

**BRITISH COLUMBIA
MINISTRY OF FORESTS**

Revelstoke Timber Supply Area

**Rationale
for
AAC determination**

**John Cuthbert, RPF
Chief Forester**

**effective January 1, 1995
until next determination within five years**

August 26, 1994

Introduction

Description of the timber supply area

The Revelstoke Timber Supply Area (TSA) is situated in the north-western part of the Nelson Forest Region and is administered from the Revelstoke Forest District Office. The TSA covers 503 984 hectares (ha). The terrain of the TSA is rugged and mountainous, with only 202 098 ha of productive forest land. For a number of reasons including operability, environmental sensitivity and lower timber quality, the timber harvesting land base is currently just under one third of the productive forest land, or 12 percent of the total land base.

The TSA consists of three major biogeoclimatic zones: Alpine Tundra (on which there are few trees) forms 29 percent of the total area of the TSA; Interior Cedar-Hemlock 32 percent; and Engelmann Spruce-Subalpine fir 38 percent. In the forested area in the TSA the dominant tree species groups are: mixtures of spruce and balsam 49 percent; hemlock 30 percent; western redcedar 16 percent; and Douglas-fir 11 percent.

Within the current timber management land base, 49 percent of the timber is over 200 years old; 26 percent is 0 to 20 years, 20 percent is 21 to 120 years, and only 5 percent is 121 to 200 years old. This has implications for the retention of forest cover for integrated resource management (IRM) in the TSA.

The forest industry is a major employer in the TSA. There are three sawmills, two cedar shake and shingle mills, and a pole yard in the city of Revelstoke. Tourism and recreation are also important in the area, in part because the Trans-Canada Highway bisects the TSA and because there are two national parks adjacent to the TSA. The TSA is bordered on the south by Tree Farm Licence 23, and surrounds Tree Farm Licences 55 and 56.

History of present AAC

The present allowable annual cut (AAC) for the TSA is 269 000 m³.

In 1981 the total land base for the TSA was only 248 619 ha—about half the present figure. At that time a yield analysis was completed which resulted in the determination of an AAC—for this smaller area—of 130 000 m³. Since that time various factors, including addition of area to the TSA due to the downsizing in 1985 of Tree Farm Licence 23, have led to adjustments to the AAC, resulting in a net increase of 139 000 m³. The AAC for the TSA has been set at 269 000 m³ since 1985.

It should be noted that this current AAC has not been supported by a complete timber supply analysis based on the new total area of the TSA, and that the current AAC does not reflect a number of the Revelstoke Forest District's current integrated management objectives.

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

Forest Licences (3)	193 856 m ³
Small Business Forest Enterprise Program	48 956 m ³
Major Timber Sale Licensees (5)	12 925 m ³
Woodlots	1300 m ³
Subtotal (allocated)	257 037 m ³
Unallocated	11 963 m ³
Total = current AAC	269 000 m ³

Based on information presented to me, the current AAC supplies 48 percent of the wood supply for local mills. The balance comes mainly from local tree farm licences.

New AAC determination

Effective January 1, 1995, the new AAC for the Revelstoke TSA will be 230 000 m³. This 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 Revelstoke TSA includes the following:

- Forest inventory planning file, British Columbia Forest Service (BCFS);
- Five-year timber harvesting development plans;
- Timber tenure-holder annual reports;
- Silviculture history records, BCFS;
- Fire protection database, BCFS;
- *Forest Insect and Disease Impacts in Timber Supply Areas*, BCFS;
- Environment Canada weather data;
- *Movements and habitats of caribou in the mountains of southern B.C.*, Simpson and Woods, 1986;
- *Integrating mountain caribou and forestry*,
- the Revelstoke Caribou Project, McLellan and Flaa, 1993;
- *Revelstoke Forest District Five-Year Development Plan Evaluation Criteria* (1991)
- *Revelstoke TSA Timber Supply Analysis*, BCFS, June 1993;
- *Revelstoke TSA Timber Supply Review Audit: Final Report*, Timberline Forest Inventory Consultants, February 1994;
- *Revelstoke TSA Socio-Economic Assessment*, ARA Consulting Group, November, 1993;
- *Revelstoke TSA Public Discussion Paper* BCFS, February 1994;
- *Revelstoke TSA Summary of Public Input*, BCFS, July 1994;

- *Area-based Timber Supply Analysis of the Revelstoke TSA*, John Nelson, 1994;
- April 15, 1994, meeting with the Revelstoke TSA Licensee Group (consisting of Downie Street Sawmills Ltd., Joe Kozek Sawmills Ltd., Arrow Lakes Cedar Pole Co. Ltd., and Bell Pole Co. Ltd.: hereafter called the "Licensee Group");
- Correspondence dated August and November 1993 from the Licensee Group;
- June 28 and 29, 1994, meeting with Revelstoke Forest District staff;
- Letter from the Minister, dated July 28, 1994, stating the Crown's economic and social objectives.

Technical limitations of the information used

The *Forest Act* requires me to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis and the inventory and growth and yield data used as inputs to the analysis formed the major body of technical information used in my AAC determination for the Revelstoke TSA. The timber supply analysis and associated inventory are concerned primarily with biophysical factors such as rate of timber growth, and definition of the land base considered available for timber harvesting. They also indirectly incorporate some economic information such as an operability classification that defines the types of terrain and timber that can be physically and economically accessed given current technology and markets.

However, the analytical techniques used to assess timber supply are simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due to both random variation and limited understanding of ecological dynamics.

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 correct answer or solution to forest management problems such as AAC determination. The information does, however, provide valuable insight into potential impacts of different resource-use assumptions and actions, and thus forms an important component of the information I must consider in AAC determinations.

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

In addition, I have taken the following into account.

- The inventory information for the TSA is at least 15 years old but is the best available.
- In the timber supply analysis, variable density yield predictions (VDYP), which are intended for use with existing stands, were used to predict growth and yield in second-growth forests; managed stand yield curves were not used.
- Site index estimates for older stands may underestimate the productivity of the second growth stands which replace the old stands after harvest.

- Some factors, e.g. non-recoverable losses, are difficult to quantify.

