonable to extrapolate results from the Kispiox TSA to the Cranberry TSA. Therefore, I note that wildlife tree patch requirements for the Cranberry TSA could have been underestimated by 2.5 percentage points**.**

In reviewing the recent examination of current practice on the Kispiox TSA, and extrapolating these results to the Cranberry TSA, I accept that there are additional

downward pressures on timber supply beyond those assumed in the base case, representing 2.5 percent of the timber harvesting land base. I have accounted for this factor as discussed below, under "Reasons for Decision."

- *landscape-level biodiversity*

Landscape-level biodiversity objectives involve maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures across a variety of ecosystems and landscapes. The *Biodiversity Guidebook* is based in part on the principle that this, together with connectivity of ecosystems and the maintenance of forested areas of sufficient size to maintain forest interior habitat conditions, will provide for the habitat needs of most forest and range organisms.

A major consideration in managing for biodiversity at the landscape level is leaving sufficient and appropriately located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests. Although some general forest and range management practices can broadly accommodate the needs of most ecosystems, more often a variety of practices is needed to represent the different natural disturbance patterns under which ecosystems have evolved. Natural disturbance patterns vary from frequent wildfires in the dry interior regions to rare events in the wetter coastal regions.

The delineation and formal designation of "landscape units" is a key component of a subregional biodiversity management strategy. Any of a range of biodiversity emphasis options may be employed when establishing biodiversity management objectives for a landscape unit. The *Biodiversity Guidebook* outlines three biodiversity emphasis options—lower, intermediate and higher. When a reasonable distribution of options is maintained across the land base, it is generally considered that biodiversity can be maintained in conjunction with timber harvesting objectives.

For areas where landscape units have not yet been formally established, or an emphasis option has not been assigned for a landscape unit, in accordance with the *Biodiversity Guidebook* the lower biodiversity emphasis option is used as a default to guide operations. In addition, government policy direction that is intended to balance social and economic impacts against risk to biodiversity stipulates that within a sub-regional planning unit approximately 45 percent of the area should fall within the lower, approximately 45 percent within intermediate, and approximately 10 percent within the higher biodiversity emphasis options.

The forest cover requirements used in the analysis were determined in accordance with the above government policy that within a subregional planning unit, approximately 45 percent of the area should fall within the lower- and intermediate- and 10 percent within higher-biodiversity emphasis options. In addition, only old-growth requirements were modeled in the base case—early and mature seral requirements were not applied. Old-forest requirements for lower-emphasis landscape level biodiversity were designed to be met within 3 rotations of 70 years each, with 33 percent of the requirements met over the first 70 years, 66 percent of the requirements met from 71 to 140 years from the

present, and the entire old-growth requirements met after 141 years. The resulting forest cover requirements were applied to each biogeoclimatic zone variant in the TSA.

Sensitivity analysis was conducted to examine the inclusion of mature seral requirements. In the assumptions used in the base case, there are no requirements for a portion of the land base to be maintained in stands with mature-seral stage conditions. If mature-seral requirements were applied to each natural disturbance type in the TSA, (as outlined in Tables 3 and 7 of the *Biodiversity Guidebook*), with the assumption of 45 percent lower- and intermediate-biodiversity emphasis, and 10 percent higher-biodiversity emphasis, the harvest forecast would be the same as the base case. This is because there are currently enough mature forested stands outside the timber harvesting land base to meet the majority of the mature-seral requirements for landscape biodiversity, and the abundance of existing older stands in the timber harvesting land base in the short and medium term provides the remainder of mature stands to meet the requirement.

In addition, sensitivity analysis was conducted in which the lower-emphasis portion of old-seral requirements outlined in the *Biodiversity Guidebook* were applied in full at the beginning of the planning horizon, rather than increased over 140 years to the full amount, as modeled in the base case. Mature-seral stage requirements were also applied. Results indicate that the harvest forecast would be the same as in the base case. In other words, mature- and old-seral requirements are not particularly limiting to timber supply.

A final sensitivity analysis was conducted in which the entire TSA was assumed to have a high biodiversity emphasis. In this case, the older forest requirements were made more stringent than in the base case. Again, results indicated that the harvest forecast would be the same as in the base case. In summary, the timber supply of the Cranberry TSA is not sensitive to the more stringent landscape-level biodiversity requirements examined in the timber supply sensitivity analyses.

