

CASSIAR TIMBER SUPPLY AREA

Socio-Economic Analysis

Prepared for:

**Economics & Trade Branch
Ministry of Forests**

Submitted by:

Robinson Consulting & Associates Ltd.

and

Ms. Carla Blackner

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EXECUTIVE SUMMARY

The Cassiar Timber Supply Area (TSA) covers a large, sparsely populated, relatively undeveloped and inaccessible region of the province. It is well endowed with natural resources of provincial and international significance, including large wilderness parks, a diversity of wildlife, particularly big game species, proven mineral wealth, and forest resources.

Historically, mining has been the leading economic activity. Guide-outfitting and trapping are also important sources of regional income. Industrial forest activity has been intermittent. Harvested volumes have generally been below the allowable annual cut (AAC) of 140 000 cubic metres per year. Registrants in the Small Business Forest Enterprise Program harvest small volumes for local needs. Larger volumes, also issued annually on a competitive basis, are allocated from the Forest Service Reserve. The latter volumes are typically removed from the TSA for further processing.

The Timber Supply Analysis has determined the long-term harvest level to be in the order of 870 000 cubic metres per year. In deriving this value, broad assumptions were adopted in place of detailed land and forest information, which is not available for this TSA. The estimate of the long-term harvest level should be considered indicative of the potential harvest, and subject to revision as the information base improves.

The socio-economic analysis of increased harvest levels also suffers from a lack of information. In part, this is because the forest industry is not well established in the TSA and the potential increase in harvest volumes implies a very large increase in economic activity relative to the TSA's existing economy. For this reason, two hypothetical harvest levels were selected to illustrate the nature and magnitude of the social, economic and environmental implications. The two harvest levels were 240 000 cubic metres per year (an increase of 100 000 cubic metres per year), and 640 000 cubic metres per year (an increase of 500 000 cubic metres per year). These harvest levels are for discussion purposes and do not suggest a preferred AAC level, nor will they be the only options considered in the final AAC determination. The discussion that follows summarizes the economic impacts that could be associated with these harvest levels, as well as the community, First Nations and environmental implications.

Economic Impacts

The economic implications of TSA harvesting activities at the current level, and at the two hypothesized levels, are summarized in Table ES-1. A harvest level of 240 000 cubic metres per year could probably be realized by the existing community and economic structure of the TSA. A minimum five-year phase-in, however, would be required in order to conduct the proper planning functions. It is assumed that a large proportion of the incremental harvest would be conducted by out-of-TSA contractors, and be would be processed outside the TSA. Direct forest sector employment within the TSA is projected

to increase from about nine person-years (PY)¹ of employment currently, to about 42 PY. This would stimulate 14 PY of indirect and induced employment. Total TSA employment (excluding Forest Service employment) would increase from 12 PY currently to 56 PY. While the employment figures are not large, they are significant in the small TSA economy. Implicit in the analysis is a modest increase in TSA wood processing.

Much of the economic activity generated by the increase in harvest levels (given the continuation of current policy) is assumed to occur outside the TSA, as most of the harvesting phase activities would be undertaken by contractors from neighbouring TSAs. As well, most of the processing would occur outside the Cassiar TSA, likely at mills along the Highway 16 corridor from Houston to Terrace. Direct employment in the province at this harvest level is estimated at 185 PY (includes TSA employment). Total provincial employment is estimated to be 462 PY.

Table ES-1.
Annual Economic Impacts¹

Economic Impact	Harvest Level (m ³ /year)		
	Current 87 000	240 000	640 000
Employment (PY)			
<u>TSA</u>			
Direct	9	42	246
Indirect/Induced	3	14	103
Total TSA Employment	12	56	349
<u>Province</u>			
Direct	67	185	493
Indirect/Induced	100	277	739
Total Provincial Employment	167	462	1 232
Employment Income (millions \$93)			
Total TSA Employment Income	\$3.4	\$1.52	\$9.24
Total Prov'l Employment Income	\$4.00	\$11.10	\$29.50
Government Revenue (millions \$93)			
British Columbia	\$2.4	\$6.6	\$17.5
Canada	\$0.9	\$2.6	\$7.0
Total Government Revenue	\$3.3	\$9.2	\$24.5

Notes:

1. Not included in the total impacts are the effects of the district Forest Service. At the TSA level, the Forest Service is estimated to support a total of 41 PY, and contribute approximately \$1.3 million in employment income. At the provincial level, total employment and income associated with the Forest Service are estimated to be 75 PY, and \$2.0 million, respectively.

¹ Note, this analysis excludes Forest Service staff. In 1993, there were approximately 30 PYs employed by the Forest Service based out of the district office in Dease Lake, and a field office in Atlin.

The 240 000 cubic metres per year harvest level would generate government revenue through various federal and provincial taxes. The annual total value of government revenue is estimated at \$9.2 million annually.

Increasing the harvest level to 640 000 cubic metres per year would have a more than proportional economic impact on the TSA. This is because the TSA economy would grow and diversify relative to what exists today, before this level of harvest could be attained. In particular, at this harvest level, cut blocks would be distributed throughout the TSA. The cost of continuing to transport logs to "southern mills" from more distant areas of the TSA may, in cases, not be financially justifiable. This suggests that a processing plant sited in the TSA might be necessary before this level of harvest could be attained. The TSA does not presently have the industrial infrastructure (i.e. transportation, energy, suppliers) and skilled labour resources to support a substantial processing facility. This infrastructure would be necessary before a mill could be established in or near the TSA.

In projecting the economic impacts summarized in Table ES-1, it was assumed that a larger proportion of the TSA population would be employed in the forest sector, and that roughly 50 percent of the processing employment would be in the TSA. It was also assumed that a more diversified TSA economy would result in a larger share of the indirect and induced effects being realized locally. For the purposes of estimating the induced effects, the local income multiplier corresponding to the Smithers/Houston economy was used. Given these assumptions, the TSA's share of total employment is 37 percent at this higher harvest level as compared to 13 percent at the 240 000 cubic metres per year harvest level, and seven percent at the current harvest level. It follows that the TSA would also realize a greater share of the income generated. Government revenue, given similar assumptions under the two harvest levels, is projected to increase in proportion to the increased harvest.

The analysis demonstrates the nature of the economic effects that may arise at the different harvest levels. One should not attach too much importance to the specific harvest levels that have been selected to illustrate the implications. It may not be a question of what "harvest threshold" would bring forth a diversity of economic growth. Rather, it is a process of economic growth that must proceed to a point where the TSA is capable of capturing a greater share of the economic opportunities offered by an expanded harvest level. Clearly, if the economy and infrastructure of the TSA were sufficiently developed today, it could capture a much larger share of the economic effects than is projected here, even at the lower harvest level.

Community Impacts

The TSA communities are all relatively small and isolated at the present time. As long as the wood continues to be processed outside the TSA, increased harvest levels would have a limited effect in terms of employment and income (as illustrated at the 240 000 cubic metres per year harvest level). Given a further substantial increase in the harvest level,

(640 000 cubic metres per year) it is assumed that the TSA would have experienced economic growth and diversification. The expanded forest industry would be part of the economic growth that might be experienced in the area. However, it is difficult to predict at this time which particular communities might be most directly affected by the expansion of the forest sector. Growth within the TSA communities would likely be a lengthy process.

First Nations

First Nations will pursue an active role in forest resource management and use of resources within their traditional lands. Higher harvest levels may lead to more opportunities for First Nations involvement in the forest industry. Specific impacts on First Nations communities would depend on their desired role, and geographic proximity to forestry activity. First Nations will have to weigh the economic benefits associated with involvement in the forest industry against any adverse impacts on their traditional way of life.

Environment

A lack of inventory information necessitates that environmental impacts be treated in an overview manner. The TSA contains vast areas of pristine wilderness. Areas that become accessible through the building of roads for logging purposes could be significantly impacted. Fish and wildlife populations may suffer due to related changes in predator/prey relationships, or increased human use. This would be compounded by the generally lower productivity and recovery rates as compared to more southern areas. Environmental resources are also important from a use perspective. Tourism, recreation, and guiding are significant economic activities in the TSA. All depend on wilderness settings and could be adversely impacted given increased harvest levels.

1.0 INTRODUCTION

The Ministry of Forests is conducting a review of the province's 36 Timber Supply Areas (TSA). As part of the assessment of timber supply availability, the Minister of Forests and the Chief Forester require a socio-economic analysis of the effects of changing harvest levels. This report presents the analysis and findings of the socio-economic analysis completed for the Cassiar TSA.

The report generally follows a multiple account framework. This framework is intended to identify the potential ramifications of alternative harvest levels on the diverse values inherent in the forest resource. These diverse values are embodied in a number of "accounts" that are useful in describing the social, economic and environmental ramifications in a consistent and systematic manner.

1.1 Study Area

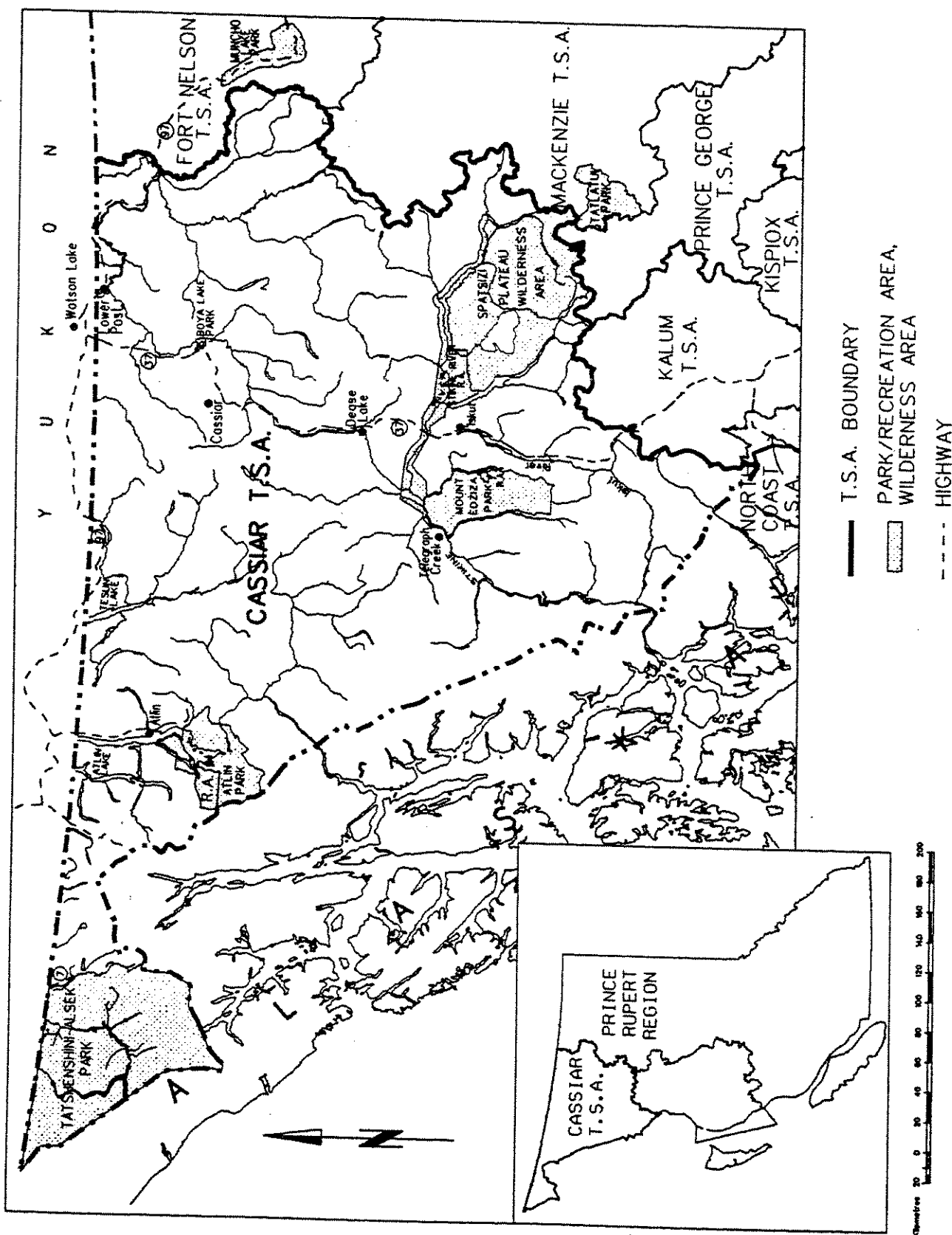
The study area is the Cassiar TSA, which for forest administration purposes is equivalent to the Cassiar Forest District, which falls within the Prince Rupert Forest Region (Map 1). The TSA is the largest in British Columbia, covering 14 million hectares, or about one sixth of the province's land area. The TSA is bounded by Yukon Territory in the north; the Fort Nelson and Mackenzie TSAs in the east; the Kalum and Prince George TSAs, and Spatsizi Park in the south; and by the Alaska border in the west.

While it is the province's largest TSA, it is also the least populated. The area is often perceived by residents and others as British Columbia's last frontier. The TSA contains vast areas of essentially pristine wilderness with spectacular scenery and abundant wildlife populations.

1.2 Report Organization

The report is organized into seven chapters. Chapter two describes the TSA's communities and demographic trends, and includes an overview of the First Nations groups resident within the region. Chapter three describes the environmental setting within the TSA, while chapter four profiles the region's economy. In chapter five, the report narrows its focus to the forestry sector. It describes the timber harvesting land base, current AAC level, and the harvest forecasts against which the current situation is compared. Chapter six examines the economic, social and environmental implications of the harvest forecasts. Chapter seven presents a summary and conclusion. Appendices include a list of contacts, a discussion of the procedure used in calculating economic impacts, and a glossary.

Map 1. Location Map - Cassiar TSA



1.3 Key Assumptions

Readers of the report are asked to keep in mind the following points:

- The two harvest forecasts analysed in this study (240 000 cubic metres per year and 640 000 cubic metres per year) were chosen to present a range of possible economic, social and environmental effects. These harvest forecasts are for discussion purposes and do not suggest a preferred AAC level, nor will they be the only options considered in the final AAC decision.
- With respect to the economic impacts (employment, employment income, and government revenue), readers should be aware of three assumptions:
 - (a) Economic impacts are presented as if they would occur concurrently with a change in the harvest level, i.e. the analysis does not adjust for time lags.
 - (b) Development of a forest industry within the TSA will be dependent to a large degree on the price of timber, in that prices must be high enough to sustain interest in the area's timber resources. Forest industry activity in the TSA has been sporadic to date. The price of timber necessary to make TSA timber economically viable is not known. This analysis, however, assumes that the future price of timber will be sufficient to maintain industry interest in harvesting TSA timber at volumes considerably above the current harvest rate.
 - (c) The prediction of future economic activity within the TSA is not based on current conditions. First, it was assumed that in the future, a larger proportion of the harvesting and processing employment and income generated by the TSA would occur locally than is currently the case. For instance, at the highest harvest level considered, 640 000 cubic metres per year, a large wood processing facility was assumed within the TSA; at present, almost all wood is processed at mills along the highway 16 corridor between Houston and Terrace. Secondly, a more diversified TSA economy is assumed, which would result in a larger share of indirect and induced effects being realized locally.
- The study also assumes that the current timber harvesting land base and forest management practices will remain in effect in the future. The study does not consider the implications of treaty negotiations, Protected Areas Strategy, or the implementation of new guidelines (B.C. Forest Practices Code) to protect biodiversity and riparian areas.