Statutory framework

Section 7 of the *Forest Act* (revised 1992) requires the Chief Forester to consider various factors in determining AACs for TSAs. Section 7 is appended as Appendix 1.

Guiding principles

In considering the various factors that section 7 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the AAC—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 AAC—such as IRM objectives beyond those articulated in current planning guidelines.

The impact of the Forest Practices Code is a matter which was raised repeatedly in public input. Even without the Code, I consider it reasonable to expect that, based upon recent trends, the constraints upon timber supply from the application of current guidelines would become increasingly significant over the next five years. In this determination, made prior to implementation of the Code, I have not had the benefit of any regulations or standards which might assist me in assessing the impact of any new constraints on timber production which might be imposed under the Code. However, while I have not considered any more stringent restrictions or additional impacts upon timber supply beyond those anticipated to occur due to the application of current guidelines, I have assumed that the Code will at the very least entrench the standards exemplified by current guidelines as statutory requirements.

The impact on the timber supply of land use decisions resulting from the Commission on Resources and Environment (C.O.R.E.) process is a matter often raised in discussions of allowable annual cut determinations. In this respect, in determining allowable annual cuts it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from land-use decisions which have not yet been taken by government. Thus I do not consider the possible impacts of existing or anticipated recommendations made by the C.O.R.E. process, nor do I attempt to anticipate any action the government could take in response to such recommendations. I consider only those effects on timber supply which result from land-use decisions that have already been taken by government.

The Forest Renewal Plan will fund a number of intensive silviculture activities that have the potential to affect the long-term timber supply. It is too early, however, for me to assess their efficacy and so I have not taken them into consideration in this determination. The next timber supply review will be better positioned to determine how the Plan has affected the short and long-term timber supply.

Some have suggested that, given the large uncertainties present with respect to much of the data in this determination, 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 changing. Moreover, in the past, waiting for improved data has created the extensive delays that have resulted in the current urgency to redetermine many outdated AACs. In any case, the data and models available today are far superior to those available in the past, and will undoubtedly provide for more reliable determinations.

Overall, in making this determination, I am mindful of my obligation as steward of the forest land of British Columbia and of the mandate of the Ministry of Forests as set out in section 4 of the *Ministry of Forests Act*.

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

Section 7 (3)

In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 10, shall consider

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

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

Inventory information

-general comments

The inventory information used in the timber supply analysis is old, dating from 1962, 1968, 1974, 1975 and 1977. Disturbance information and forest cover projections, however, have been updated to 1990 and 1992, respectively, for the entire TSA. Significant to the present AAC determination is the fact that existing mature wood volumes may be overestimated in the inventory (see below, *mature volumes in existing stands*). Potential inaccuracies in the data cannot be systematically assessed until completion of a statistical survey project in March 1995. However, the current inventory is the best information available, and in determining the AAC for this TSA I have been mindful of the uncertainties in the data.

- age class structure

Fifty percent of the timber within the timber management land base in the TSA is over 200 years old, and 26 percent is younger than 21 years old. These large volumes in older stands permit harvesting to be sustained for a number of years at rates substantially above the long-term level without impairing the future productivity of the land (see below, subsection 7 (3) (b) *the short and long term*

implications to the Province of alternative rates of timber harvesting from the area). However, uncertainty regarding the amounts of decay, waste and breakage reduces confidence in the estimated net merchantable volumes available for this purpose, and indicates a need for caution regarding initial harvest levels.

The relatively large area of younger stands can cause problems in achieving forest cover requirements to meet IRM objectives, including those for wildlife and visual quality, and thus exerts downward pressure on the projected initial harvest level. (See subsection 7 (3) (a) (v) below, *IRM objectives*).

- *site indexes*

Inventory data includes site indexes used to classify the productivity (growth potential) of growing sites. The Licensee Group claimed that the site indexes (estimates of growth potential) for older stands that were used in the timber supply analysis were too low—that is, they felt that after the existing trees are harvested, the new trees in the regenerated stands will grow more quickly than assumed in the BCFS timber supply analysis.

Although the evidence is inconclusive that site indexes are higher to the degree proposed by the Licensee Group, some increase is possible, and there are some implications for the expected volumes in regenerated stands, which I have considered in the section below on *regenerated stand volumes*.

Higher site indexes would decrease green-up periods (see *IRM objectives* below) and, because the trees will grow more quickly, can also result in the ability to decrease minimum harvest ages (i.e. trees will be large enough to harvest earlier)—which the timber supply analysis shows could increase short-term timber availability to some degree (see below, *minimum harvest ages*). Taken alone, this latter factor would indicate some upward pressure on the potential initial harvest level indicated in the base case of the timber supply analysis.

However, evidence that the site indexes are much higher is inconclusive, and even if site indexes were substantially higher there would be no effect on the volume estimates for *existing* stands, and only a small effect on projected initial harvest levels from reduced minimum harvest ages. I therefore consider it appropriate for the purposes of determining this AAC to rely on the site indexes used in the timber supply analysis.

- *aggregation procedures*

Inventory information consists of a very large number of records from relatively small areas or units known as polygons. Each record includes information on tree species composition, heights and ages of trees, and the sites on which they grow. For convenience this data can be aggregated by combining the information so as to

describe a smaller number of larger units. Used excessively, this may reduce accuracy, but work by industry analysts and the BCFS Inventory Branch assures me that no obvious biases have been introduced in the timber supply analysis with respect to average annual growth or in estimation of the current growing stock.

However, there is some concern that the aggregation of old and younger age classes may have contributed to overestimation of existing volumes per hectare of mature timber. This is not a major point, but taken alone it does indicate to me the initial harvest level should not be higher, and could be lower, than the projected initial harvest level in the base case. (See next section, *mature volumes in existing stands*.)

Growth and yield predictions

- mature volumes in existing stands

Based on records from licensees' annual reports for 1988-93, the volumes of wood actually harvested per hectare in the TSA are lower than the volumes projected in the timber supply analysis. I conclude that the existing mature volumes per hectare are overestimated in the inventory. (It is also possible, but in this case unlikely, that the order in which stands are harvested could affect volume projections in the analysis—See below, subsection 7 (3) (a) (vi) *Harvest sequencing*.)