Public concern was raised regarding the location of the Cranberry TSA, an ecological transition zone, whereby coastal forests meet interior forests. Special concern was noted that the TSA is located in a unique ecosystem type requiring special considerations to maintain all values. I have been mindful of this concern when making my determination.

I am satisfied that landscape-level biodiversity has been modeled in consideration of provincial objectives regarding the achievement of acceptable biodiversity timber impacts. In addition, I am mindful that since completing of the information package, draft landscape units have been defined for the Cranberry TSA. According to the draft maps, the Cranberry TSA comprises parts of 5 different landscape units—Lower Kiteen, Cranberry River, Nass River-Kalum, Upper Cranberry and Brown Bear. However, I note that the Cranberry River landscape unit covers approximately 80 percent of the Cranberry TSA and thus the timber supply will not likely be significantly changed. In addition, since the timber supply analysis was initiated, draft biodiversity emphasis options have been prepared for the Cranberry TSA. The entire TSA is anticipated to have an intermediate-biodiversity emphasis. Since sensitivity analysis indicated that timber

supply was not sensitive to increasing requirements to a higher emphasis level, I believe that intermediate biodiversity emphasis can also be accommodated within the base case timber supply forecast. In consideration of all of the foregoing, I accept the landscape level biodiversity assumptions as modeled.

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

First Nations

Two First Nations assert traditional territorial rights within the Cranberry TSA: The Nisga'a First Nation and Gitanyow First Nation. Both have asserted claims to traditional territories during treaty negotiations. According to the records of Indian and Northern Affairs Canada, the on-reserve native population as of December 31, 1991, numbered 3401, or approximately 53 percent of the total population in the larger Hazelton-Kitwanga area. I am aware that additional First Nations people are living off-reserve, but no population estimates are available at this time.

I have carefully considered each factor and any First Nations implications thoroughly in my determination. Where possible, I have attempted in this rationale to respond briefly to the views expressed by First Nations, and consideration of this input has been an important component of this determination.

Partitioned harvest

The Nisga'a Tribal Council requested consideration regarding the possible implementation of a partition for hardwoods in the Cranberry TSA. I note that deciduous species comprise a significant portion of timber supply in the Cranberry River floodplain area. However, as noted in *riparian habitat*, I am not considering the Cranberry River floodplain area to contribute to timber supply. For the remainder of the Cranberry TSA, there is not a significant enough component of deciduous species to warrant a partition. Again, as noted in *riparian habitat*, I have asked that the management objectives for the Cranberry River floodplain area be re-examined and clarified by district staff. This review should examine issues surrounding deciduous species in the floodplain area.

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

Alternative harvest flows

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

In addition to the base case, the BCFS analysis shows five alternative harvest projections for the Cranberry TSA. The first alternative demonstrates that if a more gradual transition of 2 percent per decade is used to reach the long-term harvest level, the current harvest level can still be maintained for 4 decades. Under this harvest flow pattern, about 1 percent less volume could be harvested over the first 160 years compared to the base case.

The second alternative harvest flow shows a harvest forecast in which a constant flow harvest level of 89 500 cubic metres per year is maintained throughout the planning horizon. Over the 250-year planning horizon, approximately 7 percent less volume would be harvested under this flow pattern than in the base case. Eventually, the harvest level in this forecast would have to decline to the same long-term harvest level as in the base case.

The third alternative harvest flow illustrates the effects of maintaining the current AAC for as long as possible without going below the long-term harvest level. In this case, the current harvest level could be maintained for 10 decades if followed by a 21 percent drop in decade 11 to the long-term harvest level. This harvest forecast would provide only 0.2 percent more timber volume over the first 110 years of the planning horizon than the base case. Therefore, managing for a more gradual transition to the long-term harvest level does not significantly decrease the amount of timber that can be harvested.

The fourth alternative harvest flow depicts an initial harvest level of 115 000 cubic metres per year, 5000 cubic metres higher than the current AAC. This illustrates that harvest levels can be maintained for 7 decades before declining—at approximately 8 percent per decade—to the long term level. This harvest forecast provides only slightly (about 0.2 percent) more timber volume over the first 120 years compared to the base case

because even though a higher initial harvest level is used in this alternative, the harvest level must begin declining to the long-term harvest level 2 decades earlier than in the base case.

