

**Quesnel Timber Supply Area
Socio-Economic Analysis**

March 1995

**Economics and Trade Branch²⁴
British Columbia Ministry of Forests**

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Acknowledgment

The assistance of Price Waterhouse in data collection is acknowledged. Analysis and conclusions presented in the report are the sole responsibility of the Ministry of Forests.

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Executive Summary

The Socio-Economic Analysis of the Quesnel Timber Supply Area (TSA) is one of four reports prepared as part of the Timber Supply Review process and Allowable Annual Cut (AAC) determination. The purpose of this analysis is to illustrate the social and economic impacts of timber harvest decisions, which might result from the Timber Supply Review, and to generate public comment.

Current Socio-Economic Profile

- The Quesnel TSA is located in the Cariboo Forest Region, and is under the joint administration of the Quesnel Forest District and Cariboo Forest Region.
- In 1991, the population of the TSA was 22 860 persons, the City of Quesnel and adjacent communities of Red Bluff, Barlow Creek and Bouchie Lake form the largest populated area with 8179 people. Other communities in the TSA include Nazko, Wells, Kersley, and several other small centres.
- Six First Nations Bands have historical interest in the TSA, four of which have reserves located in the TSA. The bands have 1598 members, of whom 1127 live on reserves. Approximately five percent of the adult population available for work are employed in the forest industry. Two of the bands (Soda Creek and Ulkatcho) do not reside within the TSA boundaries.
- First Nations people view settling treaty negotiations of paramount importance. They are generally opposed to participating in land use planning exercises until treaty negotiations are settled.
- Major employers in the TSA are (in order of significance) the forest industry, the supply and service sector¹, the public sector, tourism, agriculture and mining.
- In addition to employment income, the economy of the TSA is supported by investment income, unemployment insurance, pension income and other government transfer payments.
- The forest industry directly and indirectly accounts for approximately 35 percent of TSA employment. The major employers include Cariboo Pulp and Paper, C&C Wood Products, Quesnel River Pulp, Slocan Forest Products, Tolko Industries, Weldwood of Canada, and West Fraser Mills. In 1993, these companies provided employment for 2265 people, including a portion of sawmill and pulp mill employment related to fibre supply from outside the TSA and the bulk of the value-added employment. In addition,

¹ Supply and services includes parts of manufacturing, construction and transportation not attributable to the major basic sectors, fishing and trapping, and the non-basic sector.

other smaller secondary wood products manufacturing sectors accounted for about 45 person years (PY) of employment.

- In 1993, the combined sales revenues of the forest industry in the Quesnel TSA exceeded \$570 million. This amount includes revenue associated with fibre supply from outside the TSA.
- In 1993, the forest industry related to the Quesnel TSA harvest generated \$96 million in provincial and federal government revenues. This figure reflects the 1993 situation, thus does not include the higher stumpage rates that went into effect in May of 1994. Since that time stumpage rates have increased by approximately 80 percent.
- Tourism directly and indirectly accounts for approximately five percent of total TSA employment. The area's main attraction are the wide variety of outdoor recreation activities, and its vast, rolling scenic landscape.
- Interviewees for the study believe that there is opportunity for growth in tourism and recreation, particularly in the areas of sport fishing, wilderness tourism, and winter activities such as cross-country skiing, snowmobiling and sled-dog racing.
- Together, the agriculture and mining sectors account for approximately 6 percent of total TSA employment.

Environmental Setting

- The TSA is characterized by flat rolling hills in the west to steeper terrain rising to the Cariboo Mountains in the east.
- The TSA has a wide variety of wildlife species because of its diverse soils, climates, and topography. There are provincially significant populations of caribou and the American Peregrine Falcon.
- In the ecosections represented in the TSA, approximately 22 species (mammals, birds, reptiles, amphibians, fish and vascular plants) are candidates for designation as endangered and a further 26 species are considered sensitive or vulnerable. These species may be found within the Quesnel TSA.
- Many of the streams in the TSA have either critical or moderate value as spawning and rearing habitats.

Current TSA Profile

- The Quesnel TSA covers approximately 1.65 million hectares. The B.C. Ministry of Forests reports that 61 percent of the total land base is available for long-term harvesting under current forest management practices. This estimate does not consider the settlement of treaty negotiations, land use planning initiatives such as the Cariboo-Chilcotin Land Use Plan, and changing forest management practices.
- The current allowable annual cut (AAC) is 2 350 000 cubic metres per year and is apportioned to a coniferous AAC of 2 000 000 cubic metres per year, problem forest types AAC of 300 000 cubic metres per year, and deciduous AAC of 50 000 cubic metres per year.

This timber supply review did not analyze woodlot licences (34 500 cubic metres) and the deciduous component (50 000 cubic metres), as a result the AAC assessed is 2 265 500. Subsequently, this report discusses socio-economic impacts of TSA harvested timber related to this AAC.

Socio-Economic Impacts of Timber Harvest Levels

- To provide a basis for discussion, the Ministry of Forests chose three scenarios for this analysis: Scenario 1 for a detailed, long-term, analysis and two additional scenarios for a short-term review to illustrate the sensitivity of jobs, income and revenues to changing harvest levels. These scenarios are provided as illustrations only and do not indicate preferred options.

Scenario 1

- Scenario 1 maintains the current harvest rate of 2 265 500 cubic metres per year for the first seven decades, declining approximately ten percent in Decade 8 and approximately four percent in the following decade to the long-term harvest level of 1 955 500 cubic metres per year.

Scenario 2

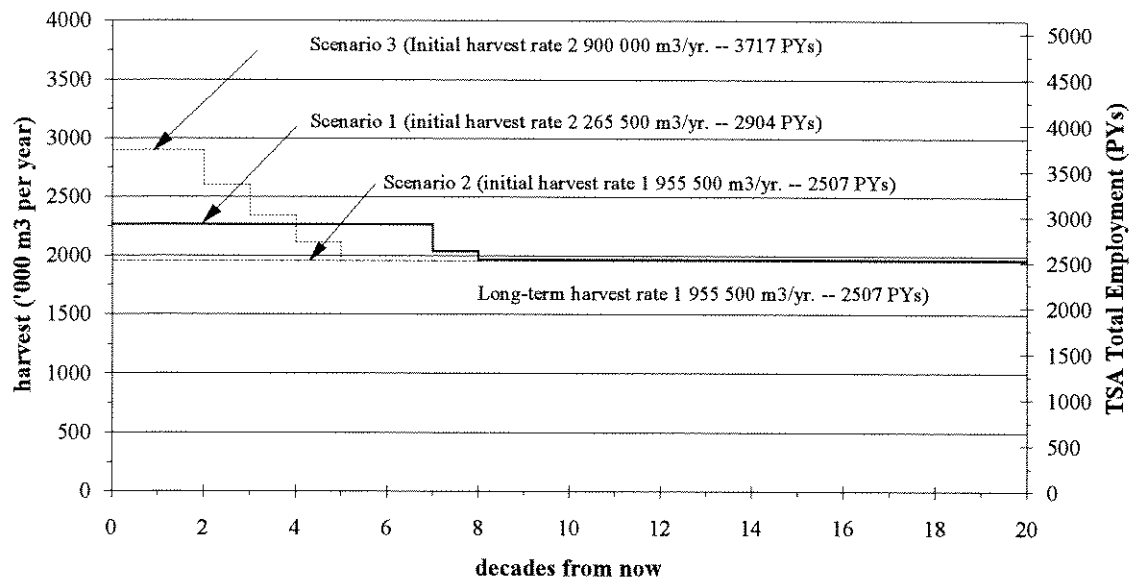
- Scenario 2 reduces the harvest rate immediately to the long-term harvest level of 1 955 500 cubic metres per year.

Scenario 3

- Scenario 3 begins at an initial rate of 2 900 000 cubic metres per year for the first two decades, declines by approximately ten percent in Decades 3 and 4 to the long-term harvest level of 1 955 500 cubic metres per year.

The following figure shows the three harvest scenarios and the associated TSA total employment levels.

Figure ES-1: Quesnel TSA Harvest Forecasts and Total TSA Employment



The socio-economic impacts of these scenarios are summarized in the following table.

Table E1: Economic and Community Impacts of the Quesnel TSA Harvest Scenarios.

	Scenario 1			Scenario 2	Scenario 3				
	Decades 1-7	Decade 8	Decades 9-20	Decades 1-20	Decades 1-2	Decades 3	Decade 4	Decade 5	Decades 6-20
Harvest (000m ³)	2266	2036	1956	1956	2900	2606	2346	2116	1956
TSA Level Economic Impacts									
Direct Forestry Employment (PYs)	2017	1812	1741	1741	2581	2319	2088	1883	1741
Total Forest Employment	2904	2609	2507	2507	3717	3340	3007	2712	2507
Direct Forestry Income (\$millions)	65.6	58.9	56.6	56.6	83.9	75.4	67.9	61.2	56.6
Total Forestry Income	85.4	76.7	73.7	73.7	109.3	98.2	88.4	79.7	73.7
Provincial Level Economic Impacts									
Direct Forestry Employment (PYs)	2062	1853	1780	1780	2639	2371	2135	1926	1780
Total Forestry Employment	5155	4632	4450	4450	6598	5929	5337	4814	4450
Direct Forestry Income (\$ millions)	67.2	60.4	58.0	58.0	86.1	77.3	69.6	62.8	58.0
Total Forestry Income	136.2	122.4	117.6	117.6	174.4	156.7	141.0	127.2	117.6
Government Revenues									
Provincial Revenues	64.0	57.5	55.3	55.3	81.9	73.6	66.3	59.8	55.3
Federal Revenues	32.0	28.8	27.6	27.6	41.0	36.8	33.1	29.9	27.6
Community Impacts	Employment stability for the first seven decades, given the continuation of current forestry/employment relationships. Scenario 1 would allow groups ample time to prepare for potential community and individual stresses.			Immediate job impacts lowering TSA forestry related PYs by 14%. Would create individual and community stresses. Little time to plan for community impacts.	Initial gains in employment would help increase local business activity in the short-term. After the second decade, employment would begin to decline and would create community and individual stresses, five decades before Scenario 1. In the long-term, each scenario would result in the same number of job losses from current forestry employment levels.				

1.0 Introduction

1.1 Background

The British Columbia Forest Service is conducting a timber supply review to assist the Chief Forester in setting allowable annual cut (AAC) levels. The review examines the quantity of timber available for harvesting in timber supply areas (TSAs) if current management practices continue. Four documents are being prepared for each of the province's 36 TSAs. Two technical documents, a Timber Supply Analysis and a Socio-Economic Analysis provide information on the timber supply and the social, environmental, and economic implications of changing timber harvest levels. A Public Discussion Paper summarizes the technical information and provides a focus for public discussion of issues surrounding timber harvest levels. A fourth report describes the rationale behind the Chief Forester's AAC decision.

This report, the *Quesnel TSA Socio-Economic Analysis* describes the economy, physical environment, and land use issues within the Quesnel TSA, and the socio-economic and environmental implications of changing the current Quesnel TSA timber harvest level.

The *Quesnel TSA Timber Supply Analysis* report (December 1994) focuses on the base timber harvesting forecast² developed in the timber supply analysis. Other harvesting forecasts are also examined, but discussion about their social, economic, and environmental implications is limited to the short-term. The timber harvesting forecasts discussed in this study are not meant to suggest a preferred AAC level, nor will they be the only options considered in the final AAC determination.

The report organizes the effects of changing timber harvest levels into five categories, two of which are quantitative in nature (economic), while the other three are qualitative discussions (social and environmental).

² A timber harvesting forecast represents the flow of potential timber harvests over time. It measures the maximum timber supply that can be realised, over time, for a specified land base and set of management assumptions. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions. The base timber harvest forecast represents the flow of potential timber harvests that best meet the following criteria: (a) begins as close to the current AAC as possible, and (b) declines/increases to the long-term harvest level at a gradual rate of change.

Table 1: Socio-Economic Analysis Components

Economic Impacts	
1 <i>Employment and Income</i>	• identifies direct and indirect/induced effects on TSA and provincial employment and employment income over the short and long-term.
2 <i>Government Revenues</i>	• identifies impacts on government revenues derived from the timber resource.
Social and Environmental Implications	
3 <i>Community</i>	• discusses possible effects on local residents/families who lose their jobs, and pressures they may place on existing social services infrastructure.
4 <i>First Nations</i>	• discusses possible effects on local aboriginal communities, and identifies potential areas of conflict with aboriginal cultural values and political aspirations.
5 <i>Environment</i>	• discusses possible effects on forest ecosystems.

Information presented in this report was collected over a three month period (July 1994 - September 1994) and is intended to provide an overview rather than a detailed profile of the area. Most of the information in this report was collected through interviews (refer to Appendix C) and a review of published reference material.

1.2 Report Structure

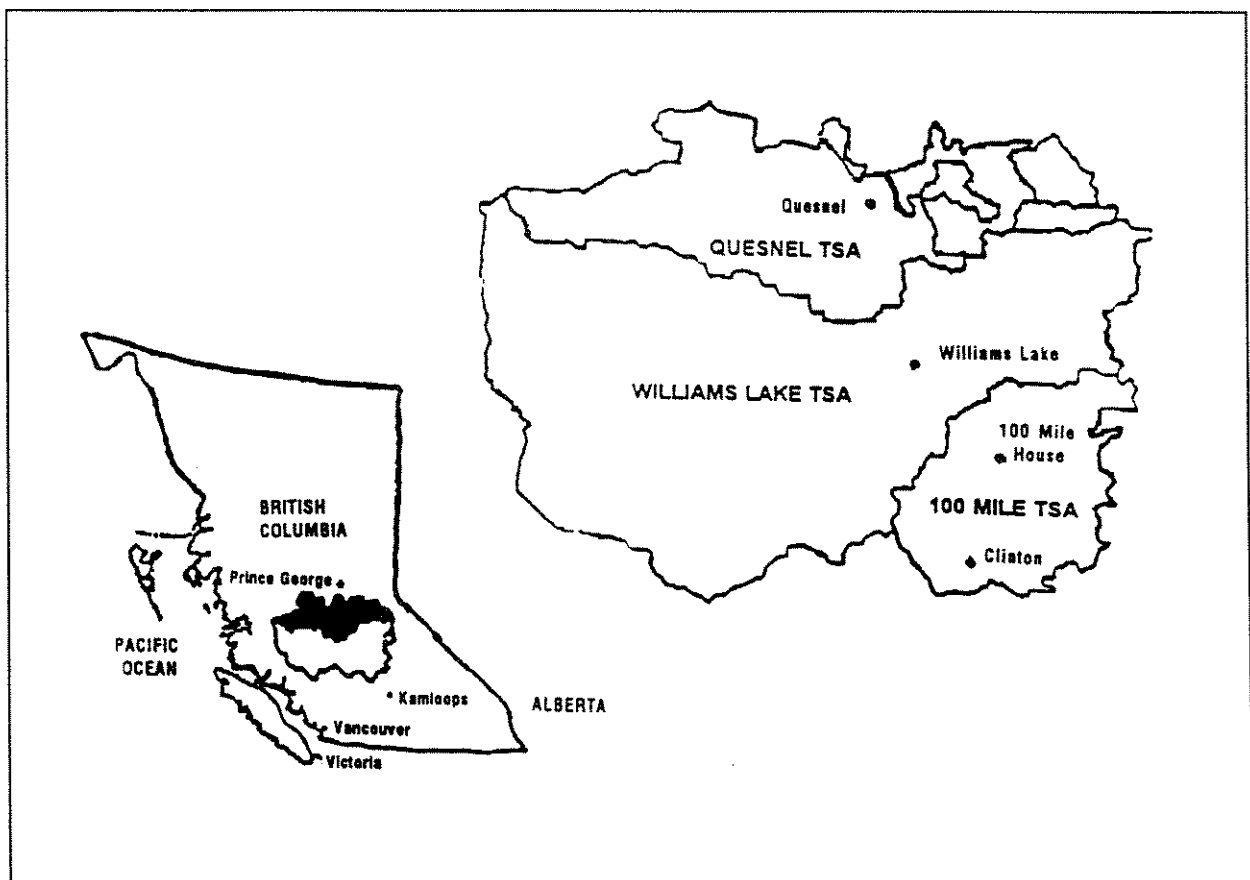
The report is organized into seven chapters. Chapter 2 describes the communities and economy of the Quesnel TSA. Chapter 3 discusses the environmental setting. In chapter 4, the report narrows its focus to the forestry sector of the Quesnel TSA. It reviews the timber harvesting land base and the guidelines that direct forest management, identifies the level of employment associated with the current AAC level, and describes the timber harvesting forecasts against which the current situation is compared. Chapters 5 and 6 examine the economic, social, and environmental implications of the harvesting forecasts. Chapter 7 presents a summary and conclusion. Appendices include a glossary, discussion of impact assessment methodology, list of contacts, references, and an incremental impact table.