Some questions have been raised as to the accuracy of the licensees' annual report figures. The District Manager and his staff, however, have confidence in the figures—noting that all areas for pre-harvest silviculture prescriptions in the last five years have been measured by tight chain traverse to ensure accuracy—and advise me that after allowance for decay, waste and breakage the volumes in the timber supply analysis may be overestimated by as much as 20 percent.

In the timber supply analysis the projected initial harvest level is highly sensitive to variations in the estimated volumes in existing stands—a 10 percent volume overestimation required a 16 percent reduction in the projected initial harvest level. There is thus a significant risk to short-term supplies if existing stand volumes are in fact overestimated.

This risk is difficult to quantify since the possible degree of volume overestimation is not known accurately. Even if the annual reports are not precisely accurate the advice of the BCFS staff is based on first-hand experience with and knowledge of the area, rather than on statistical evidence.

Nevertheless, since the professional judgement of the District staff based on a review of annual reports indicates that the risk of overestimation is present, since no evidence was presented to me to indicate that the estimates of existing volumes were too *low*, and since the projected initial harvest level is very sensitive to

changes in existing volumes, it follows that caution is required. In consideration of this factor alone, therefore, it is appropriate to view the base-case projected initial harvest level as an upper limit to the short-term timber supply.

- regenerated stand volumes

In predicting the volumes of wood anticipated to be present in regenerated forest stands, the timber supply analysis relied on the VDYP model, which is designed primarily for use in predicting volumes in *existing*, rather than in *regenerated* stands.

BCFS staff acknowledged that if the Table Interpolation Program for Stand Yields (TIPSY)—which was designed for use with managed stands—had been used, the long-term timber supply level in the analysis could have been 20 to 25 percent—possibly 30 percent—higher than the value of 98 000 m³/year produced using VDYP. However, a sensitivity analysis in the timber supply analysis included the implications of increasing regenerated yields by 20 percent. The long-term timber supply level increased to 124 000 m³/year. However, this analysis and others with even higher regenerated yields (completed after publication of the timber supply analysis) did not increase projected initial harvest levels, except under the specific harvest flow conditions discussed three paragraphs below. For this reason I am satisfied that further analysis using TIPSY would not have provided any information more useful to me in this determination than the sensitivity analyses carried out using VDYP.

Parks Canada and others indicated concern that operational adjustment factors currently used by BCFS in TIPSY for managed stands may be underestimating the impact of endemic root rot and other diseases, and that anticipated increases in regenerated stand volumes therefore may not materialize. This should be considered in estimating regenerated stand volumes in future analyses, but is not crucial in this determination because, as noted, TIPSY or managed stand yield tables were not used in the timber supply analysis for this TSA.

The Licensee Group used managed stand yield tables in an analysis which assumed in part that site indexes for older stands, once they are harvested and regenerated, would be better represented by site indexes for existing younger stands. I cannot consider this to be a reasonable extrapolation. This analysis also assumed there would be no problems in the regenerated stands with competing brush, and made no provision for habitat for grizzly bears or caribou. In this scenario the long-term timber supply level was raised 74 percent above that in the BCFS base case.

The BCFS evaluated this scenario in a sensitivity analysis in which regenerated yields were increased by 70 percent, minimum harvest ages were reduced by 30 years, and green-up ages were reduced by 20 percent. In this scenario the long-term timber supply level increased to about 200 000 m³. The BCFS analysis was

unable to find a way to reach the Licensee Group's higher long-term level from the current AAC without a major shortfall in the mid-term. Nevertheless, the Licensee Group produced another harvest scenario in which this mid-term shortfall had been filled, mainly by assumed improvements in non-recoverable losses due to fire and pests and by assuming harvesting in presently inoperable areas. This scenario was a hypothetical composite of other scenarios and was not based on the results of a comprehensive timber supply analysis, and again, I cannot view the assumptions used as reasonable expectations.

The ability of increased regenerated volumes to affect short-term supplies is dependent upon considerations of harvest flow, minimum harvest age, and green-up periods (through the easing of adjacency requirements). Increased regenerated stand volumes do not allow an increase in the projected initial harvest level if the harvest forecast is never to fall below the long-term level. However, the combination of increased regenerated yields and associated reductions in minimum harvest age *can* permit an increase in the projected initial harvest level *provided a decline is permitted below the increased long-term level*. In this situation, any social impacts associated with this decline would be no worse than those anticipated in the timber supply analysis base case.

From the foregoing, I am satisfied that regenerated stand volumes may well be underestimated, in which case the long-term timber supply level may be significantly higher than that shown by the analysis, which is cause for optimism in the long term. However, the magnitude of the underestimation is unknown, as is the extent to which this would influence minimum harvest ages and green-up periods. These factors should be examined in future timber supply analyses.

The intensive silviculture activities funded by the Forest Renewal Plan represent an opportunity to significantly improve regenerated stand volumes. Again, however, future analyses will be better able to evaluate the success of those activities and their impact on the long-term timber supply level.

Despite these uncertainties, in my determination I have made some allowance for the potential for increased regenerated stand volumes, in combination with other factors as discussed, to affect short-term supplies.

Minimum harvest ages

Minimum harvest age is the time it takes for stands to grow to a harvestable condition. The timber supply analysis showed that if minimum harvest ages were changed relative to the base case, there could be small changes in the projected initial harvest level. The Licensee Group stated that different aggregation (see above, *aggregation procedures*) might have reduced minimum harvest ages in some cases, and this could result in higher projected initial harvests. However,

they did not present any evidence to support this position, and I am satisfied that the minimum harvest ages used in the timber supply analysis are suitable for use in determining this AAC.

As discussed above under *regenerated stand volumes*, higher regenerated stand volumes may permit reduced minimum harvest ages which, under relaxed harvest flow conditions, may allow an increase in the projected initial harvest level, and I have made allowance for this in my determination.

Land base contributing to timber harvest.

The timber management land base in the TSA (see attached map) is limited by inaccessibility, by steep and unstable terrain, by environmental sensitivity, by the frequency of avalanches, by non-merchantable forest types, and by demands on operable (as well as inoperable) areas for other forest uses. Reasonable assumptions, and if necessary, projections, must be made about these factors and appropriate areas must be deducted ("netted-down") from the productive forest area to determine the harvestable land base. Current management assumptions used were in accordance with the *Revelstoke Forest District Five-Year Development Plan Evaluation Criteria* (1991).