2.0 COMMUNITY PROFILE

2.1 Demographic Trends

2.1.1 Population

The population in the TSA has increased over the past decade, from 2 750 in 1981, to 2 775 in 1986 (+0.9 percent), and then to 2 845 in 1991 (+2.5 percent).

The only census areas are Good Hope Lake and Lower Post. Approximate populations (1993) of the major communities within the area are:

Atlin	430-800
Dease Lake	650-700
Iskut	350
Telegraph Creek	400
Good Hope and Lower Post	275

It is important to recognize that the shut down of the Cassiar townsite on February 5, 1992, is not included in the 1991 census data, and that since that time there has been growth in Dease Lake.

2.1.2 Labour Force

In 1991 the total labour force (both sexes 15 years and over) was 1 500, 1 350 employed, 170 unemployed and 510 not in the labour force. This yields an unemployment rate of 14.3 percent and a 74.0 percent participation rate.

The distribution of the labour force by industry is shown in Table 2-1. A job, as presented in Table 2-1, includes people employed on a full-time, as well as a seasonal or part-time basis. Mining, along with government services account for nearly 40 percent of the total employment within the TSA. Compared to percentage figures for British Columbia, the TSA exhibits lower levels of employment in the finance, insurance and business services, and wholesale and retail sectors. Logging and forestry account for 40 jobs, or 3 percent of the TSA's total employment base. This percentage is similar to the provincial average.

In 1990, the average household income in the TSA was \$49 125. This is slightly more than the corresponding figure for the province (\$46 909). The incidence of low income families (less than \$20 000 per annum) was also in line with provincial trends at 22 percent. Table 2-2 shows the median income for males and females.²

² 1991 Census data.

Table 2-1.
Labour Force Distribution by Industry (1991)

Industry	Jobs in TSA	Labour Force Distribution (%)	
		TSA	Province
Mining	360	26	1
Government services	175	13	7
Education	100	7	7
Health and social services	30	2	9
Total Government Related	305	22	23
Construction	150	11	8
Transportation and Communication	110	8	8
Accommodation, Food and Beverage Services	185	13	8
Wholesale and Retail	75	5	18
Finance, Insurance and Business services	65	5	12
Logging and Forestry	40	3	2
Agriculture	10	1	2
Manufacturing	20	1	11
Fishing and Trapping	10	1	1
Other ¹	60	4	7
Total	1 390	100	100

Notes:

1. Includes recreational service industries, i.e. guide-outfitting, and other service industries.

Source: 1991 Census data

Table 2-2.
Median Income for Males and Females (1991)

Postal Area Name	Median Employment Income Males (\$)	Median Employment Income Females (\$)
Atlin	17 800	7 700
Dease Lake	32 800	13 400
British Columbia	26 800	14 700

Source: Census data by postal area for 1991

2.1.3 Social Indicators

Education levels attained by TSA residents are presented in Table 2-3. The percentage of the population 15 years and older without high school graduation (42 percent) was higher than the provincial average (34 percent). The percentage of local residents who completed post-secondary education (11 percent) was significantly lower than it was for the rest of the province (33 percent).

Table 2-3.
Educational Attainment (1991)

Educational Attainment of population 15 years & over	Cassiar TSA % Distribution	BC % Distribution
without high school graduation	42	34
with high school graduation	17	14
with incomplete post secondary	30	19
with complete post secondary	11	33

Source: B.C. Statistics, 1991 Census data

2.2 Community Profile

The recognized settlements are Dease Lake, Iskut and Good Hope Lake located on Highway 37; Telegraph Creek, located beside the Stikine River and reached by road from Dease Lake; Lower Post, located on the Alaska Highway; and Atlin, which is accessed from the Yukon (see Map 1).

As noted above, the resident population is approximately 2 800 people. During the summer months, the population may increase by as much as 25 percent. This seasonal inflow of people places significant pressure on community services.

Up until 1992, when the Cassiar asbestos mine closed, the Cassiar town site was the TSA's largest population centre (around 1 000 persons), and its regional service centre. A number of government offices, consumer service businesses, as well as the TSA's only health clinic were located there. As of 1994, few residents remain in the former town site. The role of regional centre has been taken up by the small settlement of Dease Lake.

At the time of writing, the settlement of Dease Lake is in a transition toward becoming a town. The transfer of several public offices (e.g. school district office, highways office) and the expansion of other government offices and private business has led to an increase in population, and a severe land shortage. The land shortage is exacerbated by the time required to bring Crown land to the market, as well as the absence of a local level of government. There is little private land in Dease Lake, and no real estate office.

B.C. Lands will soon make available a block sale of 14 residential lots on 54 acres at Allan B. Lakes. The sub-division will be developed by a private party selected by tender. There are local concerns that the residential lots will be too expensive and take too long to come on the market (The Northern Connector, May 1994). The Tahltan Band has applied to develop a block of land with the expansion of Indian Reserve #9. The project would include roads, civic facilities, a community water system, and the development of 100 residential lots. Land development is also dependent on the government approval process. Presently, the Dease Lake Advisory Planning Commission, an elected volunteer organization, advises the Minister of Environment, Lands and Parks on planning, developing and servicing issues. Whether this remains the preferred structure is currently being examined as part of a study on forms of local governance.

The Northern Lights College maintains the Dease Lake Learning Center which also serves other communities in the area. It offers a range of courses for retraining and general interest. Recreational facilities in Dease Lake include a community hall, outdoor skating rink and the school gym. There are Royal Canadian Mounted Police detachments in Dease Lake, Telegraph Creek and Atlin. There are no crime rate statistics available.

2.3 Aboriginal Community

2.3.1 Overview

The majority of aboriginal peoples in the Cassiar TSA are affiliated with one of three cultural groups: Kaska, Tahltan, and Tlingit.³ Kaska traditional territory encompasses the upper Liard River and extends into the upper Pelly drainage in the north and to Dease River in the southwest. Traditional Tahltan territory includes most of the Stikine River drainage and extends south into the headwaters of the Nass River, and north into the Dease River drainage. The Atlin Lake area and the Taku River watershed are the traditional homeland of the Taku River Tlingit.

The three groups had established trading patterns before European contact and trading continued after contact. The Tahltan people carried out winter hunting activities near the frozen Stikine River to the mouth of the Iskut, but were not river travellers during summer months. The Tlingits had canoes and claimed the Stikine's salmon spawning tributaries and berry gathering grounds in the area. In the summer, the Tlingits would arrive to fish and gather berries, but by late fall they would return to more coastal areas. The Tahltans also gathered berries along the Stikine. Tahltans and Kaskas would trade products from the interior with items brought from the coast by the Tlingits. Hunting, fishing, trapping, and berry gathering continue to be important activities for First Nations groups.

In the 1960s, First Nations in the traditional area of the Kaska were amalgamated into the Liard River First Nation and a central settlement and administrative base was established in Upper Liard, Yukon Territory. Recently, the Dease River First Nation at Good Hope Lake gained full status as a separate First Nation. Residents of Liard Reserve #3 and the

³ Alaska Geographic Society. 1979. "The Stikine River". Alaska Geographic Quarterly, Vol.6, No.4.

settlement of Lower Post are in the process of gaining separate status from the Liard River First Nation. First Nations people in the communities of Good Hope Lake and Lower Post are affiliated with the Kaska Tribal Council based in Yukon Territory and the Kaska Dena Council in Lower Post.

The majority of Tahltan people reside in the communities of Iskut, Telegraph Creek, and Dease Lake. Iskut is home to members of the Iskut First Nation. Members of the Tahltan First Nation reside in Telegraph Creek and Dease Lake. The Tahltan population resident in Dease Lake has expressed interest in obtaining status as a separate First Nation. The Iskut and Tahltan First Nations are affiliated with the Tahltan Tribal Council that is based in Dease Lake.

The Taku River Tlingits were known as the Atlin-Teslin First Nation until a separation in 1964. Most Atlin area people remained with the Taku River Tlingit First Nation. Teslin people joined the Teslin Tlingit Council in Teslin, Yukon Territory and a few people joined the Carcross/Tagish First Nations in Carcross, Yukon Territory. The Taku River Tlingits are affiliated with the Dax Ka Nation

Approximately 55 to 65 percent of the TSA's total population are aboriginal people affiliated one of the above mentioned First Nations.

2.3.2 Economic Activities

First Nations in the Cassiar TSA have limited access to economic development opportunities due to geographic isolation. Lack of employment opportunities at home has forced aboriginal people to seek work elsewhere. spend part of the year working in mining camps or communities such as Fort St. John, Prince George, Terrace, Watson Lake, and Whitehorse. Many individuals, who remain in their home communities, continue to lead a traditional subsistence lifestyle often taking part in seasonal activities such as trapping and guide - outfitting. Mineral development projects, such as Golden Bear and Eskay Creek mines, and First Nations administration offices are the main sources of full-time employment.

The main local employers for Kaska people are Tim Moon Construction, Liard River Construction, Northland Kaska, and Kaska Forest Resources. These companies operate in and around Watson Lake, Yukon Territory. There are no businesses in the community of Lower Post, but business ventures being explored include a service complex (gas station, cafe, and store) and other tourism and service operations. In the community of Good Hope Lake, Good Hope Lake Services (gas station and grocery store) contribute to the local economy.

Businesses owned and operated by the Iskut First Nation or by private individuals in the community include: Kluachon Guide-Outfitters, Iskut General Store, and the Iskut Trappers Association. The Tahltan Nation Development Corporation (TNDC) is a business enterprise with a board of directors composed of members from the Iskut and Tahltan First Nations and from the Tahltan Tribal Council. The TNDC employs

approximately 52 people on a seasonal basis in and around the Dease Lake area. The TNDC carries out road building, road maintenance, and construction contracts in the Dease Lake area. They employ a pool of carpenters and operate construction companies such as Tagoon Holdings in Telegraph Creek and Spatzizi Construction in Dease Lake. Future projects for TNDC include an agreement with B.C. Hydro to build a micro hydro project on Hluey Lake. The Tahltan Fisheries Program, a co-management project in the Stikine watershed with the federal Department of Fisheries and Oceans, also employs a number of Tahltan people.

Taku River Tlingit Holdings Co. is the economic development arm of the Taku River Tlingit First Nation in Atlin. Businesses operated by the company include a sawmill and construction division. The company is also involved in assisting individuals in establishing small businesses.

Forestry

All First Nations are interested in developing their local economic bases with the view to becoming more self-sufficient. The forest industry is seen as a possible source of stable, long-term employment. All First Nations have expressed an interest in pursuing long-term tenures, such as replaceable forest licences.

The Cassiar Forest District office has issued two direct award Timber Sale Licences to the Kaska Tribal Council. These licences will allow the Kaska people an opportunity to develop skills in forestry operations. The Kaska have been involved in silviculture work with the Ministry of Forests and recognize the need for more training and work experience. Kaska Forest Resources is exploring other forestry related activities on behalf of the Kaska people.

The Tahltan Tribal Council has also received direct award Timber Sale Licences. The council, in partnership with the Northern Lights College, administers the Tahltan Natural Resources Technicians Program, which will train people in natural resource management. TNDC in Dease Lake has also been contracted by the Cassiar Forest District office to undertake silviculture activities.

The Taku River Tlingit Holdings Co. small sawmill in the Atlin area produces lumber for local use in construction.

2.3.3 Treaty Negotiations

With few exceptions, the majority of First Nations in British Columbia have not signed treaties. In 1993, the British Columbia Treaty Commission received letters of intent from First Nations communities throughout the province stating their intention to negotiate modern day treaties (comprehensive land claims) with the governments of British Columbia and Canada. One of the objectives of treaty negotiation is to reach an agreement that provides a clear definition of aboriginal rights with respect to lands and resources. First Nations look to treaty negotiations as means to achieve greater self-sufficiency through acquisition of land and resources, revenue sources, and jurisdiction

over government services. Filing of an intent to negotiate a comprehensive land claim is the first step in a six stage process. There is no specified timetable for concluding negotiations and several treaty negotiations may occur simultaneously.

First Nations communities in the Cassiar TSA are participating in the treaty negotiation process.⁴ The Dease River First Nation at Good Hope Lake and the community of Liard Reserve #3 at Lower Post are part of the statement of intent filed by the Kaska Tribal Council. The Iskut Band and the Tahltan Band are represented by the Tahltan Tribal Council. The Taku River Tlingit have filed a statement of intent on behalf of their members in the Atlin area.

⁴ Three other First Nations have also filed statement of intents which encompass parts of the Cassiar TSA. However, these First Nations do not have communities within the TSA.

3.0 ENVIRONMENTAL PROFILE

3.1 Environmental Setting

Because of its relative remoteness, the Cassiar TSA has not been studied to the same detail as other TSAs within the province. Although it encompasses a vast and ecologically diverse range of ecosystems, few have been described so far.

Two systems have been developed to classify and describe ecosystems within the province, the Ecoregion Classification system adopted by the Ministry of Environment, Lands and Parks, and the Biogeoclimatic Ecosystem Classification used by the Ministry of Forests. The Ecoregion Classification is used to stratify the province's terrestrial and marine ecosystem complexity into discrete geographical units at five different levels. The three lowest levels, ecoprovinces, ecoregions and ecosections, are progressively more detailed and narrow in scope and relate segments of the province to one another. They describe areas of similar climate, physiography, hydrology, vegetation and wildlife potential. The Biogeoclimatic Classification focuses on the province's terrestrial ecosystems, and incorporates primarily climate, soil, and vegetative data. Vegetation is emphasized because it is considered to be the best integrator of the combined influence of a variety of environmental factors affecting site, and because floristic criteria can be determined to differentiate units.