2.0 Socio-Economic Profile of the Quesnel TSA

2.1 General Area Profile

The Quesnel Timber Supply Area (TSA) is one of three TSAs in the Cariboo Forest Region and is under the administration of the Quesnel Forest District and the Cariboo Forest Region. The TSA covers about 1.65 million hectares. The TSA's northern boundary is near where the Cottonwood River crosses Highway #97, and its southern boundary extends to the community of Macalister. Bowron Lake Provincial Park marks the TSA's eastern boundary and the western boundary extends almost to Tweedsmuir Provincial Park. The City of Quesnel is the largest community in the TSA. Exhibit 2 provides a map illustrating the location of the TSA.

Exhibit 2: The Quesnel Timber Supply Area, 1993



Forestry is the dominant industry in the TSA and the main species harvested include lodgepole pine, Engelmann spruce, Douglas-fir, and subalpine fir. The ecosystems in the area are prone to frequent and large forest fires. In addition, the TSA and other neighbouring Cariboo TSAs have experienced periodic infestations of spruce bark beetle and mountain pine beetle, notably in the late 1930s, the 1970s, and the early 1980s. Timber harvest levels were increased at these times to salvage merchantable timber and control the infestation. In 1990, harvest levels returned to normal.

While forestry has been, and will likely continue to be the dominant industry, in recent years tourism has gained in importance with key recreational activities including guide-outfitting, fishing, cross-country skiing and snowmobiling. The public sector, agriculture, and manufacturing and construction also contribute to the economy.

2.2 Population and Communities

The population of the Quesnel TSA, as reported in the 1991 census, is estimated at 22 860.³ Brief descriptions of each community follows:

- **Quesnel.** The City of Quesnel is the largest community within the TSA with a population of 8 179 according to the 1991 census. It is located on Highway #97 midway between Williams Lake and Prince George at the confluence of the Quesnel and Fraser Rivers.

Forestry has been the most important industry in Quesnel since World War II. The service sector contributes significantly to the population of Quesnel through both public and private sector employment. The City of Quesnel serves all of the smaller communities and rural areas of the Quesnel TSA described below.

Other industries within the Quesnel TSA include agriculture and tourism. For example, the annual Billy Barker Days commemorating the Cariboo Gold Rush era draws significant crowds each year.

- **Red Bluff, Bouchie Lake and Barlow Creek.** These communities are suburbs of Quesnel, but are not included in its municipal boundaries. Economically, they rely on the City of Quesnel and its major industries.
- **Wells and Barkerville.** Wells and Barkerville are former mining towns 80 km east of Quesnel along Highway 26. Wells is currently inhabited by about 250 year-round residents; increasing to 500 during the summer months. The reconstructed ghost town of Barkerville has been converted to a "Living History" museum and historical park.

³ Source: Central Statistics Branch, Ministry of Government Services.

The economy of this area once relied on mining; however, only one exploration project is currently in operation. As a result, the population has decreased and the remaining residents rely primarily on tourism. Forestry provides little employment to area residents.

- **Strathnaver.** The community of Strathnaver is located 50 km north of Quesnel. The community has about 100 residents and is located just outside the TSA. Forestry employment is generally related to activity north of Strathnaver. Agriculture is also economically significant to this rural area.
- **Nazko.** To the west of Quesnel, the Interior Plateau is sparsely inhabited. One hundred kilometres of paved road leads west from Quesnel through the settlement of Baker Creek to the community of Nazko, with the remaining rural areas serviced only by unpaved roads. Economically, the area is dependent on ranching and some tourism. Some forestry employment is reported in the area.
- **Kersley.** This community is located approximately 20 km south of Quesnel. Agriculture is its primary economic activity while some of its residents also commute to Quesnel.

2.3 First Nations Communities⁴

Six First Nations bands have interests in the Quesnel TSA. The Alexandria, Kluskus, Nazko, and Red Bluff bands are located in the Quesnel TSA, while the Soda Creek and Ulkatcho bands reside outside of the TSA, but have territorial claims to portions of the TSA. As shown in Table 2, these bands have approximately 1598 members, of which 1127 live on reserve and 471 live off reserve.⁵

Three Tribal Councils are based in the region representing five of the bands: the Carrier Chilcotin Tribal Council, the Cariboo Tribal Council, and the Tsilhqot'in Tribal Council. The Nazko band is currently not affiliated with a tribal council.

⁴ Sources include: Various in-person and telephone interviews (refer to Appendix A).

⁵ Indian and Northern Affairs Canada, 1994.

Table 2: First Nations Band Populations Within the Quesnel TSA

Band Name	On-reserve(1)	Off-reserve	Total Population
Alexandria Indian Band	58	77	135
Kluskus Indian Band	99	49	148
Nazko Indian Band	235	26	261
Red Bluff Indian Band	58	51	109
Soda Creek Band (2)	150	129	279
Ulkatcho Band (2)	527	139	666
	1 127	471	1 598

Notes:

(1) Includes band members living on Crown land allocated to their band.

(2) Not centred in the TSA, but have territorial interests in the TSA.

Source: Indian and Northern Affairs Canada, 1994.

The following provides a short description of each band with territorial interests in the Quesnel TSA.

- **Alexandria Indian Band** (Tsilhqot'in Tribal Council) Thirteen reserves covering a total of 1142 hectares were established in 1881 and 1916. Most of the band population living on reserve resides on Alexandria I.R. #3 and I.R. #4 between Quesnel and Williams Lake. The primary economic activities are farming and forestry related activities.
- **Kluskus Indian Band** (Carrier-Chilcotin Tribal Council) Seventeen reserves on 1653 hectares were established in 1901. The reserves are located in extremely remote areas approximately 170 km west of Quesnel and are generally accessible only by air, four-wheel-drive vehicle, or horse and wagon. The primary economic activities are forestry related.
- **Nazko Indian Band** (unaffiliated) The band has eighteen reserves on 1844 hectares approximately 112 km west of Quesnel. The largest community is on Nazko I.R. #20. The band resulted from the amalgamation of the Euchiniko and Blackwater bands in 1958. The primary economic activities are contract logging, heavy equipment owner/operators and individual cattle operations. The band is heavily involved in forestry activities through its Nazko Resource Management division, which operates harvesting, silviculture and milling activities.
- **Red Bluff Indian Band** (Carrier-Chilcotin Tribal Council) This band was named the Quesnel Band by Simon Fraser; the name was changed to Red Bluff in 1988. The band has four reserves on 683 hectares located outside of Quesnel. The main community is on Quesnel I.R. #1. The band operates a repair a shop, contract silviculture business, other forestry-related activities and a store.

- **Soda Creek Band** (Cariboo Tribal Council) The band was allocated two reserves covering 2093 hectares in 1881. The reserves are located in the Williams Lake TSA approximately 35 km north of Williams Lake on Highway #97. Employment and economic activity is generated by individual hay farms, a restaurant on Highway #97, horses, off-reserve mining activity, and logging.
- **Ulkatcho Band** (Carrier-Chilcotin Tribal Council) This band is based in Anahim Lake but does have reserves located within the western portion of the Quesnel TSA. The Ulkatcho band consists of 20 reserves on 3213 hectares allocated since 1901. The reserves are located 328 km west of Williams Lake. The population is scattered over a number of reserves, with the largest community situated on the Squinas reserve. Economic activity is generated by a general store, ranching, trapping, sawmilling and forestry related activities.

Demographic characteristics of the bands in the TSA include the following:

- Statistics for many bands in the province are not complete. One person interviewed felt that the First Nations population in the Quesnel TSA is young, relative to the non-native population, with an average age between 25 and 35 years old. According to the Aboriginal Peoples Survey for 1991, the majority of the population and average age falls within 15 to 49 years, and in some cases an older age population in the 50 and over range is just as large as the 15 to 49 category. Statistics showing a greater detail are not available.
- The educational attainment of the First Nation population is lower than the general population. In the Quesnel Region, over 50 percent of the non-First Nations population has a level of education higher than high school. Statistics for the First Nations population are not complete, but the data available indicates that few have post-secondary education. Secondary school completion rates are also much lower than the non-First Nations population, although in the younger age groups having a high school education is much more prevalent. Exact figures are not available.
- Unemployment among First Nations is high, ranging between 40 and 90 percent, depending on the season. Employment is most common in the forest industry, primarily in harvesting and silviculture activities. Band administration also provides a source of employment for First Nations, with numbers varying among bands. A limited number of First Nations people are involved in the tourism sector through guide outfitting and trail guiding. First Nations are also involved in ranching, trapping, fishing, hunting, and other sustenance activities such as berry picking, root digging, and medicinal gathering.

Involvement in the Forest Industry

The forest industry provides an estimated 28 person years (PY)⁶ of employment annually to First Nations in the Quesnel area, much of it accruing to the Nazko Band. This makes up about 5 percent of the estimated adult population available for work in the TSA. First Nations express concern that they do not receive an equitable share of the forest industry employment. They acknowledge that the situation has improved somewhat because of government initiatives, such as the granting of woodlot licences to First Nations, the MOF silviculture direct award contracts, and the B.C. Court of Appeal's recent recognition of First Nation title⁷. Disagreement with current forest practices and, as a result, a lack of desire to work in the forest industry further explains the low participation rate. Current employment opportunities in the forest industry are as follows:

- **Silviculture.** Both the MOF and licensees contract with bands for silviculture services. Each band in the Quesnel TSA has a contracting crew available. However, only a limited number of these crews have sufficient contracting experience to compete for silviculture work. Therefore, they rely heavily on direct contracts from the Ministry of Forests district office. The silviculture direct award program was established to provide First Nations contractors/crews with the opportunity to develop their skills and become a self-sufficient part of the currently established silviculture contracting community.
- **Forest Worker Development Program.** The Forest Worker Development Program is a training and employment program funded by the MOF and BC21. This program is designed to provide short-term employment and training opportunities primarily in silviculture activities for individuals on provincial social assistance and First Nations on reserves receiving federal social assistance. The Local Forest Worker Level of the program focuses on increasing the stability of the workforce by developing and improving the skills of local forest workers and encouraging contractors to hire workers locally.
- **Harvesting.** Local bands in the Quesnel TSA have worked hard to promote the participation of First Nations in the forest industry. The Nazko Band has a forestry division, Nazko Resource Management, involved in contract logging. There was no evidence that any of the other bands have a similar level of involvement, although almost all have small contracting businesses, the majority of which are owner-operated, providing trucks and logging equipment. In November 1994, the Soda Creek Band, through its forestry company Xat'sull Development Ltd., was offered a Timber Sale Licence for 42 000 cubic metres of timber in the Quesnel TSA.

⁶ A person year is a standard measure of employment that takes into account seasonal full-time work. For example, if an employee works for six months but generates 1 800 hours paid employment, she or he would still account for one person year of employment. A person year is assumed to be 1 800 hours per year of paid employment.

⁷ In 1993 the B.C. Court of Appeal determined that a limited form of Aboriginal title continues to exist. This judgement overturned an earlier (1991) decision that rejected present-day title and the right to self-government.

- **Manufacturing.** Very few First Nations work in local sawmills, however, Nazko Resource Management has a value-added mill that provides approximately ten PYs of employment. The Soda Creek Band Timber Sale Licence will help to establish a log home manufacturing plant potentially employing 17 people.

Involvement in Other Sectors

First Nations in the region are involved in other economic activities including:

- **Tourism.** First Nations take part in trail guiding and in the recreational fishing industry, but otherwise are not greatly involved in the tourism sector.
- **Ranching.** First Nations are involved in ranching, primarily on reserve lands. They expressed concern over the ability to obtain grazing rights on crown lands.
- **Band administration.** Band administration offers employment, with some bands providing up to 15 to 20 person years of employment to its members (excluding various housing projects) depending on the size of the band.

In addition, the Ulkatcho Band and the Kluskus Band have proposed to the B.C. government that they be awarded a long-term area-based forest tenure (such as a TFL), which would follow what the Bands describe as "Holistic Forest Use Zoning". The Bands have commissioned studies on environmental analysis, mapping and zoning. To this date no TFLs have been awarded to the Bands.

Issues and Concerns

First Nations in the region want to settle treaty negotiations in the TSA. The Nazko Band and the Soda Creek Band (the latter through the Cariboo Tribal Council) have filed statements of intent with the provincial and federal governments. Bands in the area are generally against any decision pertaining to land use before their claims are settled, thus are reluctant to take part in any process leading to land use decisions, such as the Commission on Resources and the Environment (C.O.R.E.), and the Protected Area Strategy. Bands consider themselves as owners of the land and separate Nations, and want to take a leadership role in the process and not simply be regarded as another interest group.

First Nations in the Quesnel TSA are supportive of properly managed logging. They have a deep attachment to the land and therefore are also very concerned over forest management practices. A summary of their concerns follows:

- rates of cut,
- utilization of timber resource,
- clearcutting and particularly the size of clearcuts,
- effects on wildlife and fishery.
- preservation of archaeological sites, and
- integration of the use of the timber resource with other sectors including tourism, trapping, hunting, fishing, and traditional use areas.

In addition, First Nations have the following concerns regarding their involvement in forestry:

- distribution and allocation of timber harvest rights and availability of licences to First Nations bands.
- availability of economic opportunities within traditional territories.
- licensee involvement in creating employment and training opportunities for First Nations.
- involvement in benefits from revenues derived from extraction and development of natural resources within traditional territories.

2.4 Major Economic Activities in the Quesnel TSA

An effective way to describe the economy of the Quesnel TSA is to divide the economy into two parts: the basic sector and the non-basic sector. The basic sector is considered the driving force in a local economy. It generates its income from outside the TSA (e.g., employees of a pulp mill that exports pulp from the TSA, and a pensioner receiving the Canada Pension Plan are both considered part of the basic sector as their incomes are derived from sources outside the TSA). On the other hand, those in the non-basic sector receive their income from sources inside the TSA by selling their goods and services to individuals living in the TSA (e.g., a pharmacist is part of the non-basic sector, selling goods and services to the pulp mill employee and the pensioner). Ultimately, the income generated in the non-basic sector depends on the spending of those employed in the basic sector, thus the employment in the non-basic sector depends on the level of employment and income of persons in the basic sector.

Table 3 shows that the forest sector is the dominant industry in the TSA, generating 38 percent of the basic income and 32 percent of the total income. Only the non-employment sources of income (investment income, pensions, unemployment insurance and other transfer payments) are close to the forest sector in terms of income.

Table 3: Estimates of 1991 After-Tax Personal Income

Personal Income Source	After-Tax Income (\$ millions)	Percentage Basic Sector ⁸	Percentage All Sources
Forestry	\$96	38	32
Tourism	7	3	2
Agriculture	7	3	2
Mining	3	1	1
Other Basic	21	8	7
Public Sector	42	17	14
Non Employment			
Unemployment Insurance	14	6	5
Pension	16	6	5
Investment	18	7	6
Transfer	18	7	6
Income Assistance	11	4	4
Total non-employment	77	30	26
Non Basic	48	n/a	16
Total	\$301	100%	100%

Source: Economic Profile for the Cariboo-Chilcotin, Cariboo-Chilcotin Land Use Plan.

Table 4 provides estimates of employment for the basic sector, by industry, and for the non-basic sector. Again the dominance of the forest industry is apparent, providing 48 percent of the employment in the basic sector. In terms of employment, only the non-basic sector approaches the forest industry.