A specific concern raised by the Licensee Group was that the figures assumed in the timber supply analysis for future losses in productivity due to roads, trails and landings were too high. This is possibly true, in which case the long-term timber supply level could be slightly higher; but this would not result in an increase in the projected initial harvest level.

Overall, the Licensee Group was of the opinion that the timber management land base used in the timber supply analysis did not accurately reflect current management. However, a 1994 review by BCFS staff of the operability lines in the licensees' own Five-Year Development Plans and other factors did not support this view. This confirms that the assumptions in the timber supply analysis do in fact reflect current management and technology.

In this regard there has been increased use of cable systems recently, but only two sales for skyline or helicopter. Thus, only very limited performance has been demonstrated with unconventional systems. Yet, given that the timber management land base includes difficult terrain, I anticipate an increased need for alternative systems such as skyline and helicopter logging just to harvest in these operable areas and meet Forest Practices Code requirements. I must therefore conclude that this is not an opportune time to consider establishing a partitioned AAC for the purpose of harvesting in historically inoperable areas.

I am satisfied therefore that the land base deductions used in the timber supply analysis to determine the current timber management land base are appropriate.

that no land-base adjustment is required in determining this AAC, and that there is at present no opportunity in this TSA to include a partitioned component in the AAC for non-conventional harvesting in presently inoperable areas.

Timber Licence reversion

Harvested volumes from Timber Licences, which are old tenure arrangements, do not contribute to the AAC for a TSA. However, once they are harvested, these areas revert to the Crown and will come under BCFS management. Future harvests from them will then contribute to the AAC for the TSA. A number of Timber Licences have already reverted in this TSA, and others are scheduled for reversion in the future. A large part of the existing younger timber in this TSA has resulted from reversions. All these reverted areas are operable and are now fully stocked, but most have yet to reach green-up. This condition, combined with further anticipated reversions, exacerbates the adjacency and forest cover requirements necessary for IRM objectives, limiting the amount of harvesting that can be achieved in the first few decades. (See below in subsection (v) *IRM objectives*.)

Timber supply profile

The Licensee Group believes that the timber supply analysis netted down too much of the land base for non-merchantable forest types. However, the BCFS had reviewed the timber supply analysis data package together with the licensees and had reached agreement on adjustments for net-downs to the gross timber management land base to account for non-merchantable types. I am satisfied that this information on non-merchantable types is therefore suitable for use in determining this AAC.

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

Regeneration delay

In recent years I have become aware of the issue of competing brush in this area, in response to which all areas are planted promptly after harvest, with the average regeneration delay being one year. The timber supply analysis assumed a regeneration delay of one year, which I consider to be appropriate since minor variations around the average would have very little impact on short-term supply.

Not-satisfactorily-restocked areas

Not satisfactorily restocked figures for the TSA have been revised since publication of the timber supply analysis:

	Treatable backlog (ha)	Deferred backlog (ha)	Current (ha)	Total not satisfactorily restocked (ha)
Timber Supply Analysis Figure	2488	--	1720	4208
June/94 figure	711	1457	1057	3255

Only 711 ha now require treatment, and the 1457 ha of deferred backlog are conditionally accepted as stocked to various levels, but will not be fully producing anticipated yields for 80 to 100 years. However, this adjustment to not satisfactorily restocked figures has no significant implications for short-term timber supply.

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

Incremental silviculture

Industry has promoted incremental silviculture as a means of offsetting potential reductions in AAC. Two options which could affect short-term supply are commercial thinning and fertilization.

Commercial thinning can provide a range of benefits, including providing wildlife habitat and advancing the harvesting of timber in some cases to fill supply gaps. However, except in the case of harvesting trees that would otherwise decay and rot, commercial thinning produces little or no net increase in volume over the rotation. In the case of this TSA, the area currently suitable for commercial thinning is small, there are concerns over root rot and accessibility, and the potential amount of additional wood volume that could realistically be brought forward for harvesting over the next decade is insufficient to significantly affect the projected initial harvest level rate.

Fertilization prior to green-up could allow a stand to reach green-up three to four years sooner than with no treatment. This would not produce any significant net increase in volume, but could free up adjacent timber earlier for harvest. The impact of this would be to increase the projected initial harvest level, as was indicated in the timber supply analysis sensitivity analysis pertaining to green-up. However, the actual response to fertilization is still uncertain, and there is also a significant cost factor to consider. Fertilization is not current practice in this District, and without demonstrated results it would be inappropriate to include speculation on the potential implications for short-term timber supply.

For the long term, pre-commercial thinning, in combination with fertilization and commercial thinning may have some effect on timber supply, but this will not affect the determination of the present AAC.

Non-clear-cut harvesting practices

There is uncertainty about the volumes estimated to be harvested by selection systems, but since selection systems are applied to less than 1 percent of the overall area of the timber management land base at this time, I conclude that any possible errors would have an insignificant impact on the projected initial harvest level.

Rehabilitation programs

None are currently underway.

- (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;

The utilization standards assumed in the timber supply analysis are consistent with BCFS standards for the Interior, and were not questioned by licensees. Compliance with utilization standards is normal and is not an issue in determining this AAC. I have no reason to project that either the standards or the level of compliance will change in the near future.

The decay, waste and breakage factors used in the timber supply analysis were developed 25 years ago and the Licensee Group feels they are too low. BCFS District staff consider that the levels of decay, waste and breakage indicated at that time are likely to have increased. The District staff consider this could be a significant factor in the possible overestimation of existing stand volumes through the use of VDYP (see *mature volumes in existing stands* above). Field studies are underway to update these factors, but the results will not be published until the spring of 1996. The updated values should be incorporated into VDYP for the next timber supply analysis.

Uncertainty in decay, waste and breakage may contribute to the possible overestimation of existing volumes, which I have discussed above (see: Growth and yield predictions).

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

Integrated Resource Management (IRM) objectives

Timber harvesting is just one in a range of uses of forest lands. Integrated resource management of forest lands to accommodate all resource values affects (among other things) the scheduling of the harvest of individual cut blocks. In recent years there have been significant increases in public demand for the use of forest resources other than timber, and in public and professional concern for other forest values. IRM considerations affecting timber supply in this TSA include

requirements for visual landscape management as well as protection for threatened species and for riparian zones.