The Cassiar TSA falls predominantly within the Northern Boreal Mountains ecoprovince. This area generally consists of mountains and plateaus separated by wide valleys and lowlands. Prevailing westerly winds bring Pacific air over the high St. Elias Mountains and Boundary Ranges to the area. This ecoprovince is characterized by rain shadow effects that can cause areas to be very dry. Moose are the most numerous and widely distributed ungulate, but the thimhorn sheep (both the pure white Dall's and Stone's) and caribou best characterize the fauna. Mountain goats are an abundant species in rugged alpine areas. Grizzly bears, black bears, and wolves are common throughout the valleys. Characteristic small mammals include the collared pika, arctic ground squirrel, tundra vole and brown lemming. Wolverines and lynx are also common. This ecoprovince supports 52 percent of the bird species known to occur in the province, and 42 percent of all species known to breed. However, many species breed nowhere else in British Columbia including the pacific loon, gyrfalcon, lesser golden-plover, wandering tattler, hudsonian godwit, red-necked phalarope, arctic tern, northern shrike, smith's longspur, snow bunting, and common redpoll. The ecoprovince also supports both anadromous and freshwater fish. Because the ecoprovince's watersheds drain into different oceans (i.e. Stikine and Tatshenshini drain into the Pacific Ocean, and the Liard and drains into the Arctic Ocean), the fish species vary. Anadromous fish are restricted to the Stikine, Taku and Tatshenshini watershed, and include chinook and chum salmon. Freshwater fish include arctic grayling, dolly varden, lake trout and whitefish. The Liard river watershed is populated by northern pike and white sucker.⁵

⁵ "An Introduction to the Ecoregions of British Columbia", by Dennis Demarchi, October, 1993, Ministry of Environment, Lands and Parks, Victoria, unpublished paper.

The Cassiar TSA also encompasses small portions of the Coast and Mountains ecoprovince, and the Sub-Boreal Interior ecoprovince. The Coast and Mountains ecoprovince areas are rugged ice-capped mountains, dissected by several major river valleys, and are affected by moist, Pacific air. The Sub-Boreal Interior ecoprovince areas are characterized by rugged mountains and narrow, deep valleys with heavy snow.

Map 2 identifies the ecoprovinces and ecosections that comprise the Cassiar TSA. In total, the TSA encompasses 15 ecosections. However, the majority of the operable land base falls within seven of these ecosections (see Map 3, in chapter 5). Varying proportions of these ecosections are currently protected within parks or recreation areas, while additional areas have been designated as cabinet approved study areas under Park and Wilderness for the 90's (see Table 3-1). Cabinet approved study areas are subject to interim protection from development activities.

The TSA ranges from small areas of coastal forest in the west, to extensive areas of boreal forest and alpine tundra. In total, there are seven forested biogeoclimatic zones found within the TSA (see Table 3-2). Two of these zones, Spruce-Willow-Birch and Boreal White and Black Spruce predominate in the northern portion of the TSA's operable land base. In the southern portion, three additional zones, Engelmann Spruce - Subalpine Fir, Interior Cedar - Hemlock and Coastal Western Hemlock are also present.

Areas of significant environmental importance within the TSA are:

- riparian zones and valley bottoms, especially in areas, such as the Boundary ecosection, which are influenced by the coastal climate;
- arid slopes in the Telegraphy Creek area with rare plant communities;
- valley bottoms for woodland caribou within the Boreal White and Black Spruce biogeoclimatic zone (found throughout the TSA, but is most predominant within the Liard Plain ecosection).

Although exact wildlife populations are not known, the Cassiar TSA, with its vast expanses of unroaded wilderness has provincially significant populations of species that are sensitive to increased human access. Several wildlife species inhabiting the Cassiar TSA have been identified as being 'at risk'. Table 3-3 identifies 'at-risk' bird and mammal species, and highlights those which commonly use habitat impacted by timber harvesting activities.

Map 2. Ecoprovinces and Ecosections - Cassiar T.S.A

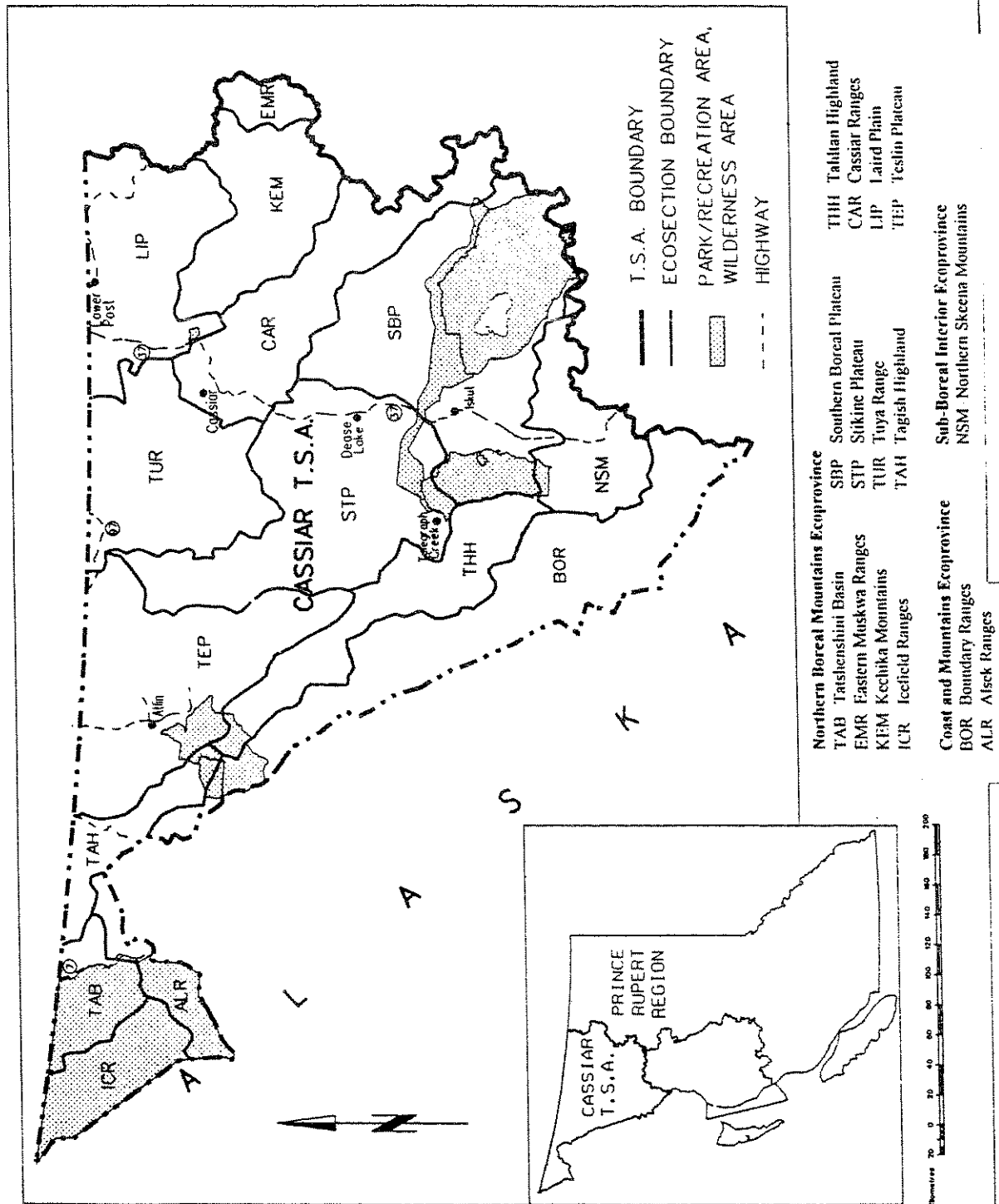


Table 3-1.**Protected Status of Ecosystems within the Cassiar TSA Operable Land Base (1994)**

Ecoprovinces/Ecosystems	Area ¹ (hectares)	% Fully or Partially Protected	% PAS Study Area	
<i>Northern Boreal Mountains Ecoprovince</i>				
• Teslin Plateau (TEP)	1 422 300	4.0%	6.8%	Atlin PP, Tutshi/Skagway CASA, Kawdy Plateau/Level Mtn CASA
• Southern Boreal Plateau (SBP)	2 589 052	42.9%	-	Mt Edziza PP, Spatsizi PP, Stikine PRA, Tatlatui PP
• Stikine Plateau (STP)	1 817 564	6.5%	47.6%	Mt Edziza PP, Stikine PRA, Kawdy Plateau/Level Mtn CASA
• Cassiar Ranges (CAR)	3 000 072	-	12.1%	Obo/Johiah Lakes CASA, Russel Ranges CASA, Kechika CASA
• Liard Plain (LIP)	1 325 502	0.5%	7.9%	Liard Eskers CASA, Kechika CASA
<i>Coast and Mountain Ecoprovince</i>				
• Boundary Ranges (BOR)	2 063 524	4.0%	19.6%	Atlin PP, Chutine/Whiting CASA, Bear Glacier CASA
<i>Sub-Boreal Interior Ecoprovince</i>				
• Northern Skeena Mountains (NSM)	1 677 702	0.4%	0.8%	Damdochax CASA

Notes:

1. Areas listed represent total ecosystem areas within B.C. Only two of these ecosystems fall entirely within the Cassiar TSA - Teslin Plateau, and the Stikine Plateau. Small portions of the Southern Boreal Plateau, Liard Plain and Boundary ecosystems spill over into the Mackenzie, Fort Nelson and North Kalum TSAs, respectively. The Cassiar Ranges ecosystem is split almost equally between the Cassiar and Mackenzie TSAs, while the North Skeena Mountains ecosystem falls predominantly within the North Kalum and Kispiox TSAs.
2. Acronyms: PP(provincial park), PRA(provincial recreation area), CASA(cabinet approved PAS study area)

Source: Land Use Coordination Office, Victoria; Prince Rupert Regional Protected Areas Team, Smithers.

Table 3-2.

Biogeoclimatic Zones¹ - Cassiar TSA

Biogeoclimatic Zones	% of Cassiar TSA	Location and Distribution	Vegetation
Non Forested Areas Alpine Tundra (AT)	21.7%	Widespread in the Coast, St. Elias, northern Skeena and Cassiar Mountains. Lies above elevations 900-1 000 m.	In general, treeless with some tree species at lower elevations in stunted form. Dominated by shrubs, herbs, mosses, liverworts and lichens.
Forested Areas Boreal White and Black Spruce (BWBS)	17.6%	Lowland to montane zone occurring at elevations ranging from 100 to 1 200 m.	White spruce, black spruce, subalpine fir, lodgepole pine, trembling aspen, balsam poplar and paper birch are the major tree species. Forest fires are frequent, maintaining a variety of stand age classes and successional stages. Climax forest is dominated by white spruce.
Spruce-Willow-Birch (SWB)	34.6%	Subalpine zone found above most of the BWBS, beginning at elevations of 600 to 900 m.	Lower elevations are forested by white spruce and subalpine fir, higher on the slopes subalpine fir dominates.
Coastal Western Hemlock (CWH)	1.2%	Occurs at low to middle elevations (sea level to 450 m), mostly west of the Coast Mountains along the lower stretches of the Unuk, Iskut-Stikine, Whiting and Taku drainages.	Closed forest dominated by western hemlock, and containing variable amounts of sitka spruce. Two key species, anabilis fir and western red cedar which characterise this zone to the south are absent here in the north.
Mountain Hemlock (MH)	1.6%	Subalpine forest and parkland lying above CWH at elevations between 400 to 1 100 m.	Lower elevations characterised by dense subalpine forest dominated by mountain hemlock and varying but still significant amounts of western hemlock. Spruce (sitka and roche) and subalpine fir are common, especially along creeks. Upper elevations are dominated by mountain hemlock and subalpine fir.
Interior Cedar - Hemlock (ICH)	0.7%	Occurs at low to medium elevations (100 to 900 m) in the central part of the Iskut and Stikine river valleys, east of the crest of the Coast Mountains.	Western hemlock is the climatic climax species. Subalpine fir and roche spruce sometimes occur in mature forest.
Sub-Boreal Spruce (SBS)	1.2%	Occurs in the coast/interior transition along Stikine and Taku rivers and their tributaries at elevations ranging from 100 to 900 m.	Dominant tree species are roche spruce, subalpine fir, black cottonwood and paper birch.
Engelman Spruce - Subalpine (ESS)	4.3%	Subalpine forest and parkland lying above ICH and SBS in the southern portion of the TSA.	Lower elevations are continuously forested by subalpine fir with minor white or hybrid spruce (engelman and roche). Mountain hemlock may be abundant at upper elevations, especially in subalpine parkland areas.

Note:

1. The biogeoclimatic zone classification system (BEC) organises "ecosystems" into a hierarchy. An ecosystem is the result of complex interactions between vegetation, animals, micro-organisms, and the physical environment. For the purposes of the BEC, an ecosystem is defined as a particular plant community and its associated topography, soil and climate. This table only identifies major tree species within biogeoclimatic zones.

Source: A. Banner, W Mackenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. *A Field Guide to Site Identification and Interpretation for the Prince Rupert Region*, Ministry of Forests, Research Branch.

Table 3-3.
At-Risk Wildlife Species¹ - Cassiar TSA

	Prov'l	Global Ranking	Commonly Used Habitat
Birds			
marbled murrelet	Blue	Rare	mature forests, estuaries, wetlands (coastal)
bald eagle	Blue	Frequent	mature forest, lakeshore riparian forest
american peregrin falcon	Red	Rare	bluffs, rocky & streamside areas, wetlands
trumpeter swan	Blue	Frequent	wetlands, breeds NE portion TSA
short-eared owl	Blue	Common	grassland, sub-alpine, alpine
hudsonian godwit	Blue	Common	lake, stream, intertidal, subalpine meadows
gyrfalcon	Blue	Common	subalpine meadows, tundra, rocky talus
wandering tattler	Blue	Common	intertidal, tundra, rocky areas
oldsquaw	Blue	Common	lakes/streams, breeds NW portion TSA
upland sandpiper	Red	Common	shrub tundra
short-billed dowitcher	Blue	Common	tundra, sub-alpine meadow, wetland
red-necked phalarope	Blue	Common	lakes, tundra, breeds NW portion TSA
lesser golden plover	Blue	Common	breed in grassy tundra
smith's longspur	Blue	Frequent	wetlands, subalpine meadows, grassland, mature forest (uses openings in forests)
Mammals			
grizzly bear	Red	Common	estuaries, forest areas, subalpine & alpine
fisher	Blue	Common	forest areas, requires wildlife trees & CWD
western wolverine (luscus)	Blue	Common	forest areas, sub-alpine & alpine
glacier bear	Blue	Common	only in far NW part TSA, winter in timber
tundra shrew	Red	Common	alpine grassland, subalpine shrublands
dall's sheep	Red	Common	tundra, subalpine grassland, rocky areas
tundra shrew	Blue	Frequent	alpine grassland, wetlands
meadow jumping mouse	Blue	Common	riparian & subalpine forest, far NW of TSA

 Birds and mammals that are shaded represent animals impacted by forestry.

Notes:

1. The Ministry of Environment, Lands and Parks has identified two groups of wildlife species they consider 'at risk' within the province: (1) Red list species are considered endangered/threatened, and (2) Blue list species are considered vulnerable. The global ranking is based on the status of a species throughout its entire range.