⁸ Percentage of basic sector income attributable to each basic sector component.

Table 4: Estimates of 1991 Basic Sector Employment⁹

	Employment	Percentage Basic Sector¹⁰	Percentage of Total
Forestry ¹¹	3416	48	35
Tourism	504	7	5
Agriculture	461	7	5
Mining	100	1	1
Public Sector	1738	25	18
Other Basic ¹²	878	12	9
Non-basic ¹³	2675	n/a	27
Total employment	9772	100%	100% ¹⁴

Source: Economic Profile for the Cariboo-Chilcotin, Cariboo-Chilcotin CORE Table.
BC Central Statistics. Experienced Labour Force.

Because the employment in the non-basic sector is ultimately dependent on the income generated in the basic sector, the information in Tables 3 and 4 can be used to provide estimates of the total employment dependent on the various basic income sources. That is, non-basic employment can be attributed, and added to particular basic sectors to show the industry dependency of total, basic and non-basic, employment. Table 5 provides estimates of the total employment, in both the basic and non-basic sectors, that can be attributed to the various sources of basic income.

⁹ The Quantitative Analysis Branch, Ministry of Finance and Corporate Relations developed employment and income dependencies for the Cariboo-Chilcotin for the CORE. This included estimates for Quesnel and Cariboo Regional Subdivision A which make up the Quesnel TSA.

¹⁰ Percentage of total basic sector employment attributable to each basic sector component.

¹¹ The forestry component of basic sector employment includes direct mill employment, as well as contractors, forestry consultants and related employment in the provision of goods and services to forest companies.

¹² Includes fishing and trapping, and parts of manufacturing, construction and transportation not attributable to the major basic sectors.

¹³ Non-basic employment includes induced employment (i.e., grocery stores, pharmacies, hair salons, dentists) which relies on the spending of income by the population within the TSA.

¹⁴ Differences due to rounding.

Table 5: Estimates of Employment Dependency on the Basic Sectors

Basic Income Source	Employment	Percent Dependency ¹⁵
Forestry	4440	45
Tourism	574	6
Agriculture	538	6
Mining	131	1
Other Basic	1098	11
Public Sector	2181	22
Non-employment income	810	8
Total employment	9772	100%

Ultimately, the forest sector supports about 45 percent of the employment, basic and non-basic, in the Quesnel TSA (3416 basic + 1024 non-basic). The public sector and tourism support 22 and six percent of the employment, respectively. Non-employment income supports 810, or eight percent, of the employees in the non-basic sector.

Unemployment levels in the Quesnel area have remained consistently above provincial averages. During the recession of the early to mid 1980s, the unemployment rate rose to a high of about 16.5 percent, 1.7 percent higher than the provincial average. By 1990, unemployment levels reached a low point of ten percent before rising once again to about 13 percent. The unemployment rate for 1993 was 10.5 percent, less than one percent higher than the provincial average of 9.7 percent. Not once in over ten years has the unemployment rate in the Quesnel area fallen below ten percent. These figures do not include those on welfare, or who have dropped out of the workforce.

2.4.1 Forestry

The forest industry in the Quesnel area has overtaken and sustained the economic growth that began during the mining boom of the 1860s. Forestry is now the largest industrial sector in the TSA and Quesnel is a major pulp and lumber centre of the BC interior.

Primary and secondary manufacturing activities within the TSA are centred in Quesnel and had combined sales revenues of approximately \$570 million in 1993. Price increases in 1994 have ranged from approximately two percent for lumber, seven percent for plywood, and from 75 to 90 percent for pulp products.¹⁶ Key features of the primary wood products manufacturers in the TSA are described in Table 6.

¹⁵ Percentage of basic and non-basic employment attributable to each basic sector component. Differences due to rounding.

¹⁶ Pulp and Paper Week, Miller Freeman Inc., 1994, and Madisons Canadian Lumber Reporter, Vancouver, B.C.

Table 6: Major Wood Products Manufacturers in the Quesnel TSA

	1993 Number of Employees	Type of Mill	AAC (m3)	Annual Capacity
C & C Wood Products (1)	107	Specialty	100 000	38 mmfbm
Cariboo Pulp & Paper	434	Pulp mill	n/a	273 000 metric tonnes
Quesnel River Pulp	172	Pulp mill	n/a	288 000 metric tonnes
Slocan Forest Products	305	Sawmill	382 194 120 000 (1)	178 mmfbm
Tolko Industries	225	Sawmill	288 704 53 000 (1)	154 mmfbm
West Fraser Mills (2)	398	Sawmill	243 366	206 mmfbm
Weldwood of Canada (2)	624	Sawmill; Plywood/ Veneer	488 122	98 mmfbm 329 mmSF
Total	2 265		1 675 386	

Notes:(1) Non-replaceable problem forest types licences - expire in 1998.

(2) West Fraser Mills and Weldwood of Canada hold tree farm licences with AACs of 518 952 m³ per year and 110 000 m³ per year, respectively, in addition to the AAC contributed from the Quesnel TSA. The additional volume contributes to the operations of their mills.

Source: Economic Profile for the Cariboo-Chilcotin, Technical Working Groups (Socio-Economic), February 15, 1994; Discussions with Timber licensees; Ministry of Forests (AAC) Environmental Base Case I.

In addition to these mills, Canadian Forest Products (Canfor) also holds a Forest Licence with an AAC of 46 261 cubic metres per year in the Quesnel TSA. Its Prince George mill processes the timber, and therefore depends to a minor degree on the Quesnel TSA. Canfor operates several sawmills and two pulp mills in Prince George employing approximately 935 employees. Annual capacities are 1158 million board feet and 520 000 tonnes, respectively.¹⁷

In addition to this industry employment, the Ministry of Forests in the Quesnel Forest District has approximately 64 full-time equivalent positions (average salaries of about \$40 000, excluding benefits). In this study, Ministry of Forests employees are classified as public sector.

¹⁷ Canfor, 1993 Annual Report.

Quesnel is home to several secondary processing operations including value-added and remanufacturing. Both Tolko and West Fraser have undertaken joint ventures with other companies in value-added plants. Much of the 1993 employment and income for this sector is captured under the major manufacturers in Quesnel; however, approximately 45 additional PYs of employment can be attributed to a variety of small operations in this sector, such as Nazko Resource Management and Reko Log Homes. Several other operations have existed sporadically, but were not operating at the time of this study. This sector generated approximately \$4.4 million in sales in 1992, excluding sales captured under the major manufacturers. West Fraser has announced the construction of a fibreboard plant in Quesnel beginning in the Spring of 1995. The construction phase will support approximately 150 workers. The plant will produce medium density fibreboard using wood waste material. When in operation the plant will support 105 full time jobs.

Trends in the Forest Industry

Forest industry representatives interviewed for this study noted the following trends in the forest industry and the Quesnel TSA. Access to timber and the cost of the timber, as opposed to markets, are the major constraints to industry growth. There is an increasing trend towards producing value-added products and two major manufacturers, Tolko and West Fraser, have undertaken joint ventures with other companies in value-added plants. Manufacturers in the Quesnel TSA have demonstrated their willingness to innovate, such as using small diameter wood and increasing the use of species such as birch and aspen, which were previously considered unmerchantable.

2.4.2 Public Sector

The public sector is the second largest employer and income generator in the Quesnel TSA. As indicated in Table 4, the school system, hospitals, health and welfare agencies, and government employ over 1700 people. This sector contributes \$42 million in after-tax income, or 17 percent of the basic sector income, to the local economy.

2.4.3 Tourism and Recreation¹⁸

Tourism in the Quesnel TSA is viewed by some area residents as significant in its potential for economic impact. Currently, tourism accounts for only about seven percent of basic sector employment and three percent of basic sector income in the TSA.

Ministry of Tourism surveys for the Cariboo-Chilcotin indicate that 67 percent of the visitors to the region in 1989 were B.C. residents. Of non-resident visitors to the area, 37 percent

¹⁸ The majority of the tourism statistics, unless otherwise noted, are sourced from the Economic Profile for the Cariboo-Chilcotin, February 15, 1994, prepared by the Technical Working Group.

reported touring as their primary purpose, 28 percent were visiting friends and family, while a further 25 percent were primarily interested in outdoor, or wilderness experiences.¹⁹

Access to the area is provided by Highway #97 which runs north from the Trans-Canada Highway at Cache Creek through Williams Lake, Quesnel, Prince George and on to points in northeastern B.C. Paved secondary roads provide access to Wells/Barkerville and to Nazko. BC Rail also provides service to the area from North Vancouver through Whistler and Lillooet stopping at many points along Highway #97 between Williams Lake and Prince George. In addition to the main access routes, several trails used during the gold rush now act as tourist attractions and secondary roads provide alternate routes for more leisurely travel.

Activities

As in the rest of the Cariboo, tourism in the Quesnel area is dependent on natural resources. Outdoor activities such as hiking, camping, fishing, canoeing, wildlife viewing and swimming are all popular summer activities. Hunting and wilderness adventure trips are also available. In the summer, tourists are attracted by Barkerville Historic Park, Billy Barker Days in Quesnel, abandoned mine sites, the Riverfront Trail system, and the Carrier-Nuxalk (Alexander Mackenzie Heritage) Grease Trail. In addition, numerous initiatives are under way to protect other historic trails as well as to develop more trail systems. Although most visitors to the area travel in summer, a number of travellers are attracted by the cross-country skiing, snowshoeing and snowmobiling available in winter. Annual snowmobiling rallies are held in both Wells and Quesnel. The two communities are also planning to promote a sled dog race to serve as a preliminary trial for the Iditarod sled dog race in Alaska.

Facilities

Provincial parks in the TSA include Barkerville, Pinnacles, and Ten Mile Lake. In addition, the TSA is bordered by two major provincial parks: Bowron Lakes and Tweedsmuir. Bowron Lakes is an internationally significant destination, accessible only through Quesnel via Highway #26. Several resorts and outfitters provide a wide variety of summer activities in the Quesnel and Wells/Barkerville areas. Hotels, motels and lodges provide year round accommodation in Quesnel and Wells. The Nazko area is frequented by wilderness adventurers (the Blackwater River is especially popular).

Economic Contribution

Tourists from outside B.C. who visit the Cariboo-Chilcotin generally stay for a shorter period of time (2.47 days versus a 5.83 provincial average) and spend less money than those who visit other parts of the province (\$34.80 per person versus a \$54.80 provincial average). An

¹⁹ Socio-Economic Evaluation Summary, Ministry of Employment and Investment

estimated 47 percent of all visitors camp rather than use fixed roof accommodations, and free access is available for recreation on Crown forest lands.

The contribution of tourism to the region is difficult to estimate for several reasons:

- it is difficult to separate local and non-local spending, and business and tourism figures;
- fragmentation of available statistical data across various sectors; and
- the large number of small tourism businesses and the difficulty this creates in assembling data.

The forest industry contributes to the tourism sector because of the large number of visitors who travel to the Quesnel TSA on forest industry business and work in Quesnel on a temporary basis.

Trends in Tourism and Recreation

According to the Social Profile, Cariboo-Chilcotin CORE Table Report, Quesnel area residents feel that the tourism sector has significant potential for development, especially in the winter season. In cooperation with the Ministry of Forests, the Community Futures Committee, based in Quesnel, is promoting an all season trail system to enhance local tourism resources. The Wells Trails Association and the Ministry of Forests is currently enhancing the trail system in the Wells/Barkerville area to increase recreation opportunities.

2.4.4 Agriculture

Agriculture is an important source of employment in the Quesnel TSA. It accounts for approximately 460 jobs or about 6 percent of employment in the TSA and contributes about \$7 million in after-tax income to area residents. Within the TSA, agriculture is supported along the terraces of the Fraser River both north and south of Quesnel.²⁰

Beef cattle is the TSA's primary agricultural product, resulting in the majority of agricultural land being used for cattle grazing. Approximately 20 percent of beef cattle sold in B.C. originates in the Cariboo.²¹ Feeder calves are sold through auction facilities at Williams Lake and are generally moved to feedlots outside the TSA. In 1992, the Williams Lake stockyards sold approximately 40 000 head of cattle with gross receipts totalling \$33 million.²²

Ranch operations are highly dependent on Crown range to meet forage requirements. Access to, and maintenance of, this range are key issues for this industry.

²⁰ Source: Social Profile Cariboo-Chilcotin Region 1993, McDaniels Research Ltd.

²¹ Economic Profile for the Cariboo-Chilcotin, Draft #2, February 15, 1994.

²² Source: Williams Lake Economic Development Progress Report, January 1994. Prepared by Hugo Stahl, Economic Development Officer, on behalf of the City of Williams Lake.

Farmers in the Quesnel TSA also raise dairy cows, horses, poultry, swine and sheep. Cash crops include hay, potatoes, hardy vegetables and nursery items.²³ No growth in the agriculture industry is foreseen in the short term.

2.4.5 Mining

Mining was once the primary industry in the Quesnel TSA, supporting a population of 10 000 people in the Wells/Barkerville area early this century. Mining activity in the Cariboo has fallen dramatically, and the mining sector now only accounts for approximately 100 jobs, or one percent of employment in the Quesnel TSA. In 1991, the industry paid about \$3 million in after-tax incomes in the TSA.

Few mining claims are active and only one placer mining claim operates year round. Quesnel has one proposed mining project, QR Gold, with the potential of providing up to 90 person years of employment for a limited life of five years.

Major concerns of the mining industry in the region include low mineral prices, settlement of treaty negotiations, the proposed provincial Protected Areas Strategy and Cariboo-Chilcotin Land Use Plan. In addition, where mining activities impact on the forest environment, mining companies will be required to comply with certain sections of the Forest Practices Code. Until a recovery in ore prices and a reduction in some of the uncertainty surrounding possible land expropriation and related issues, mineral exploration and development will likely play a relatively minor role in this region.

2.4.6 Other Sectors

Commercial use of forest plants has become increasingly popular. For example, some plants are being studied for use in the pharmaceutical industry. Pine mushrooms have been harvested as food from the TSA for export to Japan, reaching prices of \$200 per pound, and can be found in Douglas-fir, hemlock and lodgepole pine stands. Unfortunately, there are no means to quantify the value of the harvest as there have been no controls over the activity. Potential uses of other plants and fungi in the Cariboo region are currently being studied and compiled.

²³ Social Profile, Cariboo-Chilcotin Region 1993, McDaniels Research Ltd.

3.0 Environmental Setting²⁴

3.1 Description ²⁵

The Quesnel TSA is located on a section of the Fraser Basin and the Interior Plateau between the Dean River and the Ilgachuz Mountains to the west and the Matthew River and Cariboo Mountains to the east. The Fraser River bisects the TSA into eastern and western portions. The western portion of the TSA is characterized by flat land to rolling hills rising gradually into Tweedsmuir Provincial Park and the Coast Range. The eastern portion is characterized by steeper terrain as the Quesnel Highlands rise to meet the Cariboo Mountains and Bowron Lake Provincial Park.

The Quesnel TSA is part of the Cariboo Forest Region and is home to many of the wildlife species found in British Columbia. A variety of fish species is also present in the many rivers, lakes and streams of the Quesnel TSA. The TSA's primary waterbodies include the Fraser River, Quesnel River, Cottonwood River, Blackwater River, and the group of lakes along the eastern boundary known as the Bowron Lakes.