The primary basis for defining current forest management in the TSA, upon which the new AAC is based, is the *Revelstoke Forest District Five-Year Development Plan Evaluation Criteria* (1991). From this, in determining the AAC, as Chief Forester I apply the guiding principles set out on page 3 above, and consider only those factors which are a reasonable extrapolation from current practices.

In this TSA, the combined impacts of several IRM objectives impose significant constraints on timber supply in the TSA.

- mountain caribou

The Revelstoke area is home to an expanding herd of currently about 400 mountain caribou, a blue-listed species (i.e. at risk because of low numbers and restricted habitat) that makes use of old-growth forests and may not utilize large areas of young forest. The herd forms one of the largest mountain caribou populations in the province. Given the significance of this herd, it is important to ensure that timber harvesting activities make appropriate allowances for its habitat requirements and that they be compatible with overall biodiversity requirements.

The assumptions modelled in the timber supply analysis for caribou habitat consist of guidelines based on preliminary research work dating from 1987. The Ministry of Environment, Lands and Parks is concerned that the guidelines as modelled are inadequate to maintain existing populations through provision of both high and lower elevation habitat. Conflict between timber harvesting and caribou habitat is less severe at higher elevations, where forests tend to be inoperable, although minor impacts on timber supply may occur during the second or third harvest entries (harvest passes). At lower elevations, where extensive harvesting has already taken place, especially on private lands, maintaining adequate forest cover will present harvest scheduling difficulties and exert a downward pressure on the short-term wood supply from that modelled in the timber supply analysis. While I have not considered it reasonable to remove 25 percent of the TSA from contributing to the timber supply, as suggested by Parks Canada, I have considered the importance of this herd in making this AAC determination.

- protection of riparian habitats

The timber supply analysis estimated riparian habitats, based on reviews of Development Plans, at 2 percent of the timber management land base. A more recent inventory of riparian habitat, based on air photo interpretation with no ground confirmation to date, estimates riparian habitat at 6 percent of the timber management land base. The District guideline is for no timber harvesting in riparian habitats.

The true figure could lie somewhere between 2 and 6 percent, but given the shortage of and competing uses for valley bottom land, it is reasonable to consider that protecting riparian habitat in combination with other factors will continue to exert downward pressure on the available timber supply.

- forest cover objectives

The TSA is divided into management zones labelled "selection," "visual quality objectives," "wildlife," and "IRM" (see attached map). In the "selection" zone the maximum harvest per decade is 38 ha. Minimum required green-up periods in the other zones are: 25 years in the "visual quality" zone, 40 years in the "wildlife" zone, and 18 years in the "IRM" zone.

The timber supply analysis base case modelled a three-pass harvesting system in the "IRM" zone. However, BCFS District staff advise that a three-pass system of harvesting is difficult to achieve in this zone, and a January 1994 study by the Forest Operations Group in the Faculty of Forestry at the University of British Columbia found that in order to meet adjacency requirements, virtually every drainage must operate on a minimum of four passes.

The timber supply analysis included a sensitivity run which modelled a four-pass system in the "IRM" zone and indicated major reductions in the short-term timber supply—a harvest rate of 182 000 m³/yr. was the maximum achievable in the first decade. For the purpose of determining this AAC it is therefore necessary to consider that constraints on short-term supply from forest cover requirements are likely to be considerably greater than those modelled in the timber supply analysis base case, and that the initial harvest level should therefore be significantly lower.

I consider it reasonable that a minimum of a four-pass system may be needed to achieve the combined IRM objectives in the TSA. This will increase constraints on supply beyond those modelled in the timber supply analysis base case, which indicates that the base-case projected initial harvest level is too high to allow IRM objectives to be met.

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

Harvest sequencing

The timber supply analysis assumes that oldest stands are harvested first. To the extent that this does not reflect actual practice—i.e. if for various reasons some younger stands are harvested before older ones—harvested volumes would be somewhat less than projected. However, given the preponderance in this TSA of older stands of timber, I consider this factor unlikely to be a major cause of any

overestimation of existing stand volumes (see above, *mature volumes in existing stands*) or to have measurably influenced projected initial harvest levels in the timber supply analysis.

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

The nature of the transition from harvesting in old- to second-growth stands is a major consideration in determining AACs. In the short term, the presence of large volumes of older wood permits harvest levels to be sustained above long-term levels without impairing the future productivity of the forest land. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined so as 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 impacts 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 undue immediate social and economic impacts.

The BCFS timber supply analysis shows that, due to the availability of high-volume older stands, harvest levels in the short and mid terms in the TSA can remain above, but must decline toward, a long-term level to be reached seventy years from now. This level will remain relatively steady thereafter.

The base case in the analysis shows a projected initial harvest level of 254 000 m³/yr., declining by 12 percent per decade (before non-recoverable losses are deducted) to a long-term level of 98 000 m³/yr.

The analysis also shows that if the decline is restricted to 10 percent per decade the initial rate must be 237 000 m³/yr. in order to avoid future supply problems.

If instead the initial level is held at the current AAC of 269 000 m³/yr., declining at 10 percent per decade, the analysis suggests large shortfalls would begin seventy years from now. The analysis indicated it would be possible to retain the current AAC and avoid these large future shortfalls with a rate of decline in harvest levels in excess of 12% per decade. However, maintaining the AAC at the current level would compromise IRM objectives (as discussed in subsection (v) above).

The timber supply analysis also examined the impact of initial harvest rates substantially below the base case. However, in my view these lower initial rates would have immediate and significant economic impacts on the community.

With respect to socio-economic impacts, the Interior Lumber Manufacturer's Association (ILMA) submitted a report (May 24, 1994) from a paper by an independent consultant which made a number of criticisms of the socio-economic

analysis (SEA) report. The Economics and Trade Branch of the BCFS has reviewed the paper and has concluded that while it contained a number of useful comments, none of the technical points raised would significantly change the impact analysis.