Source: B.C. Conservation Data Centre, Ministry of Lands and Parks, Wildlife Branch, Victoria

3.2 Provincial Parks

The Cassiar TSA contains parks and protected areas totalling nearly two million hectares. Front country parks include those parks that are accessible by car and provide camping and boating facilities; they are relatively small in size. Backcountry parks on the other hand offer wilderness experiences, are not road accessible, and in this region are very large in size.

3.2.1 Front Country Parks

Boya Lake (45 camp sites) and Kinaskan Lake (50 sites) are front country parks located along Highway 37. Usage in the past three years has increased a full 10 percent to roughly 81 percent occupancy in the summer months. Statistics show that 70 percent of the users are non-residents journeying to Alaska. Use peaks during July and August and

drops off sharply from September to June. Peak use in July for the two parks can total 3 010 day use parties and up to 2 292 camping parties for the month.⁶

3.2.2 Backcountry Parks

The Tatshenshini, Spatsizi Plateau, Mount Edziza, Stikine Recreational Area and Atlin Lake are backcountry parks that offer wilderness experiences. Backcountry use has remained constant for big game guide-outfitting, but has increased in recreational guiding (e.g. hiking, nature tours, and fishing). The total number of new commercial recreation guiding permits and aircraft permits to fly tourists into parks has increased by 10 permits. Increase in use is estimated at 20 percent; this is substantial given these are all wilderness areas.

The Spatsizi Plateau Wilderness Park encompasses 675 000 hectares over the Spatsizi Plateau and the Skeena Mountains. It is the only park with a developed trail system and backcountry campground at Cold Fish Lake. Private use is estimated at 300 people per year in addition to the registered commercial operators. It is renowned for its high wildlife values.

The Mount Edziza Provincial Park and Recreation Area encompasses 230 000 hectares, conserving the spectacular volcanic landscape of cinder fields, cones and lava flows. The Stikine Recreation Area forming a corridor along the Stikine River provides canoeing, kayaking, and river boating opportunities. Atlin Park is 243 000 hectares in size and protects icefields, plateaus, highlands and B.C.'s largest natural lake. The Stikine, Edziza and Atlin Parks are all accessed either by air or by boat. Approximately 200 people per year visit Edziza and 100 people per year canoe the Stikine.

Travel by raft through the Tatshenshini Park (938 000 hectares) on the Tatshenshini and lower Alsek rivers from Dalton Post is considered one of the top wilderness rafting trips in the world, primarily because it is one of the longest trips in "true" wilderness. In 1991 about 1 000 people descended the rivers by raft. By a standard of one raft per day to provide a wilderness experience, the carrying capacity of the river has already been reached.⁷

3.3 Protected Areas Strategy

In 1992, the government of British Columbia released a Protected Areas strategy (PAS) with the intention of protecting representative examples of the major ecosystems across the province's 119 ecozones, as well as, special natural, cultural and recreational features. The Prince Rupert Protected Areas Team has completed a draft technical analysis identifying gaps in the existing system of protected areas, and evaluating and rating areas to fill those gaps.⁸ This technical analysis, which is being conducted for the

⁶ Ministry of Environment, Lands and Parks statistics 1993.

⁷ "Tatshenshini/Alsek Land Use", Commission on Resources and Environment, January 1993.

⁸ The 'gap analysis' being conducted includes the cabinet approved PAS study areas identified in Table 3-1, as well as other areas.

entire Prince Rupert region, of which the Cassiar TSA is only part, is expected to be released in the fall of 1994. Until the results of the technical analysis are complete and have undergone public review, it is impossible to comment on precisely how the PAS will impact on the timber harvesting land base. However, in the short term, there is the potential that the process may cause a deferral in the land base available for timber harvesting. In the longer term, an increase in the protected land base could reduce the timber harvesting land base and potential volumes available for harvesting.

3.4 Recreation

Key representative recreation settings in the TSA are the rugged mountains and plateaus dissected by wide valleys; extensive wilderness, including mountain, river, and lake settings. Special features include large wilderness lakes such as Atlin Lake; scenic travel corridors; internationally important wilderness rivers; wilderness associated wildlife, and large predator/prey systems.⁹

The area is valued for large expanses of pristine wilderness that allow for multi-day trips into remote backcountry areas especially along the rivers. The Atlin area, Taku, Turnagain, Stikine, and Dease rivers and Tatshenshini Park are areas having high recreation value.

From a hunting and wildlife viewing perspective the preservation of large mammal habitat is critical. The Edziza, Spatsizi, and Lower Stikine areas all have high wildlife values.

Sight seeing, adventure activities, and guide outfitting are all activities enjoyed by residents and non-residents alike. The visual quality along navigable corridors is highly valued. This would include rivers used by kayakers, jet boats, or canoes; popular trails used by commercial backcountry recreation operators; and roadways.

There are 16 developed forest recreation sites (only one of which is not accessible by vehicle) and two trails maintained by the Forest Service. Although there are no statistics on use, anecdotal evidence suggests steady use from June to September; the most popular sites being in the Atlin area.¹⁰

⁹ "Outdoor Recreation in British Columbia: Supply and Demand Issues and Trends"; Protected Areas Strategy for British Columbia; February 1994.

¹⁰ Information taken from conversations with Carl Simmons, Ministry of Forests, Cassiar Forest District.

4.0 ECONOMIC PROFILE

4.1 Overview

Economic opportunities in the Cassiar TSA are constrained by a lack of infrastructure, distance to markets, and a small and scattered resident population. Highway 37 traverses the central and eastern portions of the TSA. There are a handful of secondary roads off Highway 37 that provide access to areas outside the highway corridor. Otherwise, air and marine transport are the primary means for transporting personnel, product and supplies. There is no rail link. The TSA is not serviced by the provincial electricity grid. The closest deep water port is the bulk terminal at Stewart to the south of the TSA. The small population is not able to support a diversified service sector. Consequently, TSA residents live without commercial services that are taken for granted elsewhere (i.e. there is no bank in the TSA). In addition, the small labour force and skill pool generally means labour is "imported" when large projects start-up. The region's climate also influences economic activity. The effects of long, cold winters range from defining a relatively short construction period, controlling soil conditions (i.e. effects forest harvesting practices, and road building), to influencing when tourists and recreationists would elect to visit the area.

These physical constraints to development may be reflected in increased costs of developing and operating a business venture. In a competitive business environment, this is a disadvantage.

Historically, the mining industry has accounted for most of the economic activity in the TSA. The Cassiar asbestos mine operated for 40 years, before closing in 1992. Numerous precious metal mines have operated from time to time. Although mineral exploration and mining operations have provided stimulus for broader economic development (i.e. particularly road infrastructure such as Highway 37, and the new road into the Iskut valley), it has been intermittent. Trapping and guiding are also important economic activities to area residents. Forestry and tourism are economic sectors that are growing in importance. The current status of the TSA's more important economic sectors is described in the following sections.

4.2 Forest Industry

Historically, forest industry activity in the Cassiar TSA has been sporadic. This has been attributed to its remoteness and lack of infrastructure, as well as the low and cyclical demand of the local market. These considerations have led the Ministry of Forests to offer Crown timber as short term timber sales.¹¹ Unlike other TSAs in British Columbia, there are no replaceable forest licences.

¹¹ "Cassiar Timber Supply Apportionment of the Allowable Annual Cut", Hynd, SAG. Prince Rupert Forest Region, Nov. 1984.

The 140 000 cubic metre AAC is apportioned as follows:

• Small Business Forest Enterprise Program (any category)	34 000
• Forest Service Reserve	104 000
• Woodlot licence (none issued)	2 000

Only firms registered with the Ministry under the Small Business Forest Enterprise Program (SBFEP) are eligible to bid for timber volumes made available under the SBFEP. There is no restriction as to the firms that might bid for sales from the Forest Service Reserve (i.e. SBFEP registrants, major licensees, and others). The terms of the sale are similar irrespective of the apportionment (i.e. 18 month term, bonus bid, etc.). These allocation arrangements result in a changing composition of industry participants, as well as large variations in the annual harvest level (see Table 4-1). Both of these characteristics are atypical of other TSAs in B.C. The characteristics of the SBFEP operator and those bidding on the Forest Service Reserve are distinct, and discussed separately below.

Table 4-1.
Harvest History Cassiar TSA

Year	Volume Harvested (m³)
1990	80 106
1991	40 661
1992	116 248
1993	104 169
average of last 3 years	87 000

Source: Volumes Billed, Valuation Branch, Ministry of Forests, Victoria.

4.2.1 Small Business Forest Enterprise Program (SBFEP)

To be eligible to register under this program, an individual or corporation cannot hold a major forest licence(s) with an AAC of greater than 10 000 cubic metres (among other things). Further, a "category 1" operator cannot own or lease a timber processing facility while a "category 2" operator must own or lease such facilities. To date, this has not been an important distinction in the TSA.

Generally, operators register in their respective TSA, or the TSA in which they expect to do most of their work. Once registered, the operator is eligible for wood made available under the program anywhere in the province. As of 13 April 1994¹², there were 37 registrants on the Cassiar TSA small business roster. However, not all of these are currently active. Further, the register indicates that 28 timber sales have been awarded to 19 registered companies since the program commenced. The regional distribution of these sales is summarized in Table 4-2.

¹² From Small Business System Registration Listing, 13 April 1994.

Table 4-2.
Number of Sales to SBFEP Registrants (1980-1994)

Residence	Category 1	Category 2
Atlin Area	2	14
Rest of TSA	-	4
Rest of Province	1	-
Outside Province	4	3
TOTAL	7	21

Source: Ministry of Forests, Cassiar Forest District

Sixteen of the timber sales have been awarded to operators in the Atlin area. The typical operator has a small mill (i.e. category 2) and produces rough green lumber for sale to the local market. Other products include building logs, mining needs and railway ties. While the timber sales volumes are generally small (less than 2 000 cubic metres), it typically exceeds local demand. Consequently, the term of the sale is often extended to up to ten years to allow timely harvest of the full sale volume. The "outside province" registrants were Yukon Territory residents. Prior to March 31, 1992, log exports from the TSA were permitted. The "rest of TSA" category 2 operators are small mills that operate intermittently out of Dease Lake, Iskut, or Telegraph Creek. Similar to those in Atlin, these operators serve the local market with custom sawing, building logs, etc.

In the latest Crown timber sale of August 31, 1993, two sales were awarded to small business operators. A resident of Smithers was awarded a volume of 7 050 cubic metres in the Blue River area, about 170 km north of Dease Lake. The operator's tentative plans are to mill the logs on site with a portable mill, and deliver the product to customers in the Highway 16 corridor. This was the only bid submitted for this parcel. The other sale was a five hectare sale in the Atlin area to a local operator. A second sale available in the Atlin area was not bid on. None of the small business operators registered in the TSA bid on the timber sales made available from the Forest Service Reserve allocation at the last auction. The total awarded in 1993 was in the order of 8 000 cubic metres, which is well below the allocation of 34 000 cubic metres. This appears to have been typical of previous years as well.

4.2.2 Forest Service Reserve (FSR)

Timber sales from the FSR generally involve larger volumes than sales made available through the SBFEP. Recently, these competitive sales have been won by major licensees with processing facilities in the Highway 16 corridor. Prior to the expiry of the standing green export approval in 1992 (OIC #1976), a large proportion of the saw logs (large diameter spruce and pine) harvested in the Bob Quinn Lake area (southern portion of the TSA) were exported offshore through the port of Stewart. The pulp logs were

transported to Kitwanga.¹³ In 1982, Watson Lake Forest Products Ltd. (owned by R. Cattermole) was awarded a 350 000 cubic metre licence over a five year term for timber in the Liard valley.¹⁴ The volume was destined for the company mill in Watson Lake (Yukon). Ultimately, due to changing ownership of the mill and the economic recession at the time, less than 25 percent of the supply available was actually harvested.¹⁵

With the expiry of the OIC, industry interest in sales in the southern area of the TSA has continued unabated. This interest is attributed to buoyant lumber markets and the growing saw log shortage for several of the mills from Houston to Terrace on Highway 16.¹⁶ In 1992, the Northwood Pulp and Timber Company of Houston was the highest bidder for several sales totalling 65 000 cubic metres.¹⁷ This involved a seven hour one-way truck haul. The timber was harvested by the company's local contractors. In the latest sale (31 August 1993), six sales were offered in the Willow Creek (five sales) and the Bob Quinn (one sale) areas. The following companies submitted bids:

Table 4-3.
Summary of Bidders at September, 1993 Timber Sale

Company Name	# of Bids	Mill Site
Pacific Inland Resources	6	Smithers
Tyror Enterprises Ltd.	6	-
Northwood Pulp & Timber	4	Houston
Repap Carnaby Inc.	6	South Hazelton
Ed Dobler Contracting	1	-
Houston Forest Products Company	1	Houston
Kitwanga Lumber	4	Kitwanga

Source: Ministry of Forests, Cassiar Forest District

Pacific Inland Resource¹⁸ (PIR) was successful on five of its bids, totalling 50 000 cubic metres. PIR annually purchases 280 000 cubic metres of their total annual requirement of 700 000 cubic metres. The logs are purchased from a number of sources, including small business operators, and sales from private lands. The incremental supply available from the Cassiar TSA is attractive as long as it is cost competitive with other sources of supply. The logging was done during the winter by a Moricetown contractor using feller-buncher

¹³ SBFEP Business Plan 1991/1996, Cassiar Forest District, Nov. 1990.

¹⁴ "Cassiar Timber Supply Report", Prince Rupert Forest Region, April 1984.

¹⁵ *il cit.* Hynd, page 5.

¹⁶ See "The Northwest Forest Industry: An Overview of Current Wood Fibre Supply, Consumption and Processing Capacity", Ministry of Forests, Economics and Trade Branch, July 1993. Also, the general saw log shortage was confirmed by industry interviews conducted during this study.

¹⁷ Interview with Mr. Lowell Johnson, General Manager of Northwood Pulp & Timber Company.

¹⁸ Information from Mr. G. Gunson, Woodlands Manager, PIR Smithers.

and grapple-yarder harvest systems. About 10 people based out of a bush camp were involved in the operation.

Kitwanga Lumber was successful on one bid, totalling 9 000 cubic metres. The mill purchases around 50 000 cubic metres per annum (i.e. roughly one third of its total requirements) from various sources. Presently, the market is very competitive. The company considers the wood currently available from the Cassiar TSA attractive because of the relatively high proportion of sound wood. The company's timber sale is expected to be harvested early this winter when the ground freezes. A feller-buncher and grapple-skidder harvesting system will be used by a Kitwanga based contractor. About six people will be involved in harvesting operations with 7-10 trucks running per day. It is anticipated that the crew will work out of a permanent camp near Bob Quinn.