3.2 Habitat Mapping

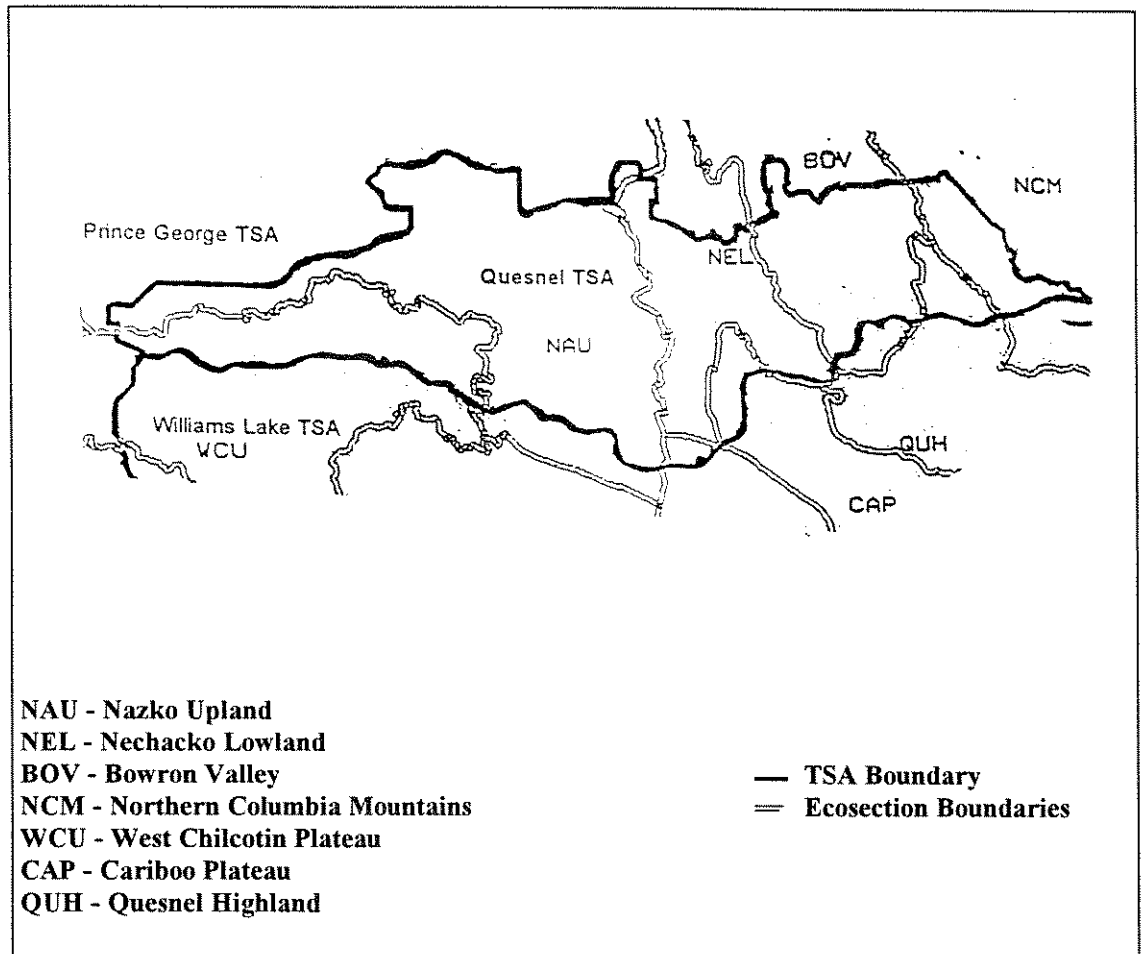
The Ecoregion Classification system classifies the ecosystem complexity of the Quesnel TSA into eight ecosections²⁶ as shown on the map in Figure 2, and discussed below:

- **Nazko Upland (NAU)** is a flat upland area covering approximately 40 percent of the TSA. The ecosection runs through the centre of the TSA to its northwest corner. There are 855 lakes in this ecosection with 105 providing sport fishing opportunities.

²⁴ For the purposes of this report, the TSA is deemed to approximate the characteristics of the 5 major ecosections described in this section, unless otherwise noted.

²⁵ For this section of the report, we relied heavily, and sometimes transcribed the information verbatim, on the following three documents: (1) Environmental Base Case for the Cariboo Part I and Part II, prepared by the Regional Technical Working Group, December 1993; (2) An Introduction to the Ecoregions of British Columbia, prepared by Dennis Demarchi of the Ministry of Environment, Lands and Parks, October 1993; and (3) Draft Quesnel Timber Supply Area Management Strategy Report, Ministry of Forests, 1994, unless otherwise noted.

²⁶ The Ministry of Environment, Lands and Parks defines ecosections as areas with minor physiographic, climatic and oceanographic differences. An ecoprovince is an area of consistent climate and physiography. There are 10 ecoprovinces in B.C. Each ecoprovince can be divided into ecoregions, which can be further divided into ecosections. Each ecosection has a unique sequence of biogeoclimatic sub-zones and marine zones. British Columbia has been stratified into 110 ecosections to reflect wildlife habitat diversity.

Exhibit 8: Ecosections of the Quesnel Timber Supply Area

- **Western Chilcotin Upland (WCU)** is an area with several high, rounded shield volcanoes separated by wide valleys. It is located in the most southwestern portion of the TSA and covers approximately 15 percent of the area. There are 265 lakes in this ecosection with 37 providing sport fishing opportunities.
- **Nechako Lowland (NEL)** is a broad, flat lowland running north/south near the centre of the TSA and is dissected by the Fraser and Nechako rivers. This ecosection covers approximately 17 percent of the TSA. Although the climate is sub-boreal, the Nechako Lowland has the mildest climate of this ecoprovince.
- **Bowron Valley (BOV)** is a moist cold area, with a wide valley surrounded by low highlands to the west and the rugged mountains of the Columbia Mountains to the east. This ecosection covers approximately 14 percent of the Quesnel TSA.
- **Northern Columbia Mountains (NCM)** is located along the eastern boundary of the TSA and is an area of high, rugged mountains, many of which are ice-capped. This

ecosection covers approximately five percent of the TSA and has the highest precipitation and coldest temperatures.

- Three other ecosections cover the remaining TSA landbase: the **Cariboo Plateau Ecosection (CAP)**, a moister upland area with moderate temperatures; the **Cariboo Basin Ecosection (CAB)**, with a transitional climate and located between the CAP and the relatively warmer, drier climate of the Fraser River Basin Ecosection; and the **Quesnel Highland Ecosection (QUH)**, which gradually rises to the Cariboo Mountains with the climate becoming increasingly wet.

3.3 Wildlife and Fisheries

The Quesnel TSA has a wide variety of wildlife and plant species, some of which have been identified as being at risk, as indicated by the provincial Red and Blue list designation.²⁷

Examples of the species included in the Red and Blue list that are found in the ecosections described above and that might be found in the Quesnel TSA are listed in Appendix D. In addition to those species, others are not necessarily on the red and blue lists, but warrant management concern. Many of these species inhabit restricted or impacted habitats, such as old-growth, riparian areas, meadows, grasslands and alpine areas. There are two particular habitat concerns being dealt with in the Quesnel TSA, the mule deer winter range and caribou habitat management:

- **Critical Mule Deer Winter Range:** The TSA Steering Committee has identified 11 critical mule deer winter ranges which have been deferred from harvest in the Quesnel TSA. These winter ranges occur in primarily Douglas-fir stands and provide deer with the necessary shelter and food during moderate to severe winter conditions.
- **Caribou habitat:** Key caribou habitats have been identified in the eastern (Quesnel Highlands) and western (Itchas and Ilgachuz) portions of the TSA. A 20 year deferral (to 2008) is currently in effect to allow for the study of habitat needs and forest management practices for a large portion of the Western Caribou habitat. In the timber supply review, approximately 99 000 hectares of forest land have been netted down from the timber supply land base to accommodate the Eastern and Western Caribou key habitats.

Other mammals common to the TSA and of public interest include cougars, moose, black bears, grizzly bears, coyotes and wolves.

²⁷ Red-listed species are recognized as threatened or endangered throughout all or a significant portion of their range in B.C., or are considered as potential designates for such status. Blue-listed species have been regionally identified as sensitive or vulnerable species, i.e., species that are not threatened, but are particularly at risk of such status.

A large percentage of the streams within the Quesnel TSA have either critical or moderate value as spawning and rearing habitats for numerous anadromous and freshwater species of commercial and recreational interests. These species include Sockeye and Chinook Salmon, Steelhead, Sturgeon and Rainbow trout. In addition to providing fishery habitats, the rivers, lakes and streams also provide recreational, social and economic benefits to the region. Larger lakes support Kokanee and Lake Char, as well as a variety of other fish species. Small lakes may support distinctive, non-recreational fish in addition to rainbow trout. Five fish species are at risk in the Quesnel TSA (see Appendix D).

3.4 Recreation Management

The Quesnel TSA has a wide range of recreational features and opportunities. Recreational activities focus on natural features and historical attractions. Much of the TSA is moderately roaded, with back country recreation a key activity. Two areas have been proposed as study areas under the Protected Area Strategy: Itchas-Ilgachuz and the Upper Niagara-Matthew River. There are more than 20 wilderness resorts, some accessible only by air, with fishing, camping, boating and hunting as other major recreational activities. The Ministry of Forests administers numerous recreation sites and trails within the TSA.

3.5 Timber and Range Management

There are a number of environmental issues relating to timber and range management. These include issues relating to the predominance of clearcuts, biodiversity, old-growth forests, forest health, fire prevention and suppression and the need to balance the range resource on an integrated basis with other resource values. These issues are discussed in further detail in Section 4.

3.6 Soils

A variety of soils are present in the Quesnel TSA, primarily Podzols and Brunisols. The Podzols occur mainly in the eastern portion of the TSA in the Quesnel Highland and Northern Columbia Mountains. Brunisolic soils occur primarily on the Nazko Upland and West Chilcotin Upland. Chernozem soils occur primarily along the Fraser Benches and Fraser Basin.

3.7 Hydrology

The major consumptive use of water in the TSA is for irrigation purposes. Irrigation is mainly used to enhance forage production for ranching operations. Water demand in B.C. is typically highest in summer, when runoff is lowest. Demands for increased water consumption in the future may conflict with fisheries, and recreation and habitat values.

3.8 Vegetation

Ecosystems in the TSA are classified at the site level using the Biogeoclimatic Ecosystem Classification system.²⁸ Four major biogeoclimatic zones are represented in the Quesnel TSA.

- **Sub-Boreal Spruce Zone (SBS)** occurs on much of the eastern portion of the TSA. This zone is intermediate between the Interior Douglas-fir Zone to the south and the Boreal Zones to the north. Forest productivity is moderately good despite the severe climate. Hybrid Engelmann-white spruce and subalpine fir are the dominant tree species with extensive stands of lodgepole pine on drier sites.
- **Sub-Boreal Pine-Spruce Zone (SBPS)** occurs in the western half of the TSA which is part of the west central interior plateau. Due to the cold, dry climate, forest productivity is generally low. The zone is characterized by many even-aged lodgepole pine stands.
- **Engelmann Spruce - Subalpine Fir Zone (ESSF)** occurs in the eastern portion of the TSA at high elevation. The growing season is short with abundant snowfall in the winter. Engelmann spruce, lodgepole pine and subalpine fir are the dominant tree species. At higher elevations, this zone provides habitats for the Quesnel Highlands caribou herd.
- **Montane Spruce Zone (MS)** occurs at mid-elevation in the western section of the TSA and is intermediate between the IDF zone to the south and the ESSF zone to the north. Due to past wildfires, a successional forest of lodgepole pine, Douglas-fir and trembling aspen is common. This zone provides important summer and fall habitats for mule deer and cattle.

Three other zones occur to a more limited extent in the TSA. The **Interior Douglas-fir Zone (IDF)**, in the southernmost portion of the TSA, the **Interior Cedar-Hemlock Zone (ICH)** on the wetter lower to mid-slopes in the east, and the **Alpine Tundra Zone (AT)** on the tops of higher mountains. As shown in Appendix D, the Quesnel TSA contains some plant species that are considered threatened, or endangered, and run the risk of extinction.

3.9 Wildcraft

The use of flora, or plants, is generally referred to as wildcraft. Wildcraft is quite common to the Quesnel TSA. First Nations people, in particular, have uses for numerous plants. Some examples are as follows:

- juniper and sage for cleansing ceremonies;

²⁸ The Biogeoclimatic Ecosystem Classification system is a hierarchical classification system that uses site specific characteristics including climate, vegetation and site factors to classify the ecology of a site.

- lodgepole pine cambium for food;
- balsam root and bark for medicine; and
- wildflowers, berries and a variety of plants used for food and decoration.

People engaged in wildcraft have focused concern on the harvesting of old growth forests, which are home to certain medicinal plant species that may be lost if some old-growth forests do not remain intact.

4.0 Current TSA Profile

The purpose of this section is to describe the current Timber Supply Area situation, including the land base available for timber harvesting, planning processes and treaty negotiations that may change the timber harvesting land base, timber supply issues, and the AAC apportionment. The section also describes the employment associated with current forestry activity in the Quesnel TSA and the forecasts chosen to illustrate the effects that changing TSA harvest levels could have on the region.

4.1 Timber Harvesting Land Base

The Quesnel TSA covers approximately 1.65 million hectares, of which about 1.02 million hectares, or 61.7 percent, are currently considered available for timber harvesting. Table 7 presents the timber harvesting land base.

Forest stands in the Quesnel TSA consist of lodgepole pine (85 percent), spruce (10 percent), Douglas-fir (three percent), and hemlock and balsam species as minor components. Much of the forest stands are mature or near mature, i.e., sufficiently developed to be harvestable.

Management zones were established to group areas where similar forest practices are implemented. The zones are listed below and are described in greater detail in the *Quesnel TSA Timber Supply Analysis* report, or the *Quesnel TSA Timber Supply Review Public Discussion Paper*:

- Additional western caribou zone - 37 000 hectares,
- Special sale area zone - 87 000 hectares,
- Local Resource Use Plans and visual quality zone - 63 000 hectares,
- Streams and lakeshores zone - 45 000 hectares,
- Integrated resource management zone - 457 000 hectares,
- Problem forest types zone - 228 000 hectares.

Table 7: Quesnel TSA Timber Harvesting Land Base, 1993

Classification	Area (hectares)	Percent of Total Area	Percent of Productive Forest Area
Total land base	1 650 514	100.0	
Less:			
Non-Crown land	117 453	7.1	
Dragon Settlement Corridor	12 216	0.7	
Non-forest land	183 080	11.1	
Total productive forest	1 337 765	81.1	100.0
Reductions to productive forest:			
Alexander Mackenzie Heritage Trail	2 235	0.1	0.2
Cariboo River Wildlife Management Area	929	0.1	0.1
Non-commercial cover	1 259	0.1	0.1
Inoperable areas	29	--	--
Not satisfactorily restocked	77 576	4.7	5.8
Environmentally sensitive areas	21 733	1.3	1.6
Eastern caribou habitat	22 919	1.4	1.7
Western caribou habitat	79 976	4.8	6.0
Critical mule deer habitat	14 056	0.9	1.0
Unmerchantable forest types	150 657	9.1	11.3
Existing roads	18 264	1.1	1.4
Total current reductions	389 633	23.6	29.1
Current productive land base	948 132	57.5	70.9
Additions:			
NSR - not satisfactorily restocked	69 827	4.2	5.2
Total productive land base	1 017 959	61.7	76.1
Future reductions:			
Future roads, trails, landings	7 576	0.5	0.6
Future timber harvesting land base	1 010 383	61.2	75.5

Source: Ministry of Forests

4.2 Land Base and Timber Supply Issues

A number of initiatives and processes are currently underway which may have varying implications for the timber supply land base, forest practices, and timber supply decisions. These initiatives include the following:

- Forest Practices Code,
- Protected Area Strategy,
- Cariboo-Chilcotin Land Use Plan,
- Forest Renewal Plan,

- Forest Sector Strategy, and
- Treaty Negotiations.

4.2.1 Forest Practices Code

The Forest Practices Code is a comprehensive package of Legislation (the *Forest Practices Code of British Columbia Act* and associated Regulations), Standards and Field Guides governing forest practices in B.C. The *Forest Practices Code* will have a substantial role in forest planning and management. The Forest Practices Code initiative covers all aspects of forest management and use including range, recreation, visual landscape and wilderness management. Code components specify requirements for planning, forest health, soil conservation, recreation, visual landscape, wilderness management, range management, silvicultural systems, forest road engineering, timber harvesting, silviculture management, and forest protection.