The final alternative harvest flow illustrates an initial harvest level of 170 000 cubic metres per year. This shows that the initial harvest level can be increased to as much as 170 000 cubic metres per year without causing severe future disruptions in timber supply, as long as harvest levels begin to decline to the long-term harvest level immediately after the first decade, at a rate of about 10 percent per decade. Under this flow alternative, total volume harvested over the first 120 years would be 4 percent higher than in the base case. This alternative illustrates that if existing stands are harvested more rapidly in the short term and replaced with regenerating stands that produce timber volume at a higher rate than in natural stands, the total harvest over the planning horizon can be higher than in the base case. However, a more immediate and rapid decline to the long-term harvest level is required to maintain long-term timber supply stability.

Overall, I note that the harvest forecasts indicate a flexible timber supply, permitting a number of alternative harvest flows that incorporate several potentially acceptable options for initial harvest rates and subsequent rates of decline. I have been mindful of this flexibility in making my determination.

Community dependence of the forest industry

About 39 percent of the basic sector income (direct and indirect supply and service industries) results from forestry-related activities in the TSA. Recent harvesting has been lower than the current AAC. In 1996, harvesting, processing and silvicultural activities generated an estimated 58 person years of employment within the Hazelton area and 78 person years of employment provincially. Based on 100 percent utilization of the AAC, it is estimated that the base case scenario could support between 92 and 126 person-years of direct employment in the region for the next 90 years. This translates into a net increase of 34 to 68 direct person-years.

As mentioned above under *botanical forest products*, the commercial harvesting of mushrooms (primarily pine mushrooms) within the Cranberry TSA has become a significant source of income for many local residents, and increasingly, for non-local pickers. In 1994, harvesting of pine mushrooms in the Nass Valley area, including the Cranberry TSA, generated an estimated $3.4 million. The harvest provided approximately 30 500 person-days (120 person years) of employment during the year, mostly during the months of September and October. However, according to a study by Meyer Resources Inc. (published in February 1995) entitled, *A Preliminary Analysis of the Economic Importance of the 1994 Pine Mushroom Industry of the Nass Valley Area*, only approximately 5 percent (or $170 000 and 6 person years of employment) of this total can be attributed to the Cranberry TSA.

Difference between AAC and actual harvest

The AAC has been set at its current level of 110 000 cubic metres per year since 1990. There is one major license in the Cranberry TSA—forest licence A48704 held by C GED Forest Products Ltd. for 100 000 cubic metres per year. In addition, there is an active Small Business Forest Enterprise Program (SBFEP)—10 000 cubic metres per year.

The Nisga'a Tribal Council raised a concern regarding the undercut in the Cranberry TSA. The cut control period for forest licence A48704 is 1996 to 2000. While there was an undercut in 1996 and 1997, the licensee is building Standing Timber Inventory and will be able to utilize these planned volumes to rebalance their harvest level in the remaining three years (1998 to 2000) of the cut control period. The SBFEP plans to sell 10 000 cubic metres per year in the Cranberry TSA. Therefore, it is possible and indeed planned that the periodic cut control will be met by both C GED Forest Products Ltd. and the SBFEP and no undercut is anticipated at this point.

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

Timber processing facilities

In 1996 only about 3 percent of all timber processed in the Hazelton area came from the Cranberry TSA. Lumber mills are located in or near Kitwanga (C GED Forest Products Ltd., Kitwanga Lumber Company) and New Hazelton (Kispiox Forest Products, Skeena Cellulose Inc.). The Skeena Cellulose Inc. chip mill is also located in New Hazelton. Two small speciality mills are located in the area—one at Kispiox and the other just east of Hazelton (Seaton Timber). With the exception of C GED Forest Products Ltd., most of the mills' timber requirements are met by the harvesting activities from the adjoining Nass, Kalum and Kispiox TSAs.

The Cranberry TSA is currently the main source of fibre for the C GED Forest Products Ltd. sawmill in Kitwanga. However, this mill has been shut down since mid-December, 1996. Prior to this, it was operating at less than half capacity, on a one-shift-per-day cycle. The mill is currently not able to fully utilize the timber profile—50 percent split between sawlogs and pulplogs. The mill can only process logs up to 16 inches in diameter so it is not able to utilize the larger sawlogs or the pulp logs. C GED Forest Products Ltd. has a planermill and is seeking agreements with other local mills to purchase fibre from them and provide them with custom planing work—however, no arrangements have been finalized. Woodchips from the C GED Forest Products Ltd. mill are trucked to the Eurocan pulp facility in Kitimat.