The timber supply analysis indicates to me that an appropriate balance between avoiding both short-term economic disruption and future supply shortfalls would be achieved by some initial reduction in harvest rate relative to the current AAC followed by a steady rate of decline to a stable level. The timber supply analysis base case and similar forecasts are within a suitable range for achieving this purpose.

The Licensee Group presented alternative harvest scenarios based on assumptions about expanded operability and higher site indexes and regenerated yields—which, as already discussed, I do not consider reasonable—and on reduced unsalvaged losses. While I acknowledge the possibility of harvest rates in the long term *somewhat* higher than indicated in the timber supply analysis, after reviewing the methods and assumptions used in the Licensee Group's analysis, I conclude that I cannot give their forecasts a weight equal to that of the BCFS timber supply analysis.

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

The BCFS timber supply analysis included all those types of timber which regional processing facilities are currently processing or capable of processing. The Revelstoke TSA currently provides 48 percent of the wood supply needs of local mills, and it is unlikely that any reductions in wood supply from the TSA could be made up from other sources in the District.

There was considerable public input on the implications of AAC reductions for the local timber processing facilities. As discussed above, the timber supply analysis examined the impact of projected initial harvest levels substantially below the base case initial harvest level of 254 000 m³/yr. In my view these lower initial levels would have immediate and severe economic impacts on the local timber processing facilities and hence the community.

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

The Minister has expressed the social and economic objectives of the Crown for the province (letter dated July 28, 1994 attached as appendix) and I understand them to apply to the Revelstoke TSA as well. They are consistent with the objectives stated in the Forest Renewal Plan and include forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest level changes in a managed transition from old growth to second-growth forests,

so as to provide for continuity of employment. 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 I consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. The latter would likely require the use of alternative harvesting systems, and to encourage this the Minister suggested I consider a partitioned cut.

The employment and community impact issues are discussed in detail in the *Revelstoke TSA Socio-Economic Assessment*, and I am familiar with the varying impacts of different harvest levels (see discussion under (c) above). The use of commercial thinning has been discussed in *incremental silviculture* above, where I concluded that its potential impact on the AAC is insignificant.

The operability issue was discussed in *Land base contributing to timber harvest* above. There I concluded that the operability assumptions in the timber supply analysis do reflect current management and technology and that there is no reason to believe the current harvesting land base can be expanded. Further, given the increased need for alternative harvesting systems simply to log in existing operable areas and still meet Forest Practices Code requirements, I do not feel a partitioned cut is warranted at this time.

The Minister's letter suggests that I should consider important local social and economic objectives that may be derived from the public input in the timber supply review. Assuming it would be appropriate for me to do so, in the present case the local objectives would appear to parallel the provincial objectives expressed by the Minister.

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

Non-recoverable losses

The Licensee Group identified two concerns with the assumptions in the timber supply analysis with respect to non-recoverable losses to fire, pests and wind. First, these losses were overestimated, although alternative figures were not provided; and second, the timber supply analysis assumed a constant level of losses when the actual level should decrease proportionally over time along with the decrease in the amount of growing stock.

Both of these concerns may have some validity, although current uncertainties in the data may be equally significant. With respect to the first point, District staff have produced a revised net-down for losses that, if correct, would increase wood supply immediately by almost 6000 m³/yr. Taken alone, this would indicate that the projected initial harvest level could be somewhat higher than in the timber supply analysis base case. If the second point is true, the long-term timber supply level could also be somewhat higher than in the timber supply analysis base case,

but this would not affect the projected initial harvest level. Work is needed to quantify these losses more accurately for the next timber supply analysis.

Reasons for decision

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

- The current AAC of 269 000 m³ is not supported by a timber supply analysis and does not reflect a number of the Revelstoke Forest District's current management objectives. Moreover, it exceeds the range of projected initial harvest levels shown in the timber supply analysis without causing future shortfalls in supply (assuming a rate of decline of no more than 12 percent per decade).
- The timber supply analysis base case does provide a projected initial harvest level that avoids serious future shortfalls. However, some of the factors identified and considered above influence the validity of the projected initial harvest level in the base case and indicate that this rate must be modified in order to determine an AAC that will meet the required range of forest management objectives.
- There is evidence that the management practices required for adequate protection of mountain caribou and riparian habitats were underestimated in the timber supply analysis. The necessary changes to protect these values would exert downward pressure on short-term timber supplies, although it was not possible to quantify this effect for this determination. The required information should be obtained before the next timber supply analysis for this TSA.
- A sensitivity analysis in the timber supply analysis provided me with quantitative estimates of the impacts on the short-term timber supply resulting from changes in forest cover objectives. A specific concern was the identified need for a four-pass harvesting system in the "IRM" zone, rather than the three-pass system modelled in the base case. The timber supply analysis showed that the use of a four-pass system required that the projected initial harvest level be reduced to 182 000 m³/yr. I consider this to represent the lower limit of a reasonable range of projected initial harvest levels.
- Another factor with a significant potential to affect the projected initial harvest level is the possible overestimation in the timber supply analysis of volumes in existing stands. The evidence presented for overestimation of these volumes cannot be viewed as conclusive in the absence of completed statistical surveys. However, given that the *potential* impact on the initial harvest level from any such overestimation is considerable, responsible stewardship requires that the initial harvest level be set in a range lower than in the base case, in order to provide some degree of assurance against future shortfalls in the event that the volumes are overestimated. I received no

evidence of any *underestimation* of the existing inventory volumes that would suggest the projected initial harvest level should be set higher than in the base case.

- There are two factors which could possibly allow an initial harvest level higher than the base case. First, if the revised estimates for non-recoverable losses are correct, this would allow an increase of nearly 6000 m³/yr. in the projected initial harvest levels for all timber supply analysis forecasts, without causing future shortfalls. Second, if higher site indexes permit lower minimum harvest ages, a small increase in the short-term supply could offset to some degree the reductions indicated by the larger downward influences.

In consideration of all of the above, an appropriate harvest level must be less than the current AAC of 269 000 m³. For the reasons discussed, I must also view the base-case projected initial harvest level of 254 000 m³/yr. as too high. On the other hand, there are factors which could offset reductions and the appropriate harvest rate should therefore be set somewhat higher than the 182 000 m³/yr. associated with the use of the four-pass system in the "IRM" zone.