4.2.2 Protected Area Strategy

In 1992, the provincial government initiated a Protected Areas Strategy (PAS) with the intention of protecting 12 percent of the provincial landbase by the year 2000. The goal of the PAS is to protect the diverse natural, cultural heritage and recreational values of the province. The PAS is a single, integrated process for coordinating all of British Columbia's protected area programs and objectives. The protected areas designated through this process will not be available for timber harvesting, or other resource development.

4.2.3 Cariboo-Chilcotin Land Use Plan

On October 24, 1994, the government of British Columbia announced a Land Use Plan for the Cariboo-Chilcotin region. This Land-Use Plan designates 12 per cent of the Cariboo-Chilcotin as Protected Areas where commercial timber harvesting will not be permitted. Eighty percent of the region is dedicated to the commercial resource land base within the following zones:

- Enhanced Resource Development Zone (40 percent)
- Special Resource Development Zone (26 percent)
- Integrated Resource Management Zone (14 percent)

The remaining eight percent of the regional land base is Private/Settlement lands.

The Land-Use Plan includes broad management objectives for each zone and specific targets for some resources. Detailed objectives and the remaining targets for each reserve in each zone are to be established by the end of January, 1995, through an implementation process. Until this plan is fully implemented and practices are adjusted in the field, the actual timber supply impact of the Land-Use Plan cannot be measured. This Timber Supply Review will be used as a basis for determining the actual impacts of the Land-Use Plan once it is implemented. The next Timber Supply Review will be based on actual experience with the

Land-Use Plan gained during the implementation period. If it becomes apparent that the Land-Use Plan has modified the timber supply to such an extent that the allowable annual cut is no longer consistent with the plan, the Chief Forester is prepared to reassess the timber supply and to redetermine the AAC based on Section 7 of the *Forest Act*.

4.2.4 Forest Renewal Plan

The Forest Renewal Plan was introduced early in 1994 with goals focusing on sustaining jobs and communities. The plan includes a substantial increase in stumpage rates with the dual objectives of funding the plan and increasing government revenues. Funds will be directed toward silviculture, investment in companies producing value-added wood products, programs for improving the skills of forest industry workers, assistance for communities, and First Nations initiatives. Forest renewal investments will be managed and directed by a new Crown agency, Forest Renewal British Columbia.

4.2.5 Treaty Negotiations

The British Columbia Treaty Commission began accepting First Nations Statements of Intent to enter into treaty negotiations in mid-December, 1993. Two bands associated with the Quesnel TSA have indicated their commitment to this process: the Nazko Band and, through the Cariboo Tribal Council, the Soda Creek Band. The treaty negotiation process provides the framework for achieving settlements that are fair, neutral, equitable, and affordable, and which would provide for certainty between government and First Nations in British Columbia, as well as all British Columbians. The potential effects of those negotiations in the TSA cannot be predicted at this time.

4.3 Timber Supply Issues

The Ministry of Forests outlined the main issues relating to the TSA in the draft *Quesnel TSA Management Strategy Report*. The main issues discussed in the strategy report are summarized below:

- **Timber resource issues.** Different levels of wildlife management strategies, the utilization of forest types that were previously unmerchantable for saw-logs and not contributing to the AAC, logging on identified steep or sensitive sites, and the appropriate level of silviculture activity.
- **Recreation resource issues.** Issues are related to the ability of the recreation program to respond to increased recreational use of forest land, and whether improved information on recreational values, uses and demands would affect the recreation management objectives.
- **Range resource issues.** The potential for range improvement projects to increase the quality of range and season of use.

- **Wildlife resource issues.** There are four main habitat concerns in the Quesnel TSA: mule-deer winter range, western caribou habitat, eastern caribou habitat and general habitat requirements for other species.
- **Fisheries resource issues.** To increase productive capacity of fish habitat relative to water quality and quantity.
- **Water Quality.** Forest operations must maintain water quality and quantity.
- **Forest Health.** The Quesnel TSA is subject to forest health problems which collectively account for growth loss and damage in young and mature forests. Some of the major forest health problems include the following:
 - Bark beetles: mountain pine beetle, Douglas-fir bark beetle, spruce bark beetle;
 - Root diseases: armillaria and tomentosus;
 - Parasitic diseases: lodgepole pine dwarf mistletoe and stem rusts;
 - Black army cutworm; and
 - Frost dieback.
- **Fire Suppression and Preparedness.** The risk and impact of forest fires on the forest land base in the TSA needs to be maintained at acceptable levels. Prescribed fires must be planned to meet specific management objectives including air quality.

The draft Strategy Report also recognizes that biodiversity at the stand level and at the landscape level is an issue in the Quesnel TSA.

4.4 Current Timber Supply Situation

In 1992, the Allowable Annual Cut (AAC) for the Quesnel TSA was set at 2 350 000 cubic metres per year.²⁹ The Quesnel TSA AAC is partitioned into three components, each with a distinct objective:

- conventional conifer sawlog with an AAC of 2 000 000 cubic metres per year;
- deciduous stands with an AAC of 50 000 cubic metres per year;
- problem forest types with an AAC of 300 000 cubic metres per year.

The timber supply review of the Quesnel TSA does not assess the deciduous stands, or the woodlot component of the conifer stands. As a result, the initial harvest volume analysed in

²⁹ Over the last ten years, the AAC in the Quesnel TSA has fluctuated. In 1985, the AAC was increased from 2.3 million cubic metres to 3.45 million cubic metres for a period of five years in response to a major infestation of mountain pine beetle. In 1991, West Fraser Mills Ltd. was granted a tree farm licence (TFL 52) with an AAC of 518 952 cubic metres per year. The granting of this licence resulted in the withdrawal of the new TFL land area from the TSA and a reduction in the AAC for the TSA.

the *Quesnel TSA Timber Supply Analysis* report is 2 265 500 cubic metres per year. Subsequently, this report discusses socio-economic impacts of TSA harvested timber related to a timber supply of 2 265 500 cubic metres per year. Table 8 presents the apportionment of the Quesnel TSA timber supply:

Table 8: Quesnel TSA Allowable Annual Cut Apportionment

	Coniferous m ³ /year	Percentage
Forest Licences:		
Canfor	46 261	2.0
Slocan Forest Products	382 194	16.3
Tolko Industries	288 704	12.3
West Fraser Mills (1)	243 366	10.4
Weldwood (1)	488 122	20.7
Sub Total - Forest Licences	1 448 647	61.7
Timber Sale Licences	5 803	0.2
Small Business Forest Enterprise Program (SBFEP) (2):		
Category 1 (Section 16)	223 129	9.5
Category 2	23 000	1.0
Bid Proposal	193 501	8.2
Sub-Total - SBFEP	439 630	18.7
Deciduous (not analysed) (3)	50 000	3.1
Forest Service Reserve	23 420	1.5
Woodlot Licence (not analysed) (3)	34 500	14.8
Nonreplaceable Forest Licences	348 000	
Problem Forest Types (273 000m ³)		
Additional (75 000m ³)		
Total AAC	2 350 000	100.0
AAC Analysed (3)	2 265 500	96.4

Notes: Source: Ministry of Forests

- (1) In addition to apportionments from the Quesnel TSA, West Fraser Mills and Weldwood have tree farm licences adding 630 000 cubic metres per year to their operations in the Quesnel Forest District.
- (2) The Small Business Forest Enterprise Program (SBFEP) makes timber available for harvesting by individuals and sawmill operators (non-quota holders). A portion of this timber is allocated only to those operators that will use the wood for value-added purposes. The objective of the program is to provide new opportunities for individuals and firms to enter the industry and provide a fibre source for small operators.
- (3) The deciduous and woodlot components of the AAC were not analysed for the timber supply review. As a result, the AAC assessed in this socio-economic analysis is 2 265 500 cubic metres per year.

4.5 Quesnel TSA Forestry Operations

Timber processors in the TSA obtain part of their fibre requirement from the Quesnel TSA, with the balance coming from adjacent TSAs, TFLs, and private woodlots. As shown in Table 9, in 1993, the TSA's solid wood mills acquired approximately 74 percent of their requirements from the Quesnel TSA licensees and small business operators.

In 1993, Quesnel pulp mills obtained approximately 46 percent of their chip supply from the processing of timber harvested in the TSA. The remainder came from non-TSA timber processed in Quesnel mills, and other processors located outside the TSA. These fibre flow percentages are used to prorate the total Quesnel mill employment to reflect only that related to the Quesnel TSA harvest. This is done in order to identify economic impacts associated with changes in the timber supply from the Quesnel TSA. The source of chips flowing to TSA pulp mills can change however, thus the 46 percent TSA share may not perfectly reflect the TSA's contribution in all years.

Table 9: Wood Consumption by Quesnel TSA Processors

	Fibre input (^{'000} m³)	TSA Share (^{'000} m³)	Percent TSA Share
Solid Wood Mills Quesnel TSA	3254.0 (1)	2399.2 (2)	74%

Notes: Source: Ministry of Forests, Valuation Branch, and Economics and Trade Branch

(1) Includes volumes from the Quesnel TSA, TFLs 52 and 5, and private sources.

(2) The TSA share of wood processed equals the total volumes billed in the TSA less the volume harvested by Canfor and shipped to the Prince George TSA for processing.

Quesnel TSA forestry operations support employment in harvesting and other woodlands activities, plus processing, silviculture, transportation, and administration. Direct employment related to the Quesnel TSA AAC of 2 265 500 cubic metres is approximately 2017 PYs. This level of employment is derived using the coefficients presented in Table 10. This employment level differs from Table 5 as only those employees related to Quesnel TSA harvested timber are included in Table 10. The numbers differ from basic sector employment given in Table 4 for the same reason, and also indirect employment is included in basic employment, but not included in Table 10.

**Table 10: Quesnel TSA Direct Employment and Employment Coefficients
(based on an AAC of 2 265 500 cubic metres per year)**

	TSA Employment	Provincial Employment	TSA Employment / 1000 m ³	Provincial Employment / 1000 m ³
Harvesting	453	453	0.20	0.20
Processing	1427	1450	0.63	0.64
Silviculture	68	159	0.03	0.07
Transportation	68	n/a	0.03	--
Total	2017	2062	0.89	0.91

Employment does not include the Forest Service, which is assumed to be independent of marginal changes to the harvest level and is included in public sector employment. Approximately 64 PYs are allocated to the Quesnel Forest District. For a discussion of the calculation of these coefficients see Appendix B.

The coefficients are used to determine employment that would be associated with various harvest levels in the Quesnel TSA, given current management assumptions and economic conditions. They provide an estimation of employment related to the current Quesnel AAC. However, cut control flexibility allows the quantity of timber harvested to fluctuate, in turn causing employment, especially in harvesting, to fluctuate also. The harvest must eventually (over a five year planning period) closely approximate the AAC, thus employment levels related to the AAC are indicative of forestry activity in the area.

4.6 Harvest Scenarios

Based on the *Quesnel TSA Timber Supply Analysis*, the Ministry of Forests selected three scenarios to provide a basis for discussion of the socio-economic impacts involved in altering the timber harvest. Each scenario is based on the current land base and management practices. The harvest scenarios have been selected to identify the range of socio-economic implications associated with different harvest levels and do not indicate preferred options. Table 11 provides the harvest levels for the three scenarios while Figure 3 presents the forecasts graphically.

Scenario 1: Maintains the current AAC for the first seven decades at 2 265 500 cubic metres per year including conventional conifer sawlog and problem forest types.³⁰ The harvest level would decline roughly ten percent in Decade 8 and a further four percent in Decade 9 to the long-term harvest level of 1 955 500 cubic metres per year. The current harvest can be maintained for seven decades for two reasons: the TSA has an abundant

³⁰ Scenario 1 corresponds to the base forecast in the *Quesnel TSA Timber Supply Analysis* report.

supply of mature and near mature forest, and most significantly, because of the addition of stands that were previously considered non-merchantable.

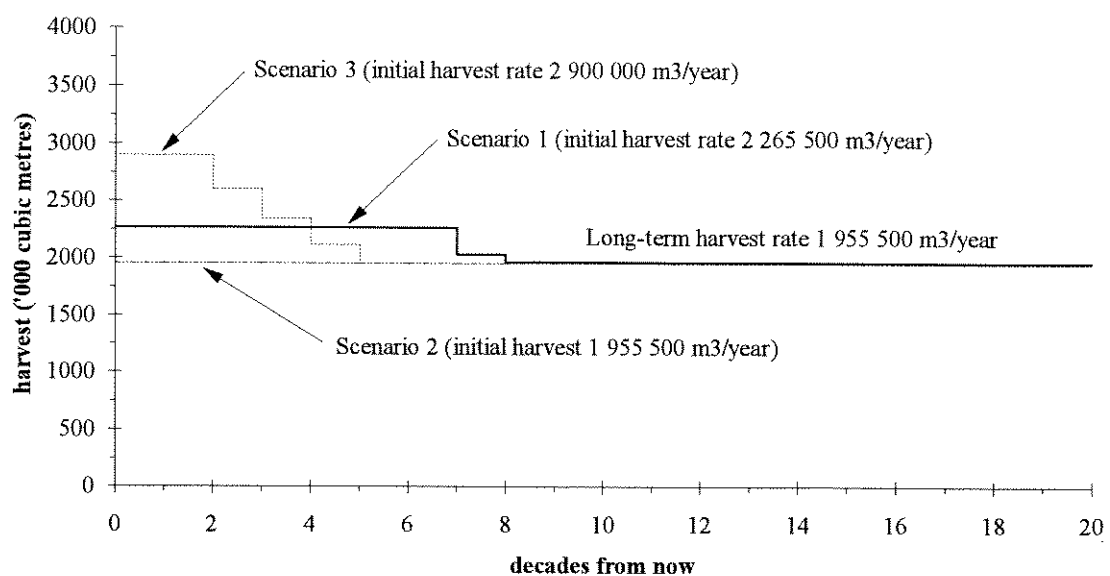
Scenario 2: This scenario begins with an immediate reduction in harvest level of 17 percent to the long-term harvest level of 1 955 500 cubic metres per year in Decade 8.

Scenario 3: The harvest level in this scenario starts at 2 900 000 cubic metres, then declines at ten percent per decade in Decades 3 through 6 to the long-term harvest level of 1 955 500 cubic metres per year. This scenario illustrates that it is possible to raise the harvest in the short-term, but the harvest would require a much more rapid decline to the long-term level than Scenario 1, and harvest levels 40 to 80 years from now would be significantly lower than Scenario 1.

Table 11: Quesnel TSA: Harvest Scenarios (million m³/year)

Decade	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	2.266	1.956	2.900
Decade 3	2.266	1.956	2.606
Decade 4	2.266	1.956	2.346
Decade 5	2.266	1.956	2.116
Decades 6 through 7	2.266	1.956	1.956
Decade 8	2.036	1.956	1.956
Decades 9 through 20	1.956	1.956	1.956

Figure 3: Quesnel Timber Supply Area Harvest Forecasts



5.0 Economic Impacts of Harvest Scenarios

Forestry is the major economic activity in the Quesnel TSA and changes in the harvest level would affect employment and income throughout the province. This section discusses the impacts of the various harvest scenarios at the TSA and provincial levels. Starting with a detailed review of the economic impacts that Scenario 1 would have on forestry related employment, employment income, and government revenues, the section follows with a summary of the impacts of Scenarios 2 and 3 on forestry activity.

The economic impact of changing harvest levels on the TSA's other economic sectors is also discussed; however, the relationship between harvest levels and economic activity in these other sectors is more complex and uncertain. Accordingly, the discussion of impacts is more general and qualitative.

Assuming the employment coefficients do not change over the forecast period, employment impacts related to each harvest level can be calculated. While direct harvesting employment would change concurrently with a change in harvest levels, direct manufacturing employment may not change until harvests drop below a mill's threshold level. Each mill would have a different threshold level. If such a level is reached, one or two shifts may be eliminated, or an entire mill could shut down for the short- or long-term. Calculating the time at which this might happen is difficult as a result of the uncertainty of future prices and timber supply conditions. In the context of this study, several people commented that the industry has already undergone significant rationalization when the special beetle kill licences expired in 1990.