There is also a significant imbalance between milling capacity and suitable fibre supply in the form of sawlogs in the Kispiox Forest District. Hence, C GED Forest Products Ltd. is making efforts to reconfigure their sawmill to move toward remanufacturing and away from primary sawmilling. In addition, C GED Forest Products Ltd. has plans to upgrade their facilities to allow it to better utilize the profile, particularly the pulplog component by putting in a whole log chipper.

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

Minister's letters and memorandum

The Minister has expressed the economic and social objectives of the Crown in two documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996, (attached as Appendix 4). This letter and memorandum are consistent with the objectives stated in the Forest Renewal Plan and include forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

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

I have reviewed the opportunities for commercial thinning, and, as discussed under *commercial thinning*, the BCFS analysis did not incorporate provisions for commercial thinning, reflecting a current lack of practice. District staff note that opportunity for commercial thinning may increase in the future as managed stands move into more appropriate age ranges in future decades. However, at present there is limited opportunity and no performance or strategy in place to undertake commercial thinning activities. Therefore, I do not consider commercial thinning to affect timber supply for this determination.

With respect to harvesting in previously uneconomic areas, there are potential for some helicopter harvesting opportunities. If this type of harvesting does occur over the next five years and expands the timber harvesting land base, I will consider this in the next AAC determination.

The Minister's memorandum addressed the effects of visual resource management on timber supply. It asked that pre-Code constraints applied to timber supply in order to meet VQOs be re-examined when determining AACs in order to ensure they do not unreasonably restrict timber supply. I have discussed this above under "*Visually sensitive areas*," where I noted that there is relatively little timber supply to be gained from managing VQOs in a less restrictive manner. In addition, I note that opportunities to gain more volume out of VQO areas are limited because licensees are not undertaking any partial cutting at the present time.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. Submissions were received from First Nations and industry. The range of comments received are summarized in the attached *Summary of Public Input*.

The forest industry respondent recommends that the Cranberry TSA be amalgamated with the adjacent Kispiox TSA. One of the primary objectives of the initial Cranberry Forest Licence, as awarded to C GED Forest Products Ltd. in 1995 was to provide opportunities to enhance the involvement of the First Nations community in the forestry sector. The Nisga'a Tribal Council submission also addresses the issue of tenure, stating that since 1993 they have sought a way to participate in forest management in the Cranberry TSA. The submission outlines an earlier proposal for cooperative management with the Ministry of Forests, Gitanyow and Gitwangak under a tree farm licence. Although this proposal was not accepted by the Ministry of Forests, the Nisga'a Tribal Council submission expressed their desire to continue discussions on opportunities for them to participate in forest management in the area. The Nisga'a Tribal Council also raised this issue during our meeting on April 3, 1998.

The Nisga'a Tribal Council assert that the Cranberry TSA is within their traditional territory and that the Nisga'a people have used the area for millennia for subsistence and cultural activities. They comment that these uses continue today, with the addition of participating in the mushroom harvesting industry. The Nisga'a Tribal Council submission also noted that their interest and involvement in the Cranberry TSA was ignored in the socio-economic analysis. During my meeting with the Nisga'a Tribal Council on April 3, 1998, I heard their concerns, and have considered their comments in making my determination. In this rationale, I have attempted to responded briefly to all of the comments raised by the Nisga'a Tribal Council during our meeting, including socio-economic issues.

I have carefully considered all other public input thoroughly in my determination. Again, where possible, I have attempted in this rationale to respond briefly to the views expressed, and consideration of this input has been an important component of this determination.

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

Unsalvaged losses

The BCFS analysis estimates unsalvaged losses at 397 cubic metres per year. This represents fire losses only. District staff note that yield curves for standing inventory used in the base case (Variable Density Yield Program) account for losses to stem rots.

District staff note that blowdown in the Cranberry TSA is sporadic and mostly salvageable. In addition, although Mountain Pine beetle salvage played a significant role in the harvesting history of the TSA, it is unlikely to have a significant impact in the near or long term as there is little remaining mature pine in the TSA and the second-growth stands will not be grown on rotations long enough to have a high risk of attack from the Mountain Pine beetle.