4.2.3 Summary of Forest Industry

From the above discussion, it can be concluded that the forest industry's contribution to the TSA economy is not large. It is important in meeting local building needs; however, these needs are modest and account for a relatively small share of the TSA's total harvest. In the last two years, the larger volumes were harvested by non-resident contractors and processed outside the region. In cases, the outside contractors used a permanent camp near Bob Quinn which could potentially support local seasonal employment.

4.3 Mining Industry

4.3.1 Overview

The Cassiar TSA has numerous known mineral deposits and the region has seen widespread mineral claim staking. The region has high potential for mineral development, but future mineral development depends on infrastructure (transportation and power), commodity prices, and government policy.¹⁹

4.3.2 Level of Activity

The current level of activity is moderate compared to the level over the past 10 to 20 years. The Cassiar TSA contains three of B.C.'s major operating gold mines: Golden Bear (North American Metals Corp.), Snip (Cominco Ltd.) and Premier (Westmin Resources Ltd.). Construction of the Eskay Creek mine by Homestake Canada Ltd. is now underway and involves the Tahltan Nation Development Corporation as noted earlier. Gold mines can operate on a fly-in basis but ground transportation is critical to development of base metal deposits (e.g., copper) which also exist in the region. The Cassiar asbestos mine was closed in 1992 but activity has now restarted at a much reduced level. Erickson mine (gold) near Cassiar has also been reactivated by Cusac Industries after being closed for several years.

¹⁹ Information taken from conversations with Paul Wojdak, Ministry of Energy, Mines and Petroleum Resources.

Tulsequah Chief is a base metal deposit composed of zinc, copper, gold and silver. It is now entering the Mine Development Review Process. This type of mine requires a transportation link and a road to tide water has been identified. This road may have development implications for the Atlin timber supply block (see Map 3). Placer gold is significant near Atlin and jade mining is ongoing in areas east of Highway 37.

4.3.3 Exploration Activity

There are a number of significant projects in the advanced stages of exploration. Mineral exploration activity is measured by Notices of Work and less accurately by estimated expenditure. There were 49 Mineral Notices of Work in 1993 and 22 have been filed to April 30, 1994. The most active areas are the Iskut/Bob Quinn area which is part of the "Golden Triangle"; the Atlin placer gold; the Cassiar gold-asbestos camp (Table Mountain, Taurus); the Golden Bear mine area; Eddontenajon (Red Chris project - gold and copper) and the Lower Taku River (Tulsequah and Polaris Taku projects - gold). Exploration spending in 1993 for the area was about \$5-6 million.

4.3.4 Socio-Economic Implications of Mining

Mining and mineral exploration are important sources of employment for Dease Lake, Atlin, Telegraph Creek, Watson Lake, and Bob Quinn (see Table 4-4). Aboriginal people form a large part of the workforce in both mining related construction and mining activities. However, most mines operate on a fly-in basis from Vancouver, Smithers, Whitehorse, etc. In addition to the employment at the operating mines shown below, approximately 100-150 people are employed on exploration projects on a seasonal basis. Placer gold mining in the Atlin area is typically run by small local operators that seasonally employ 2-10 people.

Table 4-4.

Social and Economic Implications of Existing Mining Operations (1994)

Mine	Principal Mineral	Annual Gross Production (million grams)	Location	Average Employment	Estimated Years of Future Operation
Golden Bear	Gold	1.6	Telegraph Creek	78	1989 - Est. 1995
	Silver	.35			
Premier	Gold	1.2	Stewart	55	1989 - Est. 1994
	Silver	8.8			
Snip	Gold	4.6	Lower Iskut	132	1991 - Est. 2000
	Silver	.25			
Eskay Creek	Gold, Silver		Eskay Creek	240 operations; constr: 200-300	8-9 yrs

Source: January, 1994 Mineral Market Update

4.4 Energy

At present, electric power for the TSA is supplied by four diesel plants at Iskut, Atlin, Dease Lake, and Telegraph Creek. BC Hydro is considering small hydro projects under the Independent Power Producers Program.

Under this program, BC Hydro has contracted with the Tahltan Nation Development Corporation to build a micro hydro project at Hluey Lake (16 km southeast of Dease Lake). BC Hydro will purchase and distribute electricity from the proposed three megawatt plant. Provided the project is successful, its capacity could be increased by an additional three megawatts to serve the communities of Iskut and Telegraph Creek.

Another proposal is a seven megawatt project near Atlin at Surprise Lake. The project has yet to obtain a contract from BC Hydro and meet provincial regulatory requirements. The project would include a dam, 15 kilometres of canals and a 100 kilometre power line to Jake's Corner. Presently on hold, the estimated cost of completion is \$35 million.²⁰

4.4.1 Future Development

Large-scale hydro projects (900-1 000 megawatts) have been identified in the TSA by BC Hydro. However, these potential projects are not under active study. There is no possibility of undertaking these projects in the next decade, with a low probability over the next two decades.²¹

There are linkages between mining, forestry activity, and hydro development. If a mine starts up, or if a wood processing plant becomes feasible due to increased harvest levels, then a small hydro or diesel plant will be required. A large base metal mine would require relatively large electrical generating capacity.

4.5 Future Potential²²

4.5.1 Oil and Gas

At present there is no oil exploration taking place, nor are there any producing reservoirs. However, there are two unexplored basins with hydrocarbon potential within the Cassiar TSA: the northerly extent of the Bowser Basin, and the southern end of the Whitehorse Basin. Reserves are largely speculative at this time.

4.5.2 Geothermal

Geothermal energy is heat generated by natural processes which occur within the earth. It represents a potential source of electric energy. There is a region of high geothermal potential over the Mount Edziza Park and extending southward.

²⁰ "British Columbia Major Projects Inventory", BC Stats, Jan. 1994.

²¹ Taken from conversations with Les McLaren, Ministry of Energy, Mines and Petroleum Resources.

²² Taken from conversations with Maija Finvers and Barry Ryan, Ministry of Energy, Mines, and Petroleum Resources.

4.5.3 Coal

There are no producing coal mines in the area and no exploration activity at this time, but Cassiar boasts three known significant deposits of coal. Mount Klappan (east of Bob Quinn along the Spatsizi Park boundary beside the abandoned rail bed) is a source of high grade metallurgical coal. It was under active consideration in 1987 by Gulf Resources. However, since that period, coal prices have dropped and projects in the north are now uneconomic due to large capital investments required in power and transportation.

The other two deposits, Coal River and Tuya River (north of Telegraph Creek) are low grade thermal coal suitable as a heat source to generate electricity locally. Explored in the early 1980s, Tuya River has large reserves.

It is unlikely that there will be coal mine development within the next 10 years, due to a lack of road or rail access, electric power and lower product prices.

Coal bed methane is another resource that is beginning to receive interest in Alberta and B.C. (in the United States five percent of the gas supply is from coal beds). This process extracts the methane from coal *insitu*. Water is pumped into the coal bed to extract the methane gas; it is then pumped to the surface. The process requires intermediate grade, permeable coal beds located at depth. Deposits such as Tuya and Klappan might be suitable for this type of development.

4.6 Guide Outfitting

The Cassiar TSA is considered to have of the best big game hunting in North America. The opportunity to watch or hunt a wide diversity of wildlife is one of the premier tourism attractions of the region. The extensive areas of wilderness that remain intact in northwestern B.C. maintain this outstanding resource.²³

The industry is dependent on wildlife such as sheep, caribou, and moose. Guides offer hunting, fishing and wildlife viewing products. A very rough estimate of the revenue for the TSA would be in the \$2-3 million dollar range (a 14 day stone sheep hunt can cost up to \$14 000 US; a 10 day moose hunt can cost \$4 000 to \$6 000 US). Most clients are non-residents of Canada. Annual gross revenue for a guiding operation averages around \$90 000. The guiding industry supports a wide employment base. Guides may hire up to 18 people for four months of the year.²⁴

Cassiar has approximately 15 guiding territories with 27 guides operating in those territories; 11 of these guides are resident in the region.

²³ "Natural Based Tourism in Northwestern British Columbia, Summary Report", Industry, Science and Technology Canada and Ministry of Development, Trade and Tourism, 1991.

²⁴ Taken from conversations with Redge Collingwood, Guide.

Table 4-5.
Guide Outfitter Activity (April 1, 1992 to March 31, 1993)

Species	Total Kill	No. Hunters	Days Hunted
Black Bear	39	71	467
Grizzly Bear	33	77	474
Caribou	93	147	761
Deer	0	5	13
Elk	0	1	9
Moose	158	218	1 377
Mountain Sheep	63	83	581
Goat	94	133	662
Wolf	14	97	839
Other	0	2	20
Total	494	834	5 203
Notes: 1. Due to permit administration, days hunted are per management unit and will be greater than actual number of client days spent in the Cassiar TSA. Source: Ministry of Environment, Lands and Parks statistics.			

Providing services in support of the related guiding operations is a large local industry. Services include provisioning and transportation, in addition to the services required to support the horses, equipment and facilities utilized by guides. Active guiding territories operate in the Kechika, Turnagain, Stikine, and Tahltan watersheds, Telegraph Creek, and Atlin and Teslin Lakes, and the Spatsizi Plateau.

4.7 Range Resources

Range resources are utilized by the guiding industry. There is no significant use of range resources for beef markets. On average, each guide has 30 to 60 horses that are grazed on Crown land. Most of the units are allocated at 1 - 250 AUMs (animal unit months). Range units from 250 - 1 000 AUMs are Telegraph, Tanzilla, Cassiar and Atlin East. Kechika is the exception with an allocated 1 752 AUM. Most of the range units are uncommitted. There is little conflict with other land uses, with the exception of Kechika Plateau where there may be a conflict between wildlife grazing with commercial range use.

4.8 Tourism

A study on tourism in the North by Northwest region²⁵ found that the region, which includes Highway 16 and the northwest corner of the province, attracts substantially more numbers of Americans and international/overseas travellers, but considerably fewer

²⁵ "1991 North by Northwest Regional Visitor Survey", North by Northwest Tourism Association of B.C., December, 1991.

Canadians from other provinces when compared to the B.C. average. The higher level of American interest reflects that many are en route to Alaska and the Yukon. The majority (87 percent) of visitors to the area travel by road. The dominant trip purpose for non-resident visitors was touring (43 percent). Natural based tourism accounts for 27 percent of B.C. resident travel to northwestern B.C., far larger than elsewhere in the province.²⁶

Non-residents touring the region tend to stay longer than provincial averages, but they also tend to stay in campgrounds using RVs. Therefore their daily economic impact is less per capita than other types of travellers. Also, due to the lack of facilities in the region, expenditures in restaurants and other tourist facilities are less, while expenditures on primary items such as food and gas are greater.²⁷

Outdoor/adventure travel is a rapidly growing component of the B.C. tourism economy. It includes guide outfitters, fishing lodges or resorts, and adventure activities. Adventure tourism operations are extremely dependent upon a quality resource base since it comprises so much of the product they offer. Activities include backpacking, nature viewing, rafting, cross-country ski touring, trail riding, canoing, and boat touring.²⁸

4.9 Regional Economic Outlook (20 years)

This overview of the TSA's economic sectors has repeatedly referred to the lack of infrastructure. For activities that are dependent on wildlife resources and the maintenance of large wilderness areas, the limited infrastructure offers a competitive advantage over other TSAs in the province, and internationally. However, to industrial developments that require transport of supplies, equipment, personnel, and products to and from the region, the lack of transportation infrastructure and energy supplies can be a significant impediment.

Presently, no major development initiatives were identified that had a high probability of proceeding in the near term that would significantly alter the TSA's economic prospects. If the prospective road to the Tulsequah mineral development were extended to link up with the Alaska Highway, there would be implications for economic activities in the Atlin area. Similarly, a road linking the Iskut Valley mining road to tidewater at Bradfield Canal has been investigated by the State of Alaska.²⁹ Such a road link would offer considerable cost savings to the mining industry exploring and operating in the area, as well as the forest industry.³⁰

²⁶ "Natural Based Tourism in Northwestern British Columbia, Summary Report", Industry, Science and Technology Canada and Ministry of Development, Trade and Tourism, 1991.

²⁷ 1991 North by Northwest Regional Visitor Survey", North by Northwest Tourism Association of B.C., December, 1991.

²⁸ IBID.

²⁹ S.C. Jacoby and Associates, "Bradfield Industrial Road Feasibility Study", submitted to the Alaska Department of Transportation and Public Facilities, September 1989.

³⁰ Clayton Resources Ltd., et al., "A Benefit Cost Analysis of Transportation Alternatives for the Iskut Valley", prepared for the Ministry of Energy, Mines and Petroleum Resources, November 1989.

5.0 CURRENT TSA MANAGEMENT

5.1 Forest Management

The Cassiar TSA was created in 1980. It is composed of six timber supply blocks; only four are considered economically accessible and contribute to the timber harvesting land base (see Map 3).

The Cassiar Forest District office is responsible for planning, identifying (i.e. surveying, cruising) prospective cut blocks, providing access (i.e. roads and bridges), and basic silviculture. Two years are typically required before an area is offered for sale. The full AAC has generally not been sold annually. This is largely due to limited access, and lack of demand in the northeast and northwest parts of the TSA.

Timber harvesting is planned on a four-pass system in the southern portion of the TSA (Iskut and Boundary supply blocks), and on a three-pass system in northern areas of the TSA (Atlin and Dease-Liard supply blocks). In the southern blocks, the focus is on hemlock, spruce, balsam and pine. In the northern blocks, it is on pine, spruce and balsam.