Under Scenario 1, employment would be stable, given the seven decades of stability modelled in the forecast. The other two scenarios would have more abrupt changes in employment over the first five decades. In the longer term, the cumulative impacts would be the same, given the assumption of a constant coefficient. The analysis is also based on the assumption that indirect and induced impacts would occur immediately. In the actual economy, these 'spin-off' effects would occur over a longer time frame. As the purchases by industry and the spending of employee incomes decline, businesses in the area will earn less revenue and would respond by laying-off workers, or shutting down completely. How long this would take is not revealed by multiplier analysis.

5.1 TSA Forestry Sector Impacts of Scenario 1

The TSA employment and employment income impacts of Scenario 1 are presented in Tables 12 and 13, respectively. Appendix B presents background information on how these numbers were derived. Table 12 shows that each 1000 cubic metres of harvest supports total, direct, indirect and induced, employment of approximately 1.28 PYs. For example, each 100 000 cubic metres would support a total employment level of about 128 PYs within the Quesnel TSA.

Table 12: TSA Employment Impacts of Scenario 1 (PYs)

Decade	Harvest Forecast ('000s m³)	Direct PYs (1)	Indirect / Induced PYs (2)	Total PYs (3)	Percentage Change
Decades 1 - 7	2 266	2 017	887	2 904	-
Decade 8	2 036	1 812	797	2 609	(10%)
Decades 9 - 20	1 956	1 741	766	2 507	(4%)

Notes:

- (1) Direct employment includes harvesting, silviculture, processing, and transportation employment, estimated to be 0.89 PYs of employment per 1000 m³ harvested. Refer to Appendix B for details.
- (2) Indirect and induced PYs are calculated based on a regional employment multiplier of 1.44. Total employment is estimated to be 1.28 PYs of employment per 1000 m³ harvested. Refer to Appendix B.
- (3) For purposes of this review, Ministry of Forest (MOF) employees are not included. MOF employment is included as public sector employment not affected by moderate changes in harvest levels. Currently, 64 PYs are at the district office TSA; however, these figures are expected to increase as a result of the Forest Practices Code and Forest Renewal Plan initiatives.

Employment associated with the Quesnel TSA timber harvest would remain constant for the first seven decades. In Decade 8, the harvest level would drop about ten percent followed by a decrease of four percent in Decade 9 to the long-term level of 1 955 500 cubic metres and total long-term employment would stabilize at 2507 PYs. In comparison to the current AAC, the long-term harvest level would support 276 less direct PYs of employment and 121 less indirect and induced PYs of employment.

Table 13 shows that, at the current AAC, total after-tax employment income generated within the Quesnel TSA by forestry activities amounted to \$85.4 million. No decreases in employment income would occur for the first seven decades of the forecast period. Once the long-term harvest level is reached in Decade 9, after-tax income for direct, indirect, and induced employees would be \$73.7 million.

Table 13: TSA After-Tax Employment Income Impacts of Scenario 1 (\$ millions)

Decade	Harvest Forecast ('000s m³)	Direct Income (1)	Indirect / Induced Income (2)	Total Income	Percent Change
Decades 1 - 7	2 266	\$65.6	\$19.8	\$85.4	--
Decade 8	2 036	\$58.9	\$17.8	\$76.7	(10%)
Decades 9 - 20	1 956	\$56.6	\$17.1	\$73.7	(4%)

Notes:

- (1) Direct income impacts are based on a weighted average after-tax income of \$32 314 per PY. After tax incomes are reported since they are a measure of disposable income. Refer to Appendix B for details.
- (2) Indirect and induced income impacts are calculated based on an after-tax income of \$22 300 per PY.

5.2 Provincial Economic Impacts of Scenario 1

Changes in timber harvest levels would cause economic impacts beyond the Quesnel TSA as provincial employment, income and government revenues would also be affected. A provincial multiplier of 2.5 approximates the broader provincial indirect and induced employment impacts. Direct forest sector jobs are located within the TSA, whereas indirect and induced jobs are predominantly found outside the TSA.

The estimated employment and employment income impacts of Scenario 1 are presented in Tables 14 and 15, respectively. Table 14 indicates that at the current AAC, the harvest supports approximately 2062 direct and 3093 indirect and induced PYs. By Decade 9 and the long-term harvest level, total provincial employment would decline by 705 PYs, from 5155 PYs to 4450.

Table 14: Provincial Employment Impacts of Scenario 1 (PYs)

Decade	Harvest Forecast ('000s m³)	Direct PYs (1)	Indirect / Induced PYs (2)	Total PYs	Percent Change
Decades 1 through 7	2 266	2 062	3 093	5 155	-
Decade 8	2 036	1 853	2 779	4 632	(10%)
Decades 9 through 20	1 956	1 780	2 670	4 450	(4%)

Notes:

- (1) Based on a provincial direct employment coefficient of 0.91 PYs per 1 000 m³ harvested. Refer to Appendix B for details.
- (2) Total employment is calculated using a provincial multiplier of 2.5.

Table 15 shows the after-tax employment income impacts of Scenario 1. Provincial after-tax employment income would remain at \$136.2 million for the first seven decades, before declining to \$117.6 million when the long-term harvest level is reached in Decade 9. Over the forecast period after-tax income for direct, indirect, and induced employees would decline approximately 14 percent, or \$19.6 million.

Table 15: Provincial After-Tax Employment Income Impacts of Scenario 1 (\$ millions)

Decade	Harvest Forecast ('000s m³)	Direct Income	Indirect / Induced Income	Total Income	Percent Change
Decades 1 through 7	2 266	\$67.2	\$69.0	\$136.2	-
Decade 8	2 036	\$60.4	\$62.0	\$122.4	(10%)
Decades 9 through 20	1 956	\$58.1	\$59.5	\$117.6	(4%)

5.3 Government Revenue Impacts of Scenario 1

Provincial and federal government revenues are affected by changes in the level of timber harvesting, as shown in Table 16 and 17.

The current AAC in the Quesnel TSA results in provincial government revenue of about \$64.0 million. Approximately 56 percent of this total represents stumpage and rents, another 23 percent is personal income tax paid by direct, indirect and induced employees related to the forest industry, and the remaining 21 percent includes other taxes such as corporate income taxes, provincial sales taxes, property taxes, electricity taxes, logging taxes and corporate capital tax.

Timber values and stumpage rates have increased substantially since the base year for this study (1993). Similarly, income and other taxes have increased over the rates used in this report - namely the inflation adjusted five year provincial average (1988-1992). If current values persist, government revenues from the Quesnel TSA are likely to be substantially higher than those shown in Table 16, and therefore the revenues foregone as a result of the harvest level reductions are also likely to be greater.

Policy changes announced in April, 1994, as part of the Forest Renewal Plan resulted in significantly higher stumpage revenues, and will continue if the 1993 increase in lumber prices represents a structural shift in the market. The increase in stumpage rates in the last three quarters of 1994 was approximately 80 percent. Based on this increase, a harvest of 2 265 500 cubic metres would generate approximately \$62.9 million in stumpage and rents.

Table 16: Provincial Government Revenue Impacts of Scenario 1 (\$ millions)

Decade	Harvest Forecast ('000s m³)	Stumpage and Rents (1)	Personal Income Tax (2)	Other Taxes (3)	Total Provincial Revenue
Decades 1 - 7	2 266	\$35.6	\$14.7	\$13.7	\$64.0
Decade 8	2 036	\$32.0	\$13.2	\$12.3	\$57.5
Decades 9 - 20	1 956	\$30.7	\$12.7	\$11.9	\$55.3

Notes:

- (1) The average 1993 Quesnel TSA stumpage rate of \$15.33/m³ was used for stumpage calculations. A rental rate of \$0.38/m³, based on the Interior average published in the report "1993 Forest Industry in British Columbia", was added to stumpage estimates. This does not reflect the changes in 1994.
- (2) Includes taxes related to direct, indirect, and induced employment incomes.
- (3) Other taxes include corporate income tax, provincial sales tax, electricity taxes, logging tax, and corporate capital tax. A rate of \$6.06/m³ has been used based on an inflation adjusted five year provincial average (1989-1993) published in the report, "1993 Forest Industry in British Columbia" by Price Waterhouse.

Under Scenario 1, provincial government revenues from the Quesnel TSA would remain constant for the first seven decades. Annual revenues would begin to decline in the eighth decade, then stabilize at \$55.3 million once the long-term harvest is reached in the ninth decade. The reductions to the long-term level represents a 14 percent decrease from current AAC levels, or 8.7 million.

Federal government revenues are presented in Table 17. Revenues are split into personal income tax and corporate taxes, with personal income taxes accounting for the majority at 93%. The trends associated with the harvest scenarios follow those of the provincial government revenues.

Table 17: Federal Government Revenue Impacts of Scenario 1 (\$ millions)

Decade	Harvest Forecast ('000s m³)	Personal Income Tax	Corporate Taxes	Total Federal Revenues
Decades 1 - 7	2 266	29.9	2.1	32.0
Decade 8	2 036	26.9	1.9	28.8
Decades 9 - 20	1 956	25.8	1.8	27.6

5.4 TSA Impacts of Scenarios 2 and 3.

The employment and income impacts of Scenarios 2 and 3 are summarized and compared to Scenario 1 in Tables 18 and 19.

Table 18: TSA Total Employment Impacts (PYs)

Decade	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	2 904	2 507	3 717
Decade 3	2 904	2 507	3 340
Decade 4	2 904	2 507	3 007
Decade 5	2 904	2 507	2 712
Decades 6 through 7	2 904	2 507	2 507
Decade 8	2 609	2 507	2 507
Decades 9 through 20	2 507	2 507	2 507

Note: Includes direct, indirect and induced impacts

Table 19: TSA Total After-Tax Employment Income Impacts (\$ millions)

	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	\$85.4	\$73.7	\$109.3
Decade 3	\$85.4	\$73.7	\$98.2
Decade 4	\$85.4	\$73.7	\$88.4
Decade 5	\$85.4	\$73.7	\$79.7
Decades 6 through 7	\$85.4	\$73.7	\$73.7
Decade 8	\$76.7	\$73.7	\$73.7
Decades 9 through 20	\$73.7	\$73.7	\$73.7

Note: Includes direct, indirect and induced impacts

The most dramatic short-term impacts result from Scenarios 2 and 3. Scenario 2 would result in an immediate reduction of 14 percent and a loss of 397 PYs of total employment. This employment reduction would result in a loss of \$11.7 million in total annual after-tax employment income. After this initial loss, employment and income would remain stable.

Scenario 3 results in an increase in employment of about 22 percent in the first decade, or 813 PYs of total employment. This results in an increase in total annual after-tax employment income of \$23.9 million. In Decades 3 through 5, these gains drop at approximately ten percent per decade until the harvest level reaches the long-term rate of 1 955 500 cubic metres in Decade 6.

Changes in employment levels could be affected by new employment opportunities as a result of the following:

- More intensive forest management activities relating, among other causes, to the new Forest Practices Code and initiatives such as the Forest Renewal Plan.
- Expansion of the remanufacturing sector within the area. Since secondary processing creates more jobs per cubic metre harvested as compared to primary processing, further development of these operations could potentially provide opportunities for displaced workers.
- Increased wilderness and tourism opportunities. Although the tourism sector may have some growth, as it has currently exhibited over the past few years, it would likely replace only a fraction of the employment lost through potential timber harvest reductions. Furthermore, tourism jobs are often seasonal and generally pay substantially less than forestry related occupations.
- A continuation of the growth in population could offset potential out-migration that would result as forestry workers relocate to other areas in search of work.

5.5 Provincial Impacts of Scenarios 2 and 3

The provincial impacts of Scenarios 2 and 3 are as follows:

Table 20: Provincial Total Employment Impacts (PYs)

Decade	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	5 155	4 450	6 598
Decade 3	5 155	4 450	5 929
Decade 4	5 155	4 450	5 337
Decade 5	5 155	4 450	4 814
Decades 6 through 7	5 155	4 450	4 450
Decade 8	4 632	4 450	4 450
Decades 9 through 20	4 450	4 450	4 450

Note: Includes direct, indirect and induced impacts

Table 21: Provincial Total After-Tax Employment Income Impacts (\$ millions)

Decade	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	136.2	117.6	174.4
Decade 3	136.2	117.6	156.7
Decade 4	136.2	117.6	141.0
Decade 5	136.2	117.6	127.2
Decades 6 through 7	136.2	117.6	117.6
Decade 8	122.4	117.6	117.6
Decades 9 through 20	117.6	117.6	117.6

Note: Includes direct, indirect and induced impacts

In terms of provincial employment in the first decade, Scenario 3 yields 22 percent greater employment than Scenario 1. In contrast, employment is 14 percent lower under Scenario 2. All scenarios result in the same long-term provincial employment level of 4450 PYs, which is 705 PYs, or 14 percent, lower than the current AAC level. The primary difference between the scenarios is the timing of harvest declines to the long-term level. Employment income levels mirror the changes in employment.

5.6 Government Revenue Impacts of Scenarios 2 and 3

A summary of the provincial government revenue impacts is presented in Table 22.

Table 22: Provincial Government Revenue Impacts (\$ millions)

Decades	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	\$64.0	\$55.3	\$81.0
Decade 3	\$64.0	\$55.3	\$73.6
Decade 4	\$64.0	\$55.3	\$66.3
Decade 5	\$64.0	\$55.3	\$59.8
Decades 6 through 7	\$64.0	\$55.3	\$55.3
Decade 8	\$57.5	\$55.3	\$55.3
Decades 9 through 20	\$55.3	\$55.3	\$55.3

Note: Includes stumpage and rents, personal income tax and other corporate taxes.

Table 22 illustrates the sensitivity of provincial government revenues to changes in the harvest rate. The Decade 1 decline of 310 000 cubic metres in Scenario 2 would be associated with a decline of \$8.7 million in provincial government revenues. The first decade increase of 643 000 cubic metres in Scenario 3 would generate approximately \$17.9 million more in provincial revenues. These two cases illustrate that a change in the harvest rate of 100 000 cubic metres in the Quesnel TSA would affect provincial government revenues by approximately \$2.8 million.

Federal government revenues are presented in Table 23. Federal revenues are comprised of personal income and corporate taxes. The current AAC generates approximately \$29.9 million in personal income tax, with corporate taxes contributing another \$2.1 million for a total of \$32.0 million.

Table 23: Federal Government Revenue Impacts (\$millions)

Decades	Scenario 1	Scenario 2	Scenario 3
Decades 1 through 2	32.0	27.6	41.0
Decade 3	32.0	27.6	36.8
Decade 4	32.0	27.6	33.1
Decade 5	32.0	27.6	29.9
Decades 6 through 7	32.0	27.6	27.6
Decade 8	28.8	27.6	27.6
Decades 9 through 20	27.6	27.6	27.6

5.7 Other Economic Sectors

5.7.1 Public Sector

The public sector is the second largest basic employment sector in the Quesnel TSA, providing employment to over 1700 people. The relationship between public sector employment and harvest levels is indirect. Government employment is driven by, for example, population (i.e., schools and hospitals) and is unlikely to change in the short- to medium-term, given the forecast in Scenario 1. If reductions to the harvest is followed by a substantial net out-migration, those services linked to population levels would be affected. Employment at the Ministry of Forests, 64 PYs within the TSA, while dependent on the need for forest management, would not change with marginal changes in the harvest. This is particularly true because of the Ministry's increased responsibilities under the Forest Practices Code and the

Forest Renewal Plan. Given the stability in Scenario 1, no change in public sector employment would occur under current conditions.

5.7.2 Tourism and Recreation Resources

The tourism and recreation industry in the Quesnel TSA is an important sector of the economy. Due to the wilderness and varied topography, activities such as guide-outfitting, trail riding, fishing, nature viewing, hiking, snowmobiling, skiing and dog-sledding are common. As the relationship between tourism and forestry is somewhat unclear, it is difficult to quantify or assess how the tourism sector and resulting employment would be affected by changes in harvest levels. However, some qualitative conclusions can be reached.