In making this determination I must also consider social and economic impacts. The rate set must not be so high as to cause later disruptive shortfalls in supply, nor so low as to cause undue immediate social and economic impacts.

Since 12 000 m³/yr. are unallocated and unharvested (except for small amounts harvested under miscellaneous tenures such as Free Use Permits etc.), and since the 1300 m³/yr. allocated to woodlots does not come from the AAC attributable to the rest of the TSA, a more accurate figure for the actual current harvest level in the TSA is 256 000 m³. There would thus be very little socio-economic impact from reducing the AAC to 256 000 m³.

Socio-economic impacts increase as allowable harvest rates are reduced below this level, but some reduction in AAC is necessary at this time in order to accommodate IRM objectives and avoid future shortfalls in timber supply. In determining this AAC for the next five years I have considered the need to continue to provide local mills with a supply of wood sufficient to allow for levels of operation that are not severely reduced from current levels.

It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that ensures longer-term IRM objectives can be met, that reflects current management practices, that avoids severe curtailment of locally established patterns of socio-economic activity based on timber harvesting, and that avoids disruptive shortfalls in future wood supply, can best be achieved in this TSA at this time by establishment of an AAC of 230 000 m³.

Implementation of Decision

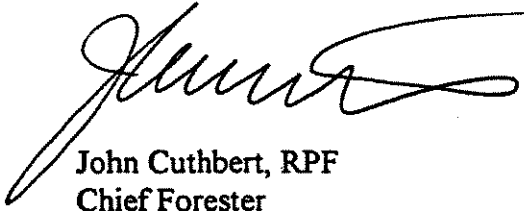
This determination comes into effect on January 1, 1995, and will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Although this AAC will satisfactorily accommodate IRM and socio-economic objectives during the period in which it will be in effect, further study is required before the next timber supply analysis to reduce uncertainties with respect to :

- (a) IRM objectives and prescriptions to achieve them; and
- (b) mature wood volumes in existing stands.

Work on (b) is underway and should be completed by March 1995. In addition to these two critical factors, BCFS staff are currently undertaking a project to evaluate the possible underestimation of site indexes in older stands.

As mentioned earlier, this determination was made before the publication of the C.O.R.E. land-use recommendations for the Kootenay region. It does not reflect or anticipate those recommendations or any action the government may take in response.



John Cuthbert, RPF
Chief Forester

August 26, 1994

Appendix 1

The B.C. *Forest Act* Section 7 (revised 1992) reads as follows:

Allowable annual cut

7. (1) The chief forester must determine an allowable annual cut before December 31, 1995, and after that determination at least once every 5 years after the date of the last determination, for

- (a) the Crown land in each timber supply area, excluding tree farm licence areas and woodlot licence areas, and
- (b) each tree farm licence area.

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

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

then, with respect to that timber supply area or tree farm licence area, as the case may be, the chief forester is not required to make the determination under subsection (1) of this section before December 31, 1995, or within 5 years after the last determination, but is required to make the determination

- (c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and
- (d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(1.2) When the chief forester determines an allowable annual cut for a tree farm licence area, any management plan that specifies an allowable annual cut for that area is conclusively deemed to be amended so that the allowable annual cut specified in the management plan is the same as the most recent one determined by the chief forester.

(1.3) In determining an allowable annual cut under this section the chief forester may specify portions of the allowable annual cut attributable to

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

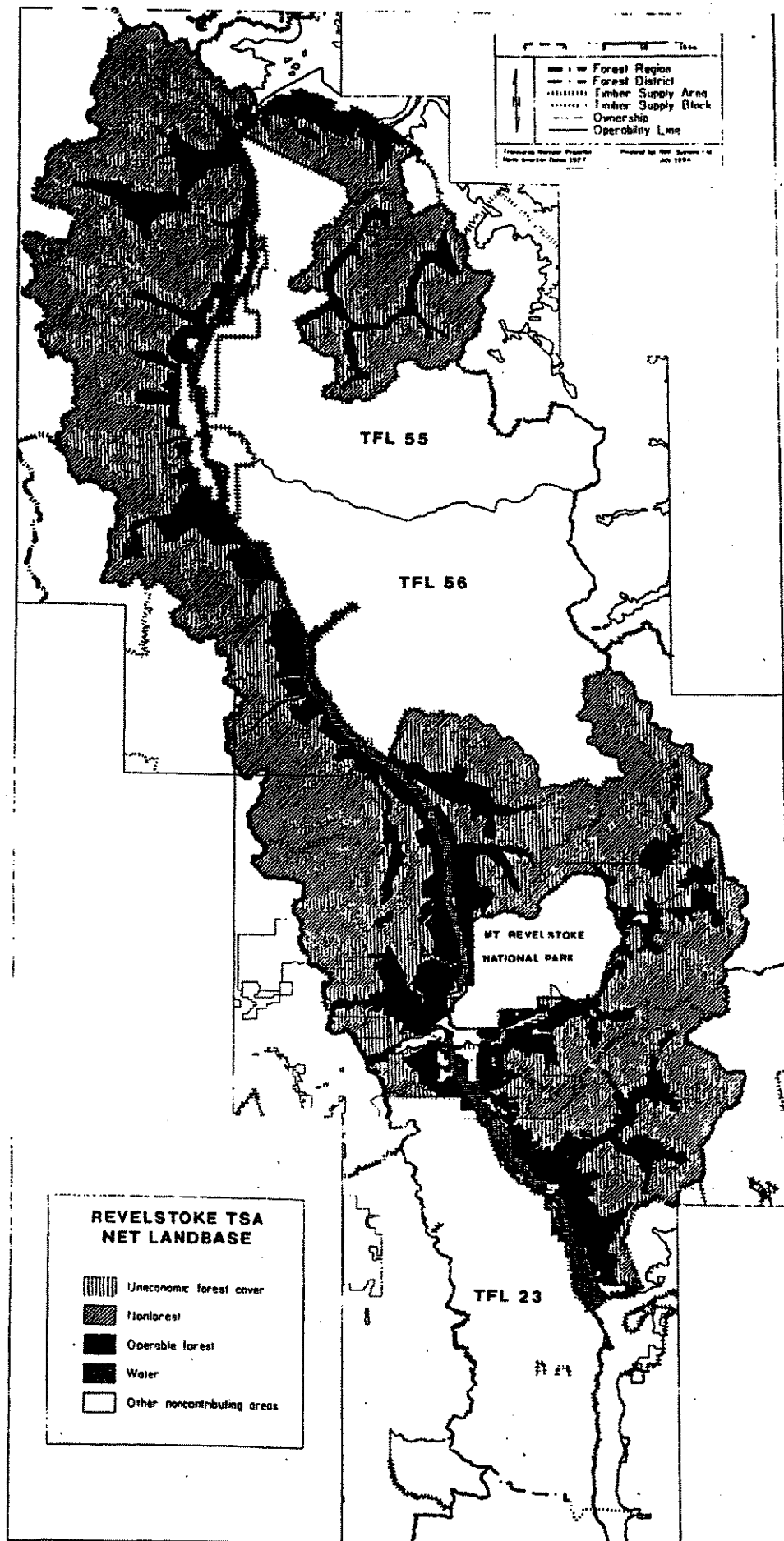
(2) The regional manager or district manager shall determine a volume of timber to be harvested under a woodlot licence during each year or other period of its term, according to the licence.