District staff have also noted that research into incremental growth rates of Balsam Bark beetle infested stands over the ages of 100 should be undertaken to determine the significance of volume losses over time, and to confirm the level of infestation. I agree with district staff and expect that for the next AAC determination, more information will be available. When this additional information is available, it will be considered in future AAC determinations.

I am satisfied that the information presented regarding unsalvaged losses is the best available and is suitable for use in this AAC determination.

Reasons for Decision

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

For the reasons stated in "Timber supply analysis" and from reviewing the considerations recorded above, I accept the BCFS base case for the Cranberry TSA as an adequate basis from which to assess the timber supply in the Cranberry TSA for the purposes of this AAC determination. The BCFS timber supply analysis base case projected an initial harvest level of 110 000 cubic metres per year, which is no change from the previous AAC determination for the Cranberry TSA.

The following factors are identified as reasons why the timber supply projected in the base case may have been *over*estimated to a degree that may be quantified:

- Riparian habitat: The Cranberry River floodplain meets the criteria of an "active floodplain" under the Forest Practices Code. In the *Riparian Management Area Guidebook*, the recommended prescription for an active floodplain area is to reserve the entire floodplain area (and definitely no more than a 30 percent basal area removal using selection methods). Considering the guidebook recommendations, and also that in the past, silvicultural problems have been identified within the Cranberry River

floodplain area, and that this floodplain is an unique ecological area within the Cranberry TSA, I consider it appropriate to expect retention of the floodplain which extends the riparian reserve area for the Cranberry River by 644 hectares.

In addition, the base case does not account for management zones for S4 to S6 streams. The combined land base impacts of the additional floodplain area, and management in riparian management zones for S4 to S6 streams represent a reduction to the timber harvesting land base of at least 2 percent.

- Stand-level biodiversity: In the base case, 799 hectares, or approximately 2.5 percent of the timber harvesting land base, was removed to account for stand-level biodiversity. However, further research conducted by district staff after the completion of the timber supply analysis indicates that a 2.5 percent reduction is insufficient to reflect stand-level biodiversity objectives as recommended in the *Biodiversity Guidebook*, and that a further reduction of 2.5 percent is required to reflect these objectives.

The following factor is identified as indicative of a potential *under*estimation of the timber supply to a degree that currently cannot be quantified with accuracy.

- Site productivity estimates: As discussed under *site productivity estimates*, studies done both province-wide and for nearby areas lead me to believe that site productivity has been underestimated in the Cranberry TSA. However, I do not have direct evidence of the specific magnitude of this underestimation. Sensitivity analysis results indicate that higher site indices could increase projected timber supply in the short, medium and long term. Therefore, I have allowed for an unquantified underestimation of short-, medium- and long-term timber supplies as projected in the base case.

In reviewing the above-noted factors indicating an overestimation or underestimation of the timber supply in the base case projection, it is reasonable to assume that adjusting the timber supply to account for site productivity estimates could offset the timber supply impacts of riparian habitat and stand-level biodiversity to some degree. However, due to the absence of site index studies specific to the Cranberry TSA, which creates some uncertainties, I am not willing to accept that increasing the estimate of site productivity generates greater upward pressures than the downward pressures brought about by the riparian habitat and stand-level biodiversity issues.

In addition to the above, I have considered the following when determining whether a change to the Cranberry TSA AAC is required.

1. The base case projection of timber supply is stable. The base case shows that the current harvest level of 110 000 cubic metres per year can be maintained for 9 decades in the Cranberry TSA. Beginning in the 10th decade, the harvest moderately declines by 8 percent per decade until the long-term level of 87 000 cubic metres per year is reached in decade 12. Sensitivity analysis further demonstrates the stability of timber supply, by indicating that even if the timber harvesting land base were 10 percent smaller than in the base case, a harvest level of 110 000 cubic metres per year could be maintained for 6 decades before beginning a controlled decline.

2. Cumulatively, the results of the quantifiable downward pressures to account for riparian habitat and stand-level biodiversity represent a downward influence on timber supply of approximately 4.5 percent. Even with a 10 percent reduction in land base as tested in the land base sensitivity analysis, the base case initial harvest level could still be maintained for 6 decades.