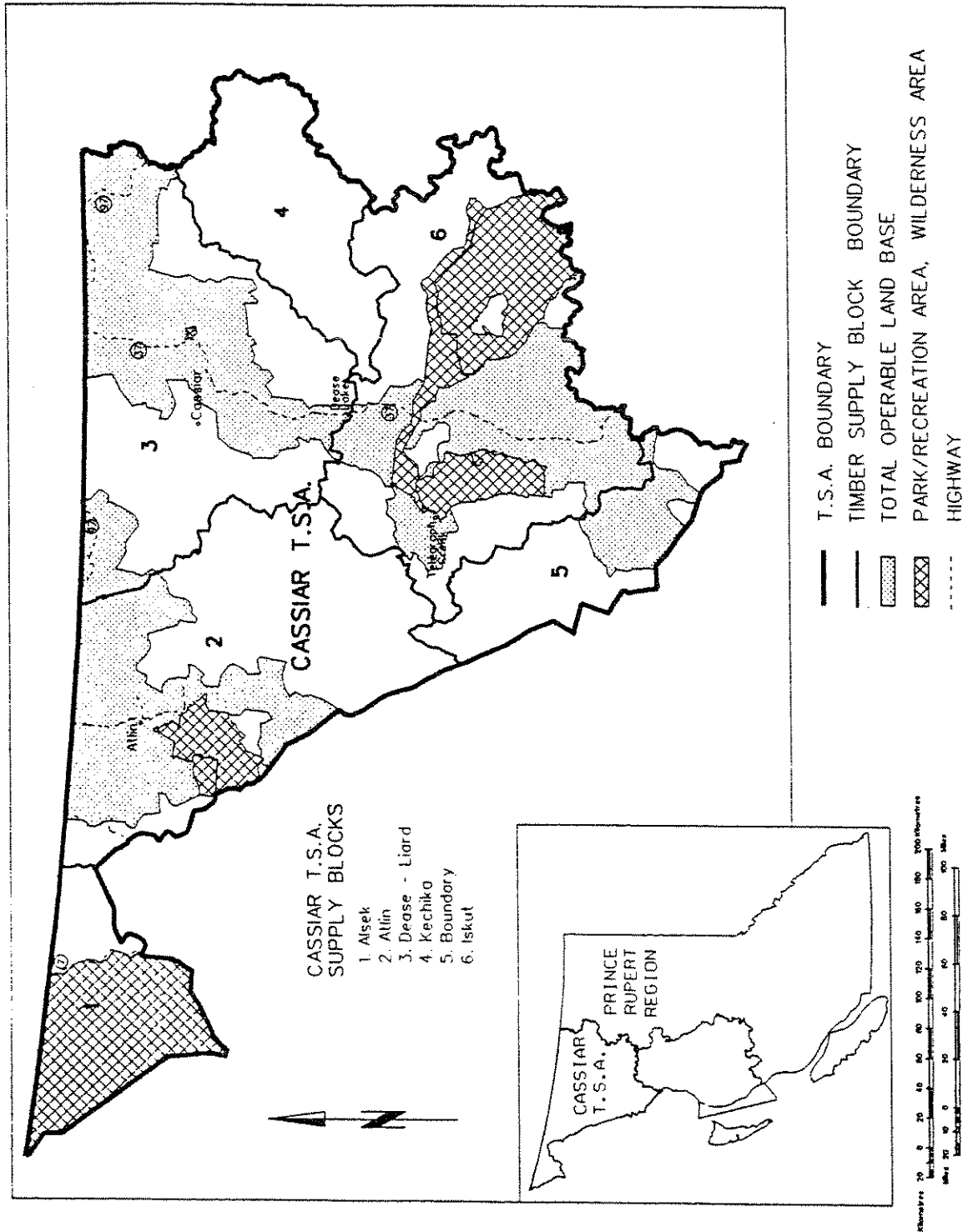
Harvesting activities within view of highway 7 (Atlin), highway 37, and Alaska highway corridors are modified by the need to maintain visual quality objectives, i.e. maintenance of the scenic landscape. A landscape management plan is expected to be completed for the Dease-Liard and Iskut supply blocks in 1994. Where possible, SBFEP sales are offered in proximity to population centres, while sales from the Forest Service Reserve are more remotely located.

Each year the forest service constructs roads to access new forest development areas (11 kilometres are planned in 1994 for the total TSA). The roads are planned to gradually move harvest activity away from the main highway corridors. The TSA and forest industry benefited from the road constructed into the Eskay Creek Gold mine (Iskut and Boundary blocks) as it opened up areas previously considered uneconomic to harvest.

5.2 Government Revenue

In advertising a SBFEP timber sale, an "upset price" is presented. The upset price is the sum of the estimated stumpage value that would apply if the timber were sold under a replaceable licence, plus levies. The levies consist of all or a portion of the costs spent by the Forest Service to develop the parcel (i.e. road construction costs) and post-harvest silviculture. The upset price is the minimum price that will be accepted. Interested parties may be willing to pay more than the upset price, the extra amount is termed the bonus bid. For competitive sales, the timber is awarded to the party submitting the highest bonus bid above the upset price.

Map 3. Total Operable Land Base - Cassiar TSA



Until its expiry in March 1992, OIC #2177 set an upset rate of \$2.34 per cubic metre. As a consequence, the Cassiar Forest District would not recover its total program expenditure unless aggregate bonus bids were sufficient. As of January 1, 1993, the upset rate has been

determined using the Interior Appraisal Manual, and includes silviculture and road building costs. This change in procedures has coincided with favourable market conditions for the timber sales offered. According to the Cassiar Forest District's business plan, profitability is expected to continue under favourable market conditions.

Table 5-1.

Small Business Forest Enterprise Program Revenue (\$/m³)

Year	Upset	Bonus	Total Rate
1989/90	2.23	8.28	10.51
1990/91	1.74	12.27	14.01
1991/92	2.96	10.52	13.48
1992/93	2.24	10.35	12.59
1993/94	14.29	12.60	26.89

Source: Timber Harvesting Branch, SBFEP

5.3 Timber Supply Analysis³¹

The Ministry of Forests has completed a timber supply analysis of the Cassiar TSA to provide information for the AAC determination for the following five years. Given the size of the TSA and the limited quantity of non-timber resource inventories, important values and relationships are not as well known as they are in more developed TSAs. The data used in the Timber Supply Analysis reflects the best information available at the time. See the *Cassiar TSA Timber Supply Analysis* report for a detailed discussion about the assumptions used in the analysis.

The calculation of the Cassiar timber harvesting land base is summarized in table 5-2. It shows that the timber harvesting land base is estimated to be 366 641 hectares. This represents a significant increase over the land base estimated in the previous analysis conducted in 1984. Factors that have led to this increase, include such things as, the inclusion of more species and sites, inclusion of part of the Boundary Supply block that has become accessible via the Eskay Creek mining road, as well as methodological changes.

³¹ Timber Supply Section, Resource Planning Branch, "Cassiar TSA Timber Supply Analysis", August, 1994.

Table 5-2.
Cassiar TSA Timber Harvesting Land Base

Classification	Area (ha)
Total Area ¹	13 413 249
less: Non-Crown land	311 000
Non-forest land	9 434 815
Total Operable Land Base	3 667 434
less: Inoperable land ²	1 838 723
Non-merchantable Stands ³	770 890
Other ⁴	691 180
Timber Harvesting Land Base	366 641

Notes:

1. The actual land base of the TSA is larger than stated - many ecological reserves, parks and recreation areas have been removed from the forest inventory file.
2. Areas defined as unavailable for harvest for access reasons.
3. Areas occupied by timber stands of low volume or non-merchantable species, or with low timber-growing potential.
4. Includes riparian (lake and streamside) and highway buffers, environmentally sensitive areas and existing roads, trails and landings.

Source: Timber Supply Analysis

5.4 Harvest Forecasts

It follows that the increased land base can support a higher level of annual harvest. The long-term harvest is indicated to be in the order of 870 000 cubic metres per year. There are a number of considerations that must be addressed prior to realizing a substantial increase in harvest levels. These include the relatively low level of economic development in the TSA and unproven industry demand for markedly higher levels of wood supply from the Cassiar area.

For the purposes of the analysis presented in the next section, two incremental increases in harvest levels are considered: an incremental increase of 100 000 cubic metres (to 240 000 cubic metres per year), and an incremental increase of 500 000 cubic metres (to 640 000 cubic metres per year). The two harvest levels were selected to broadly illustrate the nature and magnitude of the social and economic implications. The considerations that need to be addressed in attaining these harvest levels will be discussed, as well as their potential effects sketched in the multiple accounts framework presented in the following chapter.

6.0 IMPACT ASSESSMENT

The Cassiar Timber Supply Analysis identifies a harvest level that can potentially be sustained by the forest resource. The results rest on a number of assumptions regarding the biological and economic characteristics of the resource. The discussion that follows identifies important economic and institutional issues that may impinge on the attainment of the harvest potential, hence the economic and social impacts described later in the section.

There are other factors that will influence the level of future AACs, including the settlement of aboriginal land claims and the Protected Areas Strategy. These matters, which directly affect the size of the land base, are not discussed here.

6.1 Other Issues

There are a host of interrelated issues that will affect whether, or when, increased harvest levels might be achieved. The issues have been categorized under three primary headings: industry demand; allocation of the AAC; and administration of timber supply.

6.1.1 Industry demand

As discussed in Section 4.2, wood is made available annually, to registered small business operators and others, on a competitive basis. With respect to volumes made available as part of the Forest Service Reserve (FSR), the maximum price a licensee may be willing to pay for the wood depends on characteristics of the stand, product prices, cost and availability of alternative supplies, and the particular circumstances of the mill at the time the sale is offered. The mix of saw logs and pulp logs in the sale, and the haul distance to the mill (or market) are important determinants in the price one is willing to pay. In recent years, all of the FSR sales have been from the southern area of the TSA (i.e. Bob Quinn and Willow Creek areas) to mills along the Highway 16 corridor. The harvest profile (in 1993) was spruce (47 percent by volume), pine (28 percent), and balsam (21 percent). There is a high proportion of saw log grades in the harvest. In the future, the location of harvesting activity will be encouraged to shift, with the Dease-Liard supply block accounting for a larger share of total harvest than is presently the case. This implies a greater haul distance to southern mills. Also, the harvest profile is anticipated to change such that pine would become the most utilized species (by volume).³² These changing characteristics will influence the value of the proposed sale to an existing mill, presuming a share of the incremental volume continues to be offered on a competitive basis.

Another factor influencing the value of the TSA harvest to a mill in the Highway 16 corridor is the price and availability of alternative wood supplies (i.e. small business wood and wood from private lands). Presently, these mills rely significantly on purchases of saw logs from outside their respective TSAs. To the degree a saw log shortage becomes

³² "Cassiar TSA Timber Supply Analysis", 1994.

increasingly acute, there would be increased competition for the opportunity to harvest wood from the Cassiar TSA. However, over the longer term an acute log shortage would lead to a reduction in processing capacity, as less efficient processors would be unable to pay the "market price" for required supplies. This rationalization of the processing sector would lessen the apparent log shortage. With respect to the longer term, the question is how does the cost of harvesting and transporting the array of stands implicit in a TSA harvest forecast compare relative to other sources available, given that the processing industry would continue to adjust to changing timber supply.

Finally, the value of Cassiar TSA wood to Highway 16 processors is related to prices in the wood products markets. Collectively, these mills sell to a variety of markets (domestic, US, Pacific Rim, and Europe). When the price of products is (or is anticipated to be) high, mills are seeking wood sources, and willing to pay more for logs. Conversely, given low product prices, mills attempt to reduce production costs (e.g. reduce throughput, reduce wood costs and the like).

The above discussion has considered factors relating to the relative value of the TSA's wood supply from the perspective of an existing mill located in the Highway 16 corridor. The perspective of a substantial mill that is largely dependent on the TSA's wood supply (perhaps sited in the TSA or nearby) would be different from this. This is a hypothetical circumstance and it is beyond the scope of this study to assess whether such a concept is economically feasible. However, such a proposition would have to overcome a number of challenges if sited in the TSA. These include a small skilled labour pool (and supporting community infrastructure), energy supply and cost constraints, and distance to suppliers and customers, among others. Over time, provided the TSA's economic infrastructure develops more fully, several of these constraints would fall away.

There are several implications one might draw from this brief discussion of industry demand which influence the economic effects estimated later. First, industry demand for TSA wood is related to several factors. It may be the case that at times the collective influence of these factors would result in an aggregate demand that is less than the volume made available in the TSA. In this case, the actual harvest level could be described as being "demand constrained". This effect would be more apparent as relatively less economically attractive stands are brought to market (i.e. higher cost, lower volume, less valuable species mix, etc.). In other words, income and employment arising from utilizing the TSA forest resource may vary significantly due to market influences. On the other hand, a centralized wood processing facility dependent on TSA wood might create a more stable demand. It would also significantly affect total incomes and employment accruing to the TSA. However, the viability of such a plant may be contingent on the establishment of a broader industrial infrastructure base within the TSA, and other project specific considerations.

6.1.2 Allocation of the AAC and Tenure

The current AAC is allocated by the Minister of Forests between SBFEP and the FSR. In the past, the SBFEP allocation has not been fully taken due to the low level of local wood

requirements. Until there is sustained population growth in the TSA's communities, this will continue to be the case. In the Iskut and Dease-Liard blocks, there may be interest by small business registrants resident outside of the TSA. Nevertheless, it is reasonable to presume that the larger volume sales will continue to be of greatest interest to major licensees.

With respect to incremental harvest volumes, an issue is how might the harvest licence be conveyed to industry: short term timber sales, which are the present policy, and/or replaceable forest licence(s). Cassiar Forest District staff indicated that from time to time parties have expressed an interest in a replaceable licence. The form of tenure directly affects Crown revenue, as a replaceable tenure is not subject to an annual bonus bid.

Finally, given the interest shown by First Nations in forestry matters, they will seek an active role in forest resource management.

6.1.3 Administration of Timber Supply

In order to handle increased harvest volumes, an enhancement of administrative capabilities would be required. The Cassiar Forest District office is presently seeking to fill existing staffing vacancies. However, this is a relatively time consuming process given the lack of accommodation in Dease Lake. It may be the case that the present routine could continue with an incremental increase of 100 000 cubic metres, provided Cassiar Forest District administrative capacity was enhanced appropriately. However, this in itself would likely take at least several years to effect. The present administrative approach would not be workable given a large increase in the harvest level, such as an increase of 500 000 cubic metres. In the latter case, if the volume was made available under replaceable licence(s), a significant portion of the administrative responsibility would be borne by the licensee.

6.2 Economic Impact Assessment

Given the above considerations, two harvest levels were selected for analysis, 240 000 cubic metres per year and 640 000 cubic metres per year. Both of these harvest levels assume local conditions that differ from the current situation.

An hypothetical 100 000 cubic metre increase in the harvest level, to a total of 240 000 cubic metres per year, could conceivably be supported by continuing the present industrial and administrative arrangements. That is, the incremental volume could be made available via SBFEP timber sales and FSR timber sales. Alternatively, a share could be incorporated into a replaceable licence. In any case, it is assumed for the purposes of this analysis that at this level of harvest, the timber would generally be removed from the TSA for further processing.³³

³³ Given the recent growth in Dease Lake, it might be reasonable to anticipate the start-up of a small mill to cater to growing local demand. This pattern is evident from the District's history.

An hypothetical increase in the harvest level to 640 000 cubic metres per year, however, appears to imply industrial and administrative arrangements, and a level of regional development, that is quite different from the current situation. Replaceable licence(s) would be a feature, as the present system of bringing individual timber sales to market would become very onerous. A key uncertainty is whether a processing facility would be sited in the TSA. This is a complex question. Even in the absence of substantial processing capacity, one might expect that a larger share of the economic impacts associated with harvesting would accrue to TSA residents as the expanding sector would offer on-going employment opportunities. If a large mill were established in the TSA, it is assumed that considerable growth in the TSA's industrial infrastructure would be required. That change would likely bring greater social and economic change to the region than the establishment of a wood processing plant. For the purposes of this analysis, it is assumed that a processing plant(s) would eventually locate in the TSA if the harvest level was set at 640 000 cubic metres per year.