In the first decade, Scenario 2 models a decline in the average annual harvest of approximately 14 percent. In the short-term, tourists do not immediately start visiting an area because of less logging. However, reductions in forestry employment could impact the number of visits by friends and family if the laid-off workers chose to seek employment elsewhere. Increases in tourism depend on many factors such as marketing, infrastructure, amenities, and accessibility. Many recreational areas are currently accessed by roads built and maintained as a result of timber harvesting activities.

However, in the longer term, greater protection of natural habitats may have a positive effect on tourism, particularly if the reductions are in accessible and visually sensitive corridors or valleys. Several people interviewed mentioned that tourism should be able to co-exist with forestry activity if both are managed properly. A move towards an area based, rather than a volume based, harvesting system was mentioned as a way of encouraging investment in tourism infrastructure, such as recreation sites and trails.

The impacts of the scenarios on specific segments of the tourism/recreation sector are as follows:

- Sixty five percent of visitors to the Cariboo-Chilcotin list touring and visiting family and friends as the purposes for visiting the Cariboo-Chilcotin (refer to Section 2.3.3).³¹ It is this group of tourists which has the highest economic impact as they use area infrastructure and amenities to a greater extent. Changes in harvesting levels, particularly reductions, could have a negative impact on this segment.
- Sport fishing is seen as having growth potential. The Ministry of Environment, Lands and Parks and some others interviewed felt that resource extraction practices have had an adverse effect on area fish stocks. Less timber harvesting is seen as desirable to the extent that fish habitats may be better protected.

³¹ Touring includes cars, trucks, campers, recreational vehicles and buses.

- Wilderness tourism is regarded as the segment presenting the greatest growth potential, particularly in the Chilcotin and Bowron areas of the TSA.³² These types of tourists are attracted by pristine wilderness, which is protected by less harvesting activity. However, because many of these visitors choose to camp, their contributions to the regional economy are much lower on average than other types of tourists (i.e., touring, business travellers, and conferences).
- Winter activities such as snowmobiling and cross-country skiing have both experienced increased growth. A reduction in harvesting is not expected to have a material effect on these activities.
- Guide-outfitting is reliant on the wildlife present in nearby guiding territory. When logging roads are built, wildlife is frequently displaced. Wildlife populations that exist near newly constructed roads can be severely reduced as roads provide access for hunters to animals that were previously less accessible. In particular, moose hunting, which has been the mainstay of guiding in the area, particularly in the Chilcotin, has been severely restricted because of dwindling moose populations. Further, the construction of new roads increases the burden on enforcement capability of the Ministry of Environment Lands and Parks conservation service. Guide-outfitters are concerned about the future of this industry as they perceive a trend towards fewer areas being preserved as wilderness. Less harvesting could reduce the amount of new logging roads, thereby reducing wildlife disturbances that create problems for the guide-outfitter.

Most people interviewed thought that in the short-term (first decade), it is unlikely that tourism/recreation will change significantly as a result of changes in harvesting. They also noted with concern that employment in the tourism sector tends to be seasonal and lower paying. From an economic perspective, however, encouraging tourism is important as it leads to a more diversified economy. Various types of recreation are enhanced by less harvesting, and although the economic value is difficult to quantify, there is evidence that British Columbians do value and are willing to pay for wilderness recreational opportunities. Reduced harvest levels in specific areas would help preserve the wilderness and visual quality that many activities and tourism operators rely on for their survival. No conclusions can be drawn, however, as to whether growth in the tourism industry would result from lower timber harvesting, or whether tourism would be adversely affected by increases in harvesting.

5.7.3 Agriculture

According to Table 4, the agricultural industry within the Quesnel TSA supports 461 PYs of employment, mainly in cattle ranching and forage production. With respect to ranching, the ranchers' key concerns are access to, and management of, Crown land. Ranchers require access to Crown land for forage, and given the shortage of spring range and readily available rangeland, the growth in the ranching sector is limited.

³² Areas designated as wilderness (Section 5.1 of the Forest Act) have restrictions on use, particularly commercial ventures, trail and facility construction and motorized use.

Logging activity can be advantageous to ranchers in that it provides much-needed grazing land and roads that access these areas. In addition, many ranchers have woodlots or sell private wood. On the other hand, logging may remove the natural boundaries (i.e., forests) that keep cattle contained in a specific area.

Other farming activities are less impacted by harvesting as they occur primarily on private or leased Crown land. Overall, the declines indicated in the scenarios will cause no direct impact on the ranching industry, particularly in the short term.

5.7.4 Mining

Changing harvest levels would have no impact on the mining sector. The mining industry is more likely to be affected by environmental issues and land use decisions.

5.7.5 Other

Trapping is more common in the Quesnel TSA than in most other parts of the province, in particular, among First Nations people. The trappers share many of the same concerns as the guide-outfitters. Several mammals of significance to the trapping industry are dependent on old growth forest attributes. For example, the marten is one of the more valuable species for trappers, but its numbers have been dwindling due to its dependence on mature forests. Reductions in harvesting may preserve old-growth and prevent habitat loss. On the other hand, certain species benefit from harvesting because of increased forage production.

6.0 Community, First Nations and Environmental Implications

6.1 Community Impacts

The community of Quesnel largely depends on the forest industry and would be affected by lower timber harvests and reduced employment levels in the forest industry. Quesnel's economy, while influenced by other industries including mining, tourism and agriculture, is less diversified than the economies of other communities in the Cariboo.³³ In contrast to Quesnel, some smaller communities that depend more on ranching, guide-outfitting, or tourism as their primary economic activity, such as Nazko or Wells, would be less affected by lower harvest levels.

As already noted, 38 percent of basic sector income (after-tax) in Quesnel is related to the forest sector.³⁴ This is substantially larger than the next largest basic income generator, the public sector at 17 percent. However, Quesnel is also fueled by income from tourism, ranching, mining, pensions, investments, unemployment insurance, social assistance and other transfer payments. Given forestry's high percentage of basic sector income, much of the induced employment and income is dependent on the incomes earned by forestry workers.

Despite the stability of the harvest under Scenario 1, a loss of employment would ultimately occur under all scenarios as the harvest moves toward the long term level of 1 955 500 cubic metres, and would result in changes in the size and composition of the local population base. This job loss may produce out-migration of displaced workers. Employment changes could also create an environment of instability and uncertainty for communities within the Quesnel TSA and affect social cohesion and lifestyle. On a micro level, individuals who lose their jobs are affected to a greater extent than the community as a whole.

The communities within the Quesnel TSA need to be aware of potential problems incidental to reduced harvest levels in order to develop effective social service, worker re-employment and possible re-training programs. A report on community adjustment by ARA Consulting, prepared for the Vancouver Island CORE Table, describes the process of replacing high-paying resource industry jobs in communities as slow and difficult, requiring pro-active local leadership and a focus on process.³⁵

Nevertheless, employment reductions in the forest sector are a serious concern for residents of the area. Organizations in the community that have direct and indirect links to the forest sector and are concerned about forestry employment are Share Our Cariboo-Chilcotin

³³ See Horne, G. Community Economic Dependencies, 1993.

³⁴ Refer to Section 2.3 for a discussion of basic sector employment.

³⁵ "Process" refers to the attention paid to seeking consensus, involving the public, and defining goals and community objectives. Source: The ARA Consulting Group Inc., Resource Based Community Adjustments, September 1993. Prepared for the B.C. Ministry of Employment and Investment.

Resources and the Save Our Jobs Committee. A general theme heard from residents in the area is that local people are not given enough say in resource use decisions which directly effect them. There was a common perception that people "on the Coast" wanted to have parks available for their use, without consideration given to people living in the region.

The following issues were raised:

- Some of the direct forest industry workers most likely to lose their jobs (i.e., processing and contracting) are older workers with less education. Some of these workers are harder to retrain because of literacy and numeracy problems. Also, they are much less willing to relocate because of family considerations and higher real estate values in areas where employment opportunities may be more plentiful.
- Employment reductions would be centred in the Quesnel area where most mill workers and contractors live. Furthermore, the vast majority of the TSA indirect and induced jobs are in Quesnel and its surroundings.
- Many of the potential replacement jobs (i.e., tourism and value added) pay substantially less than current forest industry positions, and do not generate the same indirect and individual effects. Furthermore, many tourism jobs are seasonal and the job skills are frequently not transferable.
- Many people voiced skepticism about the government's ability to create jobs to offset those lost in the forest sector. Several forest sector workers expressed concern about current high unemployment levels and questioned the potential for job creation.
- The forest companies and related contractors make substantial donations in time and money to community organizations such as minor hockey and service clubs, etc. These contributions are not widely known, but are very important to the community and its quality of life.
- The forest companies located in Quesnel provide the major tax base for the city and account for 68 percent of property taxes.

6.2 Individual Impacts

Individuals who lose their jobs are obviously affected to a greater extent than the community as a whole. Signs of personal stress often include increases in domestic violence, substance abuse, suicide and marital breakdown. Negative impacts on children related to changes in parental roles and family financial difficulties are common. These impacts are often reflected

in increased school drop out rates.³⁶ The degree to which these signs of stress could manifest themselves as the result of job displacement in the Quesnel TSA is impossible to determine

Experience gained as a result of the closure of Weldwood's mill in Williams Lake has indicated that if an adequate support structure is in place and employment reductions are planned over a period of years with involvement of those affected, many job losses can be handled through attrition, or possibly transfers to jobs in other locations. However, the impacts of these adjustments are very real and cannot be ignored.

6.3 First Nations Community Impacts

Reduced harvest levels would be consistent with First Nations' environmental and cultural values, in that reduced logging, particularly in sensitive areas, would help preserve cultural, medicinal and food values. First Nations people also recognize the economic opportunities associated with timber harvesting. Current harvest levels, along with greater access to timber harvesting rights would be consistent with some First Nations economic development objectives. Any decisions that would help preserve existing timber resources until such time as treaty negotiations are settled would be desirable from their perspective.

Reducing timber flows would help protect employment in other sectors and other economic activities including hunting, fishing, trapping, trail guiding and related tourist sector activities.

Some jobs would be lost, and given the high unemployment rates in the First Nation population, any job losses are significant. However, only five percent of the labour force is employed in the forest industry, compared to 35 percent for the general population. Thus, while jobs would be lost, overall, First Nations stand to be relatively less affected from a reduction in timber flows than the non-Native population. Specific bands more heavily involved in forestry would experience more of an impact as a result of harvest reductions.

The chances of First Nations people attaining a higher percentage of the timber allocation may be affected. As the timber supply is constrained, competition for timber supplies will increase.

6.4 Environmental Implications

All of the harvest flows in the timber analysis are based on current management practices. The scenarios are not differentiated, for example, by different levels of environmental protection. The following is by necessity a subjective and general discussion of the implications of timber harvesting under current management practices.

³⁶ Source: Simons Strategic Services Division and Cortex Consultants Inc., Community Stability in Forest Sector Dependent Communities in British Columbia, May 1991. Prepared for the Old Growth Values Team of the Old Growth Strategy Project.

All scenarios propose a substantial level of timber harvesting that will have varying degrees of effect on fish, wildlife and stand-level biodiversity. The levels proposed will ultimately move much of the accessible forest into the younger forest age classes. This will have negative consequences for some wildlife species and for biodiversity conservation, and will also have some positive effect on some early seral dependent species, such as moose and lynx.. As well, a reasonable assumption is that road access will increase. This will result in a significant negative impact for many wildlife species and sensitive habitats.

Eastern and western caribou and mule deer wintering habitat is largely protected under existing management by deducting the area from the harvesting landbase. The Douglas-fir bark beetle is attacking overmature Douglas-fir trees and this is resulting in a loss of mule deer core wintering habitat.

Logging may also have some positive impacts for some species. For example, it may increase moose forage in some biogeoclimatic zones. As well, if managed carefully it can produce a forest that, in terms of age structure, is closer to 'natural' values than would be the case if only fire control was practiced. Careful application of logging guidelines as required under the Forest Practices Code will also help to reduce negative impacts from logging.³⁷

Forest harvesting has replaced fire as the major disturbance in the TSA's forests. At the landscape level, the key aspects of forest harvesting that affect plants and animals are the rate and distribution of cut. A rapid rate of harvest will result in large areas of forest in early seral stages, e.g., recent clear-cuts that are unforested but which may have an abundance of shrubs and forbs, or recent clear-cuts regenerated with young forests. The effect this has on wildlife habitat and biodiversity will vary significantly over the TSA depending on the existing age-class distribution of the forests.

In some areas of the TSA that receive greater rainfall or where mean temperatures are lower, the age-class distribution can be dominated by mature and old-growth forests. This has occurred since, historically the size of naturally occurring fires was small and the fire cycle long. The fire cycle is the average number of years between fire occurrences. Rapid rates of harvest in forests such as this would cause a greater change from natural conditions than in other forests in the TSA, where historically fires were larger and the fire cycle shorter, e.g., lodgepole pine forests.

A key assumption supporting biodiversity objectives is that maintaining a variety of forest stand attributes and structures, patch sizes and seral stages across a variety of ecosystems and landscapes will meet the habitat needs of most forest organisms.³⁸ In general, narrowing the age class distribution of the forest would cause changes in the distributions and population

³⁷ Environmental Base Case, Part II. p. 8.

³⁸ Ministry of Forests and Ministry of Environment, Lands and Parks (1992), Guidelines to Maintain Biological Diversity in Coastal Forests.

levels of some wildlife species. Populations of species that use a wide range of habitat types, and species that use immature forests may increase in numbers. Populations of species that depend on mature forests may decline.

Depending on the spatial distribution of timber harvesting and the rate of harvest, fragmentation of habitats can be high. Older forest stands may be unconnected to habitats that are suitable for dispersal of certain species. As a consequence, fragmentation may result in reductions in species richness within remaining old-growth stands.

The age class distribution of future forest stands is also affected by the rate of timber harvesting. For example, if a large area was harvested in a 20 to 30 year period, the new forest would be relatively homogeneous. Initially, while the forest was young, this harvesting pattern would benefit species that utilize early seral stages. However, these younger stands and seral shrub areas would become largely unavailable for most of the forest rotation as the forest matures. This would have a negative impact on early seral habitat dependent species if adjacent mature stands were not available for cutting to provide alternative habitat.

Access

Although roads are essential for human commercial and recreational use, they remove land from production and may significantly increase the potential for wildlife disturbance and poaching. Changes in water quality are often a function of altered flow regimes, however they are also caused by forest practices that expose erodible materials. This ranges from the surface erosion of forest roads to mass wasting events caused by logging or road building in unstable terrain. Although there are techniques for minimizing the severity and risk of such incidents, forest practices inevitably elevate the transport of sediment and other materials into water bodies. Closure and rehabilitation of roads as well as proper location and engineering reduces their impact.

Water Resources

A major hydrological issue concerns the effect of harvesting activities on downstream resources, such as fish habitat or domestic water users. Direct damage from uncontrolled logging activity can include bank destabilization, the removal of stream side vegetation and debris jams. Measures to protect streamside and lakeshore habitats during logging are included in the Forest Practices Code, and federal fisheries legislation and regulations. Ongoing application of these management practices lowers the risk to water systems.

Other, more indirect logging related disturbances, include the alteration of hydrological processes and changes to water quality. Hydrological processes are complex, however it is generally agreed that forest cover moderates flow regimes. Maximum and minimum flows are exacerbated when too much forest cover within a given drainage is removed. Erosion associated with high flows increases sedimentation and degrades fish habitat. Conversely, low flows prevent fish from using what could otherwise be good habitat and contributes to elevated water temperatures. Under the Forest Practices Code a Watershed Assessment

Procedure (WAP) is used to calculate the acceptable rate of harvest for individual watersheds. Harvest rates will depend on past and proposed development, a terrain analysis, and the water and fisheries values of the system.

The long-term impacts on the water quality associated with forest harvesting is not well understood, although some practices such as clear-cutting are known to reduce long-term large organic debris (LOD)³⁹ recruitment. Impacts from reduced LOD availability would be realized much later than hydrology and sedimentary impacts since existing LOD would continue to function for some time after harvesting.