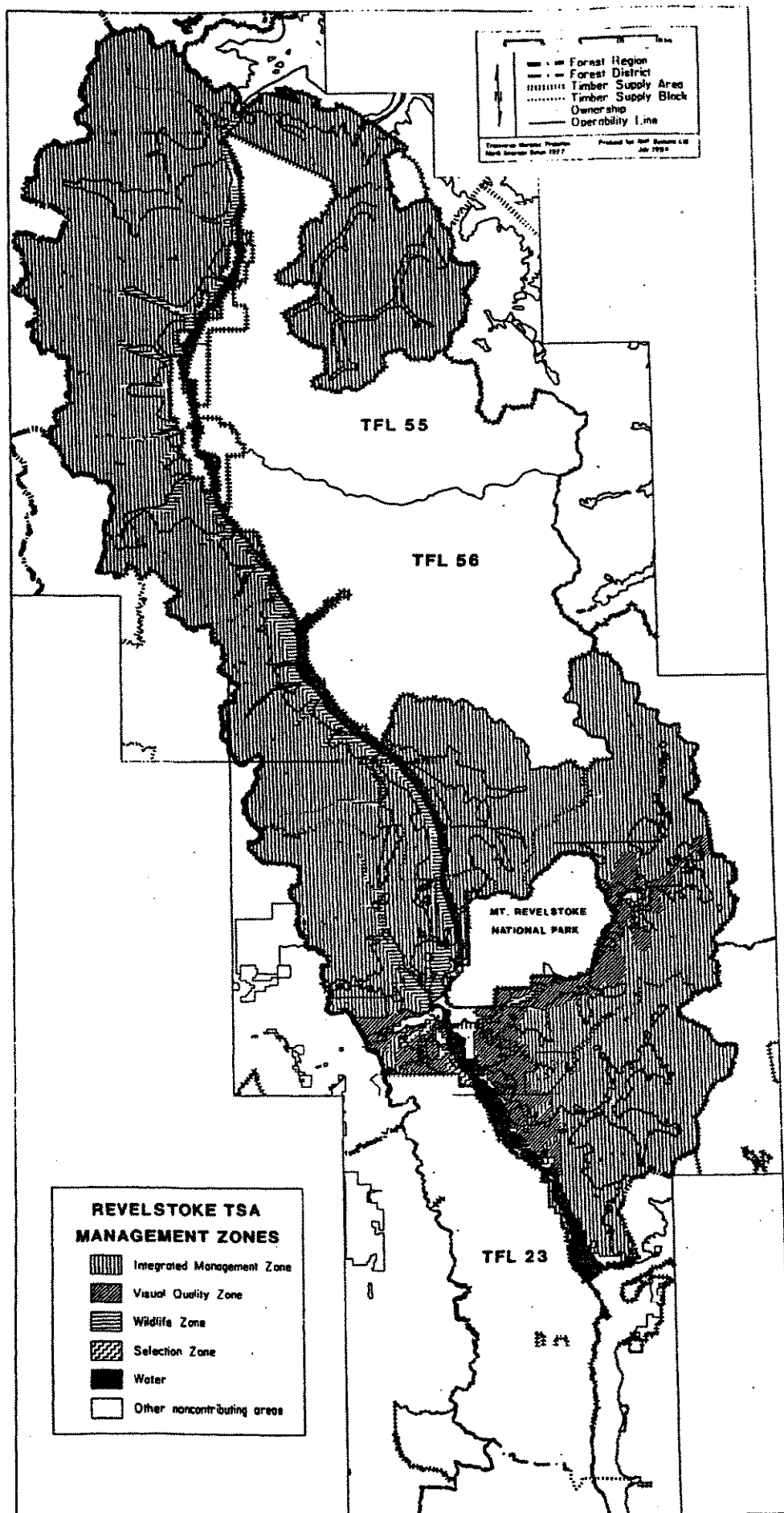
(3) In determining an allowable annual cut under this section the chief forester, despite anything to the contrary in an agreement listed in section 10, shall consider

- (a) the rate of timber production that may be sustained on the area, taking into account
 - (i) the composition of the forest and its expected rate of growth on the area;
 - (ii) the expected time that it will take the forest to become re-established on the area following denudation;
 - (iii) silvicultural treatments to be applied to the area;
 - (iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area;

- (v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production; and
- (vi) any other information that, in his opinion, relates to the capability of the area to produce timber;
- (b) the short and long term implications to the Province of alternative rates of timber harvesting from the area;
- (c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities;
- (d) the economic and social objectives of the Crown, as expressed by the minister, for the area, for the general region and for the Province; and
- (e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

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File: 10100-01

JUL 23 1994

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

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

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

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

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

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

.../2

Province of
British Columbia

Minister of
Forests

Parliament Buildings
Victoria, British Columbia
V8V 1X4

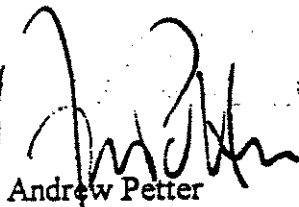
John Cuthbert

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

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

Yours truly,



Andrew Petter
Minister