3. As noted in "Alternative harvest flows", in addition to the base case, the BCFS analysis showed 5 alternative harvest projections for the Cranberry TSA. Overall, I note flexibility in timber supply that permits a number of alternative harvest flows that incorporate several potentially acceptable options for initial harvest rates and subsequent rates of declines. Of particular relevance is the alternative harvest flow illustrating an initial harvest level of 170 000 cubic metres per year. This shows that the initial harvest level could be increased to as much as 170 000 cubic metres per year without causing severe future disruptions in timber supply, as long as harvest levels begin to decline to the long-term harvest level immediately after the first decade, at a rate of about 10 percent per decade. This shows that by adjusting the decline rate within acceptable limits, there is flexibility to increase the initial harvest level projected in the base case while accommodating constraints on timber supply in addition to those incorporated in the base case, or alternatively to absorb moderate downward pressures without requiring immediate harvest reductions.

I have also reviewed the assumptions for visual quality objectives. Until final decisions are implemented regarding visual quality management objectives, the timber supply implications (if any) cannot be quantified. In the interim, the stability of the base case projection should ensure that any changes to the visual management assumptions inherent in the timber supply analysis can be accommodated in the short term without undue risk to timber supplies.

Given the above considerations, it may appear possible to increase harvests in the short term above current levels. However, it is not clear given uncertainties associated with the Forest Practices Code and site productivity estimates that such an increase could be maintained without having to decline again at some point in the future. In addition, in this unit an increase in harvest level would reduce management flexibility and potentially create risks to non-timber values as well as future timber supplies which could affect communities in the area. For these reasons, I do not believe it responsible to increase harvest levels in the Cranberry TSA in this determination.

For the reasons discussed above, I am confident that maintaining the existing AAC poses little risk to timber supply and IRM objectives over the next five years. Further, maintaining the existing level rather than increasing allowable harvests minimizes the potential necessity for larger-than-forecast adjustments in the future.

Determination

Having considered and reviewed all the factors as documented above, and taking into account the risks and uncertainty of the information provided, it is my determination that timber harvest levels that accommodate objectives for all forest resources during the next five years, that reflect the socio-economic objectives of the Crown for the area, that ensure longer-term integrated resource management objectives can be met, and that reflect current management practices, can be best achieved in the TSA at this time by establishing an AAC of 110 000 cubic metres effective June 1, 1998.

Implementation

This determination is effective June 1, 1998, and will remain in effect until a new AAC is determined, which must take place within five years of the effective date of this determination. In the period following this determination and leading to the subsequent determination, Kispiox Forest District staff should complete the following to the best of their ability:

- In consultation with Research Branch staff, validate an appropriate site index adjustment for the Cranberry TSA, for single and mixed species.

- In consultation with Research Branch staff, refine OAFs for the TSA.

- Complete mapping for the Derrick and Bonus Lakes scenic areas in order to ensure these are included as visually sensitive areas in future timber supply analyses.

- I encourage district staff to use landscape unit planning as an opportunity to minimize conflicts and ensure the mushroom resource is recognized and integrated into plans at an appropriate level. In addition, before the next determination, I request district staff to prepare a strategy and clarify their management objectives for pine mushrooms.

- Re-examine and clarify management objectives for the Cranberry River floodplain area.

Larry Pedersen
Chief Forester

May 12, 1998

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the *Forest Act* reads as follows:

Allowable annual cut

8. (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.

(2) If, after October 1, 1992, the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or
(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (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.

(3) If

(a) the allowable annual cut for the tree farm licence is reduced under section 9 (3), and
(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

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

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

(5) In determining an allowable annual cut under 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 government of British Columbia, the federal government, or both.

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

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

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

(i) the composition of the forest and its expected rate of growth on the area,
(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 the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,
(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,
(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and
(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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

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

Purposes and functions of ministry

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

(a) encourage maximum productivity of the forest and range resources in the Province;
(b) manage, protect and conserve the forest and range resources of the Crown, having regard to the immediate and long term economic and social benefits they may confer on the Province;
(c) plan the use of the forest and range resources of the Crown, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Crown and with the private sector;
(d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and
(e) assert the financial interest of the Crown in its forest and range resources in a systematic and equitable manner.

Documents attached:

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

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

Appendix 5: Summary of Public Input