6.2.1 Economic Impacts

The analysis first estimates the TSA and provincial economic impacts at the 87 000 cubic metres per year harvest level, which was the average level experienced over the past three years (see Table 4-1). This provides baseline information for estimating the potential impacts at higher harvest levels.

Current Economic Impacts

The employment and income ratios used in this study are presented in Table 6-1. They are drawn from ratios appropriate to the Bulkley TSA.³⁴ These values were used because in recent years successful bidders were from this TSA. The harvesting coefficient was increased (from 0.26 PY per cubic metre to 0.30 PY per cubic metre) to reflect the generally longer haul distance involved with the Cassiar TSA relative to the Bulkley TSA. These ratios are also used to forecast direct provincial employment at the higher harvest levels.

Employment and employment impacts associated with the current average harvest rate of 87 000 cubic metres per year are presented in Table 6-2.

³⁴ Economics and Trade Branch, "Bulkley Timber Supply Area Socio-Economic Analysis", August, 1994.

Table 6-1.
Provincial Employment and Income Ratios

Activity	Employment (PY/000 m ³)
Harvesting ¹	0.30
Processing ²	0.41
Forestry Services ³	0.06

Notes:

1. Harvesting includes road building and maintenance, logging, hauling, and bush mill operations.
2. Processing is sawmilling and maintenance.
3. Forestry Services include silviculture activities and cruise development. Does not include Cassiar Forest District staff.

Table 6-2.
Employment and Employment Income¹ at Current Harvest Level
(87 000 m³/year)

	TSA	Province
Employment (PY²)		
Direct		
Harvesting	7	26
Processing	0	36
Forestry Services	<u>2</u>	<u>5</u>
Sub-Total Direct	9	67
Indirect/Induced	<u>3</u>	<u>100</u>
Total Employment	12	167
Employment Income (millions \$93)		
Direct	\$0.26	\$1.90
Indirect/Induced	<u>\$0.08</u>	<u>\$2.10</u>
Total Income	\$0.34	\$4.00

Notes:

1. See Appendix B for definitions and derivation of the parameter values used to estimate impacts. The results in this table exclude Cassiar Forest District employment and income impacts. At the TSA level, the Forest Service is estimated to support a total of 41 PY, and contribute approximately \$1.3 million in employment income. At the provincial level, total employment and income associated with the Forest Service are estimated to be 75 PY, and \$2.0 million, respectively.
2. A PY is a person-year of employment. It is defined as 1 800 hours of employment per year.

Provincial direct employment is estimated to be 67 PY. Information on the TSA share of this total is anecdotal. Most locally based operations are small, and operate intermittently to service local demand. Also, TSA residents are employed from time to time by non-TSA operators harvesting the larger FSR timber sales. Presently, there are no wood manufacturing establishments in the TSA (bush mill employment is included in harvesting activities). For the purposes of this analysis, estimates of 7 PY related to harvesting activities, and 2 PY of forestry services were considered reasonable.

In addition to the direct effects, two other elements comprise the total economic impacts associated with TSA forest sector activity. First, the purchase of services, materials and supplies by firms harvesting in the TSA, supports employment in those businesses providing the products. Secondly, the spending by employees (in direct, and indirect activities) creates employment in consumer oriented industries. The employment and incomes created by the "ripple effect" is termed the indirect/induced impact in Table 6-2. Because of the small and undiversified character of the TSA economy, a relatively small proportion of these impacts occur locally. The method used here to estimate the magnitude of this ripple effect is presented in Appendix B.

The Cassiar Forest District office in Dease Lake is a substantial source of direct and indirect/induced economic activity. In 1993, staffing at the district office was 30 PY and the total after-tax payroll was \$1.1 million. It is assumed that Ministry of Forests staffing is at least as dependent on government policy, as it is on the level of harvest. For this reason, it has been excluded from the economic impact analysis.

Government revenue at the current harvest level is presented in Table 6-3. It is estimated that the various provincial taxes and fees currently amount to \$2.4 million annually. Revenue derived from timber sales (i.e. stumpage) is the largest single source of revenue.

Table 6-3.

Annual Government Revenue at Current Harvest Level (87 000 m³/year)

	(millions \$93)
British Columbia	
Stumpage ¹	\$1.44
Personal Income Tax ²	0.43
Corporate Taxes ³	0.51
Total B.C.	\$2.38
Canada	
Personal Income Taxes ⁴	\$0.87
Corporate Taxes ⁵	0.08
Total Canada	\$0.95
Total Government	\$3.33

Notes:

Unless otherwise noted, government revenue estimates are average values for the industry as estimated by the Economics and Trade Branch, Ministry of Forests, June 1994.

1. Based on an average revenue from Cassiar TSA timber sales for the 3 year period 1991-1993 of \$16 610 per 1 000 cubic metres.
2. Average value of \$ 4 900 per 1000 cubic metres.
3. Average value of \$ 5 900 per 1000 cubic metres. Includes income tax, sales tax, property tax, electricity tax and capital tax.
4. Average value of \$ 9 955 per 1000 cubic metres.
5. Average value of \$ 913 per 1000 cubic metres. Includes income, excise and withholding taxes.

Provincial Economic Impacts of Increased Harvest Levels

The provincial economic impacts of the current average harvest level and the two illustrative harvest levels are presented in Table 6-4. The direct employment impacts were estimated by applying the employment coefficients presented in Table 6-1. Under this assumption of fixed coefficients, total direct employment increases in direct proportion to the harvest level. The indirect/induced employment effects were estimated using a provincial employment multiplier of 2.5 (i.e. indirect/induced employment is 1.5 times the direct forest sector employment). Given this method, total provincial employment attributable to the TSA harvest (direct plus indirect/induced) would increase from a current estimate of 167 PY, to 460 PY at the intermediate harvest level, and 1 230 PY at the highest harvest level.

Table 6-4.
Provincial Economic Impacts¹

Economic Impact	Harvest Level (m ³ /year)		
	Current 87 000	240 000	640 000
Employment (PY)²			
Direct	67	185	493
Indirect/Induced	100	277	739
Total Employment ³	167	462	1 232
Employment Income (millions \$93)			
Direct	\$1.9	\$5.3	\$14.1
Indirect/Induced	\$2.1	\$5.8	\$15.4
Total Income ⁴	\$4.0	\$11.1	\$29.5
Government Revenue (millions \$93)⁵			
B.C.	\$2.4	\$6.6	\$17.5
Canada	\$0.9	\$2.6	\$7.0
Total Government Revenue	\$3.3	\$9.2	\$24.5

Notes:

1. See Appendix B for definitions and derivation of the parameter values used to estimate impacts.
2. PY is a person year of employment. It is defined as 1 800 hours of employment per year.
3. Not included is Cassiar Forest District employment of 30 PY and associated indirect/induced employment of 45 PY.
4. Not included is Cassiar Forest District employment income of \$1.1 million and associated indirect/induced employment income of \$0.9 million.
5. See table 6-3 for parameter values used to estimate government revenue.

Employment income (after tax) was estimated assuming industry average rates which are presented in Appendix B.

Government revenue was estimated using the coefficients presented in the notes to Table 6-3. That is, like the estimate of employment impacts, fixed coefficients are used to project future values. It is recognized that there are limitations to this approach as the coefficients in reality change over time. In particular, the estimate of provincial stumpage revenue does not incorporate the recent changes in the level of stumpage fees announced in April 1994 as part of the Forest Renewal Plan. These changes are anticipated to significantly increase provincial stumpage revenue provided the higher lumber prices that occurred in 1993 are generally maintained in the future. If the average lumber selling price were to exceed \$350 U.S. per thousand board feet, the average stumpage rate could be 60 percent to 80 percent higher than the rate assumed here. That is, stumpage revenue will be more sensitive to, and demonstrate a greater variation from changes in lumber prices. Given that the changes to the stumpage system have just come into effect, it is not possible to forecast their impact at this time. It might be noted however, that increased stumpage revenue will reduce both provincial and corporate income taxes paid directly by the forest industry as the stumpage payment is an allowable cost for income tax purposes.

TSA Economic Impacts at Increased Harvest Levels

A share of the provincial economic impacts presented in Table 6-4 will be realized within the TSA. It is expected that at increased harvest levels, a greater number of TSA residents will become economically active in forest sector activities. This, in turn will support additional employment through the multiplier effect. These impacts are summarized in Table 6-5, while the assumptions underlying these impacts are discussed below.

At the 240 000 cubic metres per year harvest level, growth in the resident population's participation rate in the industry is assumed. This view is premised on the continued operation of technical training programmes such as the Tahltan Natural Resource Technicians Program. Also, it is reasonable to expect residents (which includes persons moving to the TSA in the future) to be attracted to the expanded employment opportunities offered by the sector. To reflect this trend in greater TSA participation, the TSA's share of direct harvesting employment was increased to 35 percent, from current share of 26 percent. expansion of local processing might also be expected, (i.e. 10 percent share of direct employment was assumed, compared to no TSA processing employment currently). In addition, the TSA's share of forest services was increased to 50 percent. Indirect/induced employment and income effects were estimated assuming the same general structure of the TSA economy that exists today (see Appendix B for technical discussion).

Table 6-5.
TSA Economic Impacts¹

Economic Impact	Harvest Level (m ³ /year)		
	Current 87 000	240 000	640 000
Employment (PY)²			
Direct	9	42	246
Indirect	<u>3</u>	<u>14</u>	<u>103</u>
Total Employment ³	12	56	349
Employment Income (millions \$93)			
Direct	\$0.26	\$1.21	\$7.06
Indirect	<u>\$0.08</u>	<u>\$0.31</u>	<u>\$2.18</u>
Total Employment Income ⁴	\$0.34	\$1.52	\$9.24

Notes:

1. See Appendix B for definitions and derivation of the parameter values used to estimate impacts.
2. A PY is a person-year of employment. It is defined as 1 800 hours of employment per year.
3. Not included is Cassiar Forest District employment of 30 PY and indirect employment of 11 PY.
4. Not included is direct employment income of \$1.1 million and indirect/induced employment income of \$0.2 million associated with the Cassiar Forest District office.

With respect to the 640 000 cubic metres per year harvest level, a key assumption is that considerable development of the TSA's industrial infrastructure would have already taken place when this harvest level is realized. Hence, the resources required to garner a larger share of the activity would be available (i.e. skilled labour, investment capital). In other words, the TSA economy (and communities) that could sustain this harvest level would be larger, and more diversified than is presently the case. To illustrate the effects of this, the TSA's share of direct employment was increased to 50 percent. It is noted that this assumption is what speculative. However, given the size of the TSA, it is felt that areas of the TSA would continue to be accessible at a lower cost from adjacent TSAs (which presumably have become more economically developed as well). Hence, it is expected that a relatively large share of the TSA harvest would continue to be harvested and/or processed by non-TSA residents even at this higher harvest level.

To be consistent with the view of the TSA becoming more broadly developed, the indirect/induced effects were estimated using an "income multiplier" reflective of the present Smithers/Houston economy.³⁵ That is, given the current structure of the TSA economy, one dollar of direct/indirect TSA forest income creates induced income of six cents. Given a more diversified economy, the corresponding value of induced income is 13 cents per dollar of direct income. This, coupled with the larger share of direct and indirect income results in the TSA realizing substantial indirect economic impacts.

³⁵ Garry Horne, Quantitative Analysis Branch, Ministry of Finance & Corporate relations "Recommended Procedure for Estimating Regional Economic Impacts Resulting from Direct Changes in the Forest Sector-An Interim Procedure", March 1994. See Appendix B for a discussion of the application of the method to this study.

6.3 TSA Community Implications

As indicated in the previous section, it has been assumed that the 240 000 cubic metres per year harvest level could be attained given the TSA's present level of economic development. A 640 000 cubic metres per year harvest level would likely be sustained in the context of a more broadly developed economy.

For the purposes of this analysis, it is assumed that at the 240 000 cubic metres per year harvest level, timber will continue to be removed from the TSA for further processing. The TSA's share of total employment has been estimated to be 56 PY of employment (excluding Forest Service employment). of the expected net outflows in population, especially in younger people looking for work, could be mitigated by such an increase in employment opportunities. The expansion of Dease Lake that is currently driven by the closure of the Cassiar mine may be aided by an increase in public sector employment. It seems reasonable that this economic activity would drive an increase in services available in the communities such as banking, social services and educational institutions. The growth of the other communities in the TSA will be a function of their geographic proximity to the primary harvesting activity.

An increase in the harvest level, to 640 000 cubic metres per year, would require a level of regional development that is quite different from that of today's. Assuming the establishment in the TSA of a processing plant(s), the prerequisite industrial infrastructure would bring greater social and economic change to the region than the establishment of the wood processing plant itself. Total employment in the TSA under this harvest level would reach 349, representing an increase of 337 PY over the current situation (excluding Forest Service employment). What this would mean to individual communities is difficult to assess, except to say that any community which ultimately developed a large wood processing facility would most likely experience the greatest increase in population, infrastructure, private industry and social services. It is likely that the social impacts of an increase in the economy of the region would be spread over a number of years due to the linkages with prerequisite development in infrastructure.

6.4 TSA Aboriginal Community Implications

The Cassiar Forest District office, through the Tahltan Tribal Council, has provided the Tahltan and Iskut First Nations groups with several 2 000 cubic metre direct award Timber Sale Licenses. The Kaska Tribal Council has received two similar awards. First Nations hope to use these awards to develop their respective forest industry skills. All First Nations groups have expressed an interest in obtaining more long-term tenures with respect to the forest resource. Presently, the Tahltan Tribal Council and the Taku River Tlingit are investigating the feasibility of applying for a renewable forest licence, while the Kaskas wish to pursue a co-management agreement with the province. If timber volumes available for harvest were to increase, First Nations would desire access to of that resource.

Many aboriginal people in the TSA are still dependent upon a traditional lifestyle; increases in harvest activity may conflict with those values and activities. Such potential for conflicts needs to be explored in consultation with First Nations. That being said, more employment opportunities nearer to these isolated communities may bring increases in services, and add to community stability.

6.5 Environmental Implications

The environmental implications of harvests at 240 000 and 640 000 cubic metres per year are discussed together as it is assumed that greater levels of harvest will cause a proportionate increase in the impacts on the environment. Because of the limited quantity of non-timber resource inventory information in the Cassiar TSA it is impossible to relate discrete levels of harvest to threshold populations or effects. In general, however, the value of the area from an environmental perspective is based upon its abundance of large expanses of pristine wilderness.

6.5.1 Forest Resource³⁶

Forestry activities such as harvesting and intensive silviculture may have an effect on the age of forest stands, and the species diversity within a forest. An increase in harvest levels will convert mature forests to immature forests. As a result, species that use these old growth habitats or reach maximum abundance in late successional forests will decline. Intensive silviculture can have the same effect by reducing species types. Harvesting also increases the fragmentation of the ecosystems. The impacts of increased harvesting on ecosystems are:

- ♦ *old growth forest* - the shift in age class distribution of forests from mature old growth to managed forests will reduce this habitat type.
- ♦ *ungulate winter range* - goats are very vulnerable to disturbance, deer winter ranges need to be maintained over the long-term.
- ♦ *riparian habitat* - riparian habitats support many species groups. Harvesting in valley bottom areas could fragment and reduce viability of riparian ecosystems.
- ♦ *wetlands* - the habitats are extremely vulnerable to changes in hydrological processes caused by upstream harvesting.

Suggested mitigation:

- ♦ Increase rotation periods so that second growth stands imitate old growth habitat;
- ♦ Maintain forest structure by leaving random stands of forest;
- ♦ Manage critical habitats (riparian, wetlands, and winter range) in the Northern Boreal Mountains Ecoprovince.

³⁶ Information taken from conversations with Lawrence Turney, Forest Ecosystem Specialist, Ministry of Environment, Lands and Parks.

6.5.2 Fish and Wildlife Resources³⁷

Wildlife habitat can be managed under harvesting guidelines, however, the major problem is increased road access to these habitats, which may result in an increase in aboriginal sustenance activities and unregulated kills (i.e. poaching and increased predator activity). Similarly, fish populations are sensitive to possible over fishing brought about by road access.

Suggested mitigation:

- ♦ Wildlife populations will require habitat protection in order to maintain present levels. This would require partial cutting or retention of riparian zones and corridors, and the creation of forest ecosystem networks connecting reserves at the regional, landscape and watershed level;
- ♦ Stringent application of streamside and watershed management for fish habitat as outlined in the Fish and Forestry Guidelines should reduce the impacts of increased sedimentation. Highest value fisheries streams or stream reaches (Class A) require the highest level of management effort from both fisheries and forest managers to maintain productive capabilities.³⁸
- ♦ While the TSA enjoys a great diversity of wildlife, knowledge about many species is limited. Strategies outlined in *Provincial Wildlife Strategy to 2001* require inventory and research information. An understanding of the interrelationships among species and their habitats is essential to planning and managing for biodiversity.³⁹

6.5.3 Parks⁴⁰

The impacts of increased road access to wilderness parks brought about by increased forest harvesting are a concern due to the potential for unregulated access to parks.

Suggested mitigation:

- ♦ Deactivate roads to reduce access to sensitive areas;
- ♦ Create buffer zones near park boundaries to take into account the dynamics of animal habitats and to preserve the wilderness nature of these parks.

³⁷ IBID.

³⁸ "British Columbia Coastal Fisheries/Forestry Guidelines", B.C. Ministry of Forests, B.C. Ministry of Environment, Lands and Parks, Federal Department of Fisheries and Oceans, Council of Forest Industries; July 1993.

³⁹ "Maintaining British Columbia's Wildlife Heritage, Provincial Wildlife Strategy to 2001"; Ministry of Environment, Lands and Parks, March 1994.

⁴⁰ Taken from conversations with Jim Hawes, Ministry of Environment, Lands, and Parks.

6.5.4 Guiding

The guiding industry in principle opposes increased harvest activity. The conflict arises over the development of road networks. Roads may result in increased predation, for example wolf on caribou, and may facilitate increases in unregulated kills.⁴¹

6.5.5 Recreation

activities such as backpacking or wilderness canoeing require specific conditions such as intact wildlife habitat, or good water quality in undisturbed viewsheds. These types of activities that rely on wilderness settings are most sensitive to increased harvest levels. Other activities such as snowmobiling, or four wheel driving may take place in a very wide range of settings, provided suitable access is available.⁴²

⁴¹ Taken from conversations with Redge Collingwood, guide.

⁴² "Outdoor Recreation in British Columbia: Supply and Demand Issues and Trends", A Protected Areas Strategy for British Columbia, Feb, 1994.

7.0 CONCLUSIONS

The major findings and conclusions of the report are:

- ♦ The Cassiar TSA is a vast region with small widely scattered population centres and under developed infrastructure. It has environmental and economic resources of provincial and international significance.
- ♦ Forest industry activity has been sporadic. A small business sector caters to local demands. Larger volumes are sold from the Forest Service Reserve by competitive bid. Recently most of this volume has been processed in mills located on the Highway 16 corridor from Houston to Terrace.
- ♦ The annual harvest is generally well below the TSA's AAC. This in large part reflects the low level of industry demand for TSA wood fibre. There are no replaceable forest licences in the TSA. Harvest rights are conveyed through short term timber sales.
- ♦ The Timber Supply Analysis indicates that a significant increase in the annual harvest level may be feasible, but there is considerable uncertainty around the components of the analysis. A long-term harvest rate of 870 000 cubic metres per year is indicated, as compared to an average harvest level of 87 000 cubic metres per year over the past three years.
- ♦ Given the lack of developed infrastructure, and other constraints, further economic development in the TSA is required before substantially higher harvest levels become logistically feasible.
- ♦ To demonstrate the economic, community and environmental implications of increases harvest levels, the potential effects of harvest levels at 240 000 cubic metres per year and 640 000 cubic metres per year were assessed. The economic effects are summarized in Table 7-1.

Economic Impacts

- ♦ For the purposes of projecting economic impacts at the lower harvest level, it was assumed that this could be realized given the TSA's present level of economic development. The increase in harvest would create employment opportunities for TSA residents, however, these would be relatively limited. A key assumption is that most of the volume would leave the TSA for processing.
- ♦ The higher harvest level presumes significant growth in the TSA economy. This is necessary to provide the industrial infrastructure necessary to support a processing plant within or near the TSA. A processing facility, coupled with the more diverse economy, suggests the TSA would capture a larger share of economic effects.

Table 7-1.
Annual Economic Impacts¹

Economic Impact	Harvest Level (m ³ /year)		
	Current 87 000	240 000	640 000
Employment (PY)			
<u>TSA</u>			
Direct	9	42	246
Indirect/Induced	3	14	103
Total TSA Employment	12	56	349
<u>Province</u>			
Direct	67	185	493
Indirect/Induced	100	277	739
Total Provincial Employment	167	462	1 232
Employment Income (millions \$93)			
Total TSA Employment Income	\$34	\$1.52	\$9.24
Total Prov'l Employment Income	\$4.00	\$11.10	\$29.50
Government Revenue (millions \$93)			
British Columbia	\$2.4	\$6.6	\$17.5
Canada	\$0.9	\$2.6	\$7.0
Total Government Revenue	\$3.3	\$9.2	\$24.5

Notes:

1. Not included in the total impacts are the effects of Ministry of Forests employment. At the TSA level, the Cassiar Forest District office supports a total of 41 PY, and contributes approximately \$1.3 million in employment income. At the provincial level, the total employment and income associated with the Cassiar Forest District office is estimated to be 75 PY, and \$2.0 million, respectively.

Community Implications

- ♦ The social implications on communities within the TSA depend upon the level of regional economic growth achieved. Given the 240 000 cubic metres per year scenario, because most of the processing remains outside the TSA, the direct impacts are subtle. The 640 000 cubic metres per year harvest level assumes that significant economic growth would have been achieved. The communities realize the growth may be quite different from their respective status today (i.e. increased population, higher levels of community services, better infrastructure).

First Nations Implications

- ♦ First Nations will pursue an active role in forest resource management and use of resources within their traditional lands. Higher harvest levels may lead to more opportunities for First Nations involvement in the forest industry. Specific impacts on First Nations communities would depend on their desired role and geographic

proximity to forestry activity. First Nations will have to weigh the economic benefits associated with involvement in the forest industry against any adverse impacts on their traditional way of life.

Environment Implications

- ♦ From an environmental perspective, any increase in harvest levels produces adverse implications related to increased road access to what had been unroaded wilderness. This has particular significance in the TSA, where the largely undisturbed state of the natural environment is valued by residents and non-residents alike. A relatively lower harvest level provides the opportunity to collect the necessary inventory information that would facilitate land use management planning.

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Appendix B. Technical Description of Economic Impact Methods and Parameter Values

A relatively straightforward model is used to estimate the total economic impact associated with the current level of harvest and the alternative harvest levels. The first step is to estimate the employment and income directly associated with forest sector activities. Based on these direct values the second step is to estimate indirect/induced economic impacts. The background detail of this work is provided in this appendix.

Direct Employment and Income Impacts

The typical approach in SEA analyses has been to conduct a TSA industry survey to determine the average labour/wood harvested ratio. This ratio can then be used to estimate current TSA employment, as well as provide a rough estimate of employment levels at other harvest levels under consideration. A different approach was required for the Cassiar TSA given that the resident "industry" is very informal (i.e. bush mills intermittently harvesting under small business licences), with most of the harvest extracted by non-TSA operators. Since most of the timber sales in recent years have been taken by major licensees with mills located in the Bulkley TSA, the employment coefficients derived from an industry survey of that TSA were used here. These are presented in Table 6-1. The coefficients remain constant for the alternative harvest levels.

Direct incomes were estimated based on average 1993 before tax earnings as reported by Statistics Canada. These were (per PY):

Harvesting	\$ 36 640
Processing	\$ 28 200
Forestry services	\$ 25 410

It is assumed that the TSA share of direct impacts changes from current values; this reflects growth in local participation as the industry is assumed to become more fully established under higher harvest levels. The TSA shares used to determine the TSA direct impacts are summarized in Table B-1.

Table B-1.
TSA shares of Direct Impacts (expressed as a percent of provincial direct)

TSA share	Current	240 000 m ³	640 000 m ³
Harvesting	27%	35%	50%
Processing	0%	10%	50%
Forest Services	38%	50%	50%

Appendix C. Glossary of Terms

Allowable Annual Cut (AAC)	The volume of timber which may be cut each year from a forest management unit, i.e. a Timber Supply Area), set by the Chief Forester in accordance with Section 7.0 of the <i>Forest Act</i> . It equals roughly the amount of new growth produced by the forest each year, including a proportion of the mature volume minus deductions for losses due to fire, insects, and disease.
Age-class	Any interval into which the age range of trees, forests, stands, or forest types is divided for classification. Forest inventories commonly group trees into 20 year age classes.
Basic Silviculture	The harvesting methods and silviculture operations, including seed collecting, site preparation, artificial and natural regeneration, brushing, spacing and stand tending, and other operations, prescribed for the purpose of establishing a free-growing crop of trees of a commercially valuable species.
Biodiversity	An umbrella term that represents the full variety of life. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.
Direct Employment and Employment Income Impacts	Effects on forestry sector (harvesting, hauling, silviculture and processing) and employment and income resulting from changes in the timber harvest level.
Ecosystem	A functional unit consisting of all living organisms (plants, animals, and microbes) in a given area, and all non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be any size - a log, pond, field, forest, or an earth's biosphere - but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, for example, forest ecosystem.
Environmentally Sensitive Areas (ESAs)	Areas requiring special management attention to protect important scenic values, fish and wildlife resources, historical and cultural values, and other natural systems or processes. ESAs for forestry include potentially fragile, unstable soils that may deteriorate unacceptably after forest harvesting, and areas of high value to non-timber resources such as fisheries, wildlife, water, and recreation.
Forest Practices Code	A package of legislation, regulations, and standards that govern forest practices in British Columbia.
Forest Licence	A type of forest tenure which provides the holder with the right to harvest a specified volume of timber from within a TSA. It also bestows on the licence holder an obligation to reforest the land. The licence has a term of 15 to 20 years, and is generally replaceable every five years.
Forest Service Reserve	An apportionment surplus which is made available to the forest district manager for use at their discretion. Normally, the reserve comprises approximately 1 percent of the total AAC.
Indirect and Induced Employment and Income Impacts	Spin-off effects on related sectors or industries which supply materials or equipment to the forestry sector. Also includes impacts from the spending of forestry-related employment income.
Inoperable lands	Lands that are unsuited for timber production now and in the foreseeable future by virtue of their elevation, inaccessible location, low value of timber, small size of timber stands, steep or unstable soils that cannot be harvested without serious and irreversible damage to the soil or water resources, or designation as parks, wilderness areas, or other uses incompatible with timber production.

Multiplier	Ratio of total income or employment impacts relative to direct impacts. Multipliers are generally greater than 1.0 since 1.0 represents the direct component.
Multiple Pass Harvesting System	Integrated forest management guidelines (Interior Regional Timber Harvesting Guidelines for the Interior Portion of the Prince Rupert Forest Region) specify that previously harvested forest stands must reach a desired condition, or green-up (three meters in height) before adjacent stands may be harvested. The guidelines, therefore, require multiple passes or harvests in order to completely liquidate the mature timber within a specified management zone. In the Cassiar TSA, the northern portions of the TSA are managed under a 4-pass system where no more than 25 percent of the area is permitted to be less than the green-up period. The southern portions are managed under a 3-pass system where no more than 33 percent of the area is permitted to be less than green-up. Green-up ages and regeneration delays within the Cassiar TSA are approximately 20 years. Thus, mature timber within specified management zones would be liquidated in 80 years in the northern portions of the TSA, and in 60 years in the southern portions.
Protected Areas Strategy (PAS)	A process initiated by the government of British Columbia aimed at protecting representative examples of the major ecosystems across the province's 199 eco-sections, as well as, special natural, cultural and recreational features. Under the PAS, the provincial government is committed to developing and expanding a protected areas system that will comprise 12 percent of British Columbia. The 12 percent target is applied at the biogeoclimatic level within each eco-section.
Person-year (PY)	A standard measure of employment that takes into account part-time or seasonal full-time work. For example, if an employee works full-time for six months (i.e. one half of a year), he or she accounts for 0.50 PY of employment. Using PY allows different types of employment to be compared on a similar basis.
Riparian Zone	The land adjacent to the normal high water line in a stream, river, lake, or pond and extending to the portion of land that is influenced by the presence of the adjacent ponded or channelled water. Riparian areas typically exemplify a rich and diverse vegetative mosaic reflecting the influence of available surface water.
Silviculture	The art of producing and tending a forest, and the application of the knowledge of silvics in the treatment of a forest; the theory and practice of controlling forest establishment, composition and growth.
Small Business Forest Enterprise Program (SBFEP)	This program permits the Forest Service to sell Crown timber competitively to individuals and corporations who are registered in the SBFEP. Approximately 10 percent of the province's timber allocation is directed towards this program.
Timber Harvesting Land Base	The portion of the total land area of a management unit considered to contribute to, and be available for long-term timber supply.
Timber Sale Licence	A type of forest tenure offered to small business loggers and to timber processors who qualify for registration under the Small Business Forest Enterprise Program. These licences are short-term in nature (under ten years), and allow the tenure holder to harvest the timber within a specific area within a TSA. Under this form of tenure the Forest Service assumes a lot of the responsibility for forest management, including development planning, road construction to the licence area, timber cruising, timber sale layout, basic silviculture and program administration.
Timber Supply Area (TSA)	An integrated resource management unit established in accordance with Area Section of the Forest Act.