The protection of fish habitat is vital to the maintenance of fish stocks within the Quesnel TSA. Fisheries managers continue to stress the importance of habitat protection and rank maintaining wild, indigenous fish stocks as highest in importance.

Since the scenarios are all based on current management practices, they are largely distinguished only by how the harvest volumes change over the next 100 years. Scenario 3 may be the least desirable of the scenarios from a wildlife perspective in that the harvest level increases and more areas would be harvested each year. Scenario 2 may be the most preferred from a wildlife perspective as the harvest would immediately drop to the long-term level. Presumably the impacts of both harvesting and access development would be reduced at the lower cut level. Over the long-term, cut levels are similar for all three scenarios and impacts on wildlife may not be significantly different.

³⁹ L.O.D. provides habitat complexity, maintains channel stability, provides escape cover and resting areas, and is an indirect source of fish food organisms.

7.0 Summary

The purpose of this socio-economic analysis is to assess the social and economic implications of changing harvest levels in the Quesnel TSA.

7.1 Socio-Economic Profile

- The Quesnel TSA is located in the Cariboo Forest Region, and is under the joint administration of the Quesnel Forest District and the Cariboo Forest Region.
- In 1991, the population of the TSA was 22 860 persons, the City of Quesnel and adjacent communities of Red Bluff, Barlow Creek and Bouchie Lake form the largest populated area with 8179 people. Other communities in the TSA include Nazko, Wells, Kersley, and several other small centres.
- Four First Nation Bands are located in the TSA, with a further two having historical interest in the TSA. The four bands within the TSA have a total population of 653, with 450 residing on reserves. Approximately five percent of the adult population available for work is employed in the forest industry.
- Major employers in the TSA are (in order of significance): the forest industry, the supply and service sector,⁴⁰ the public sector, tourism, agriculture and mining.
- In addition to employment income, the economy of the TSA is supported by investment income, unemployment insurance, pension income and other government transfer payments.
- The forest industry directly and indirectly accounts for at least 35 percent of TSA employment. The major employers include Cariboo Pulp and Paper, C&C Wood Products, Quesnel River Pulp, Slocan Forest Products, Tolko Industries, Weldwood of Canada, and West Fraser Mills. In 1993, these companies provided employment for 2 265 people including a portion of sawmill and pulp mill employment related to fibre supply from outside the TSA and the bulk of the value-added employment. In addition, other smaller secondary wood products manufacturing sectors account for about 45 person years (PY) of employment.
- In 1993, the combined sales revenues of the forest industry in the Quesnel TSA exceeded \$570 million. This amount includes revenue associated with fibre supply from outside the TSA.

⁴⁰ Supply and services includes parts of manufacturing, construction and transportation not attributable to the major basic sectors, fishing and trapping, and the non-basic sector.

- In 1993, the forest industry related to the Quesnel TSA harvest generated \$96 million in provincial and federal government revenues. This figure reflects the 1993 situation, thus does not include the higher stumpage rates that went into effect in May of 1994. Since that time stumpage rates have increased by approximately 80 percent.
- Tourism directly and indirectly accounts for approximately five percent of total TSA employment. The area's main attractions are the wide variety of outdoor recreation activities, and its vast, rolling scenic landscape.
- People interviewed for the study believe that there is opportunity for growth in tourism and recreation, particularly in the areas of sport fishing, wilderness tourism, and winter activities such as cross-country skiing, snowmobiling and sled-dog racing.
- Together, the agriculture and mining sectors account for approximately eight percent of total TSA employment.

7.2 Environment Profile

- The TSA is characterized by flat rolling hills in the west to steeper terrain rising to the Cariboo Mountains in the east.
- The TSA has a wide variety of wildlife species because of its diverse soils, climates, and topography. There are provincially significant populations of caribou and the American Peregrine Falcon.
- In the ecosections represented in the TSA, approximately 22 species (mammals, birds, reptiles, amphibians, fish and vascular plants) are candidates for designation as endangered and a further 26 species are considered sensitive or vulnerable. These species may be found within the Quesnel TSA.
- Many of the streams in the TSA have either critical or moderate value as spawning and rearing habitats.

7.3 Current TSA Profile

- The Quesnel TSA covers approximately 1.65 million hectares. The B.C. Ministry of Forests reports that approximately 61 percent of the total land base is available for long-term harvesting under current forest management practices. This estimate excludes implications of the settlement of treaty negotiations, land use planning initiatives such as the Cariboo-Chilcotin Land Use Plan, and changing forest management practices.
- The current allowable annual cut (AAC) analyzed for the timber supply review is 2 265 500 cubic metres. The major licensees in the TSA are Weldwood of Canada, Slocan Forest Products, Tolko Industries, West Fraser Mills, and Canadian Forest Products. Together, these licensees have approximately 62 percent of the AAC. The

Small Business Forest Enterprise Program has an AAC apportionment of 439 630 cubic metres, or approximately 19 percent of the total AAC.

7.4 Timber Harvest Scenarios

To provide a basis for discussion, the Ministry of Forests chose the following scenarios for review. These scenarios are simply reference points within a range of available options and do not indicate preferred options.

Scenario 1

- An initial rate of 2 265 500 cubic metres per year for the first seven decades, declining approximately ten percent in Decade 8 and approximately four percent in the following decade to the long-term harvest level of 1 955 500 million cubic metres per year.

Scenario 2

- Harvest reduced immediately by 14 percent to the long-term harvest level of 1 955 500 cubic metres per year.

Scenario 3

- An initial rate of 2 900 000 cubic metres per year for the first two decades then declining by approximately ten percent in Decades 3 through 6 to the long-term harvest level of 1 955 500 cubic metres per year.

7.5 Forestry Employment and Employment Income Impacts

7.5.1 TSA Level Impacts

- The current AAC of 2 265 500 cubic metres per year supports approximately 2017 PYs direct and 2904 PYs of total employment. In comparison, the long-term harvest level of 1 955 500 cubic meters per year (reached in Decade 9) would be 14 percent lower and would reduce employment by 276 direct and 397 total PYs.
- After-tax employment income generated by the current AAC is \$85.4 million. After-tax income would decline to \$73.7 million, a decline of \$11.7 million, or 14 percent, at the long-term harvest level.

7.5.2 Provincial Level Impacts

- Provincial direct employment supported by the current AAC of 2 265 500 cubic metres per year is approximately 2062 PYs per year, with a further 3093 indirect and induced PYs supported across the province. Scenario 1 would sustain the current levels for seven decades, prior to a two decade decline to the long-term harvest level. Each 1000 cubic metre change in the harvest rate would affect about 2.28 PYs.
- Total provincial after-tax employment income generated from the current Quesnel TSA AAC is estimated at \$136.2 million. This level would be sustained for seven decades. At the long-term harvest level, total after-tax income in the TSA would be \$17.6 million, 14 percent lower than the current level.

7.5.3 Government Revenue Impacts

- Provincial government revenues in the first decade would be \$64.0 million. At the long-term harvest level of 1 955 500 million cubic metres per year, provincial revenue would be \$55.3 million annually, a reduction of \$8.7 million from the current AAC.
- Federal government revenues would decline from \$32 million to \$27.6 million after 70 years of stability.

7.6 Other Economic Sectors

Impacts on Tourism and Recreation

- Approximately 65 percent of visitors to the Cariboo-Chilcotin tour and visit family and friends. Reductions in harvesting may have a limited impact on this segment. However, reductions in employment opportunities may cause people to migrate from the area, potentially reducing the number of visits by relatives and friends.
- Sport fishing is seen as having growth potential. Less timber harvesting is seen as desirable to the extent that fish habitats are better protected, and the visual quality of fishing areas is retained. However, the accessibility of sport fishing locations may be reduced.
- In the longer term, greater protection of natural habitats may have a positive effect on wilderness tourism, particularly if the reductions are in visually sensitive corridors or valleys.

7.7 Impacts on Communities

- Quesnel and its surrounding communities are extremely dependent on forest sector employment. The small, outlying communities in the Quesnel TSA, particularly those in the Chilcotin are less dependent on forest sector employment.
- The government's ability to create jobs to replace those lost in the forest sector has been met with some skepticism in the Quesnel area.

7.8 First Nations Community Implications

- Local Bands have the desire to preserve the timber resource until treaty negotiations are settled.
- Reduced harvesting levels would better preserve the cultural, heritage, and religious values of Quesnel TSA First Nations but would increase the competition for timber harvesting rights.

7.9 Environmental Implications

Scenario 3 may be the least desirable of the scenarios from a wildlife perspective in that the harvest level increases and more areas would be harvested each year. Scenario 2 may be the most preferred from a wildlife perspective as the harvest would immediately drop to the long-term level. Presumably, the impacts of both harvesting and access development would be reduced at the lower cut level. Over the long-term, cut levels are similar for all three scenarios and impacts on wildlife may not be significantly different

7.10 Concluding Remarks

This study identifies the potential economic, social and environmental implications of changing harvest levels in the Quesnel TSA. The *Quesnel TSA Timber Supply Analysis* report indicates that the current AAC for the TSA is sustainable for seven decades until it requires a two decade reduction to the long-term harvest level 14 percent below the current AAC. A higher harvest could provide more short-term employment, but would lead to lower employment in the medium-term, i.e., in 40 to 80 years. Lowering the harvest immediately would not provide for any higher employment in the medium- or long-term.

This analysis assumes that factors such as current forest management practices, harvesting and processing technology and timber prices remain constant. Changes in these factors will cause changes in the socio-economic projections of this report.

Glossary of Terms

Allowable Annual Cut (AAC)	The volume of timber that may be cut from a forest management unit (e.g., a TSA), set by the Chief Forester in accordance with Section 7.0 of the Forest Act.
AAC Apportionment	The allocation by the Minister of the AAC for a TSA among timber tenures in accordance with Section 8.0 of the Forest Act.
basic silviculture	A term used to refer to the silviculture treatments that are carried out to ensure the establishment of a free growing tree crop. This may include: surveying, site preparation, planting, direct seeding or brushing.
biodiversity	The diversity of plants, animals and other living organisms and their habitats measured by factors such as genetic variability, number of species and variation in species composition.
biogeoclimatic zones	Areas which are defined by similar biological, physical and atmospheric characteristics.
Bone-Dry Unit (BDU)	A bone-dry unit of pulp chips weighs 2 400 even dry pounds. The volume of solid wood in a BDU of chips varies with species density. A conversion factor of 2.8 m ³ / BDU would be roughly applicable for the fibre flows discussed in this report.
cutblock adjacency guidelines	Integrated management guidelines that specify the desired spatial relationship among cutblocks. They can be approximated by specifying the maximum allowable proportion of a forested landscape that does not meet green-up requirements.
direct employment	Employment in the forestry sector (harvesting, milling, and silviculture).
ecosystem	Any complex of living organisms together with all the other biotic and abiotic (non-living) factors which affect them.
Environmentally Sensitive Area (ESA)	An area with significant non-timber values, fragile or unstable soils, problems in establishing a new tree crop, or where timber harvesting may cause avalanches.
ecoprovince	An area of the earth's surface characterized by very broad ecological interactions between the four major environmental components of the ecosystem: air, water, land and biota.

forest cover requirements	These specify desired distributions of areas by age or size class groupings. These requirements can be used to reflect desired conditions for wildlife, watershed protection, visual quality and other integrated resource management objectives. General adjacency and green-up guidelines are also specified using forest cover requirements.
Forest Licence (FL)	This licence is the major forest-tenure in BC. It provides a replaceable AAC in a TSA to an operator who has an established or proposed processing facility.
green-up period	The time needed for a stand of trees to reach a desired condition (e.g. such as a certain minimum height) to ensure maintenance of water quality, wildlife habitat, soil stability, or aesthetics.
harvest forecast	The flow of potential timber harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realised, over time, for a specified land base and set of management assumptions. It is a result of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions.
indirect employment	Employment in sectors which supply materials, equipment, and services to the forest sector.
induced employment	Employment supported by the local respending of the incomes of those employed in the direct (forestry) and indirect (service and supply) sectors.
inoperable areas	Areas defined as unavailable for harvest for terrain-related or economic reasons.
long term harvest level	Refers to timber harvesting levels whereby the volume of timber harvested in any given period can be replaced by a similar volume from regenerated stands within the same period.
management assumptions	Approximations of management objectives, priorities, constraints and other conditions needed to represent forest management actions in a forest planning model. These include, for example, the criteria for determining the timber harvesting land base, the specification of minimum cutting ages, utilization levels and standards, integrated resource guidelines and silviculture and pest management programs.

non-Crown areas	Areas not managed directly by the BC Forest Service (for example, private land, Indian Reserves, and provincial parks).
non-forest areas	Areas not occupied by productive forest cover (such as rock, swamp and alpine areas).
non-commercial cover areas	Areas occupied by non-commercial tree or brush species.
non-merchantable forest types	Areas occupied by timber stands that are accessible and otherwise available for timber harvesting but are assumed to be non-merchantable due to stand characteristics such as small size, incidence of decay and low stocking.
Person Year (PY)	A standard measure of employment that takes into account part-time and seasonal full-time work. For example, an employee working full-time for six months would represent 0.5 PY of employment. Using this measure allows different types of employment to be compared on a similar basis.
riparian zone	The stream bank and flood plain adjacent to streams or water bodies, with particular reference to the vegetation.
section management	A silvicultural system used to maintain or create areas containing a wide range of tree ages or sizes. The time interval between harvests in such areas is fairly short (usually less than 30 years) and during these harvests either single or scattered trees or small groups of trees are removed from across the entire area.
Small Business Forest Enterprise Program (SBFEP)	A program introduced in 1978 to provide opportunities for small businesses in the forest sector. Timber is sold to loggers, small sawmills, and re-manufacturers.
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. The harvesting land base is defined by reducing the total land base according to specified management assumptions.

APPENDIX A

Timber Sale Licence (TSL)	Licences providing established operators with a ten year AAC over undefined areas of Crown land in a TSA. These licences are replaceable in their last year. Shorter term timber sale licences are also issued to small business loggers and to timber processors who qualify for registration under the Small Business Enterprise Program.
Timber Supply Area (TSA)	An integrated resource management unit established in accordance with Section 6 of the <i>Forest Act</i> .
unsalvaged losses	The volume of timber killed or damaged annually by natural causes (such as fire, wind, insects and disease) and not harvested.
Visual Quality Objective (VQO)	Defines a level of acceptable landscape alteration resulting from timber harvesting and other activities. A number of visual quality classes can be defined based on the maximum amount of alteration permitted.
watershed	An area drained by a particular stream or river. A large watershed may contain several smaller watersheds.
Woodlot Licence	A licence issued to an individual to manage a specific area of Crown Timber, plus any private woodlands the individual holds. Requires the holder to file a management plan and to harvest at a pre-determined rate.

Forestry Sector Methodology

The impacts presented in this analysis are estimates of the employment and income changes that may occur as timber harvesting decreases to a long-term harvest level. The numbers should not be considered definitive, but illustrative of the trends to expect. Three levels of impacts occur in response to economic changes: direct, indirect, and induced. Direct activity comprises all forestry related activities involved with harvesting, processing, and silviculture. Indirect impacts result from the purchase of goods and services by direct forestry businesses. Induced impacts arise as a result of employees spending their wages and salaries on consumer goods and services.

This section first discusses the estimation of labour coefficients, then income levels used to estimate employment income impacts, and finally the multipliers used in the calculation of indirect and induced impacts.

Employment Coefficients

Labour coefficients are used to calculate forestry related employment associated with particular harvest levels. The coefficients reflect the relationship between the number of workers and the quantity of timber harvested, and are presented in the form of labour per 1000 cubic metres of timber cut. Coefficients were derived for harvesting, silviculture, transport, and processing. Multiplying the coefficients by each forecast harvest level provides a projection of the number of workers that would be employed in the forest industry at selected intervals of the forecast period.

Some assumptions are inherent in this type of analysis:

1. The relationship between the number of workers and the quantity of timber harvested is held constant. Thus, the labour coefficients do not change over the forecast period and do not adjust for potential increases or decreases in labour intensity. The method assumes that the current economic relationships will continue into the future. In other words, current socio-economic conditions (productivity, harvest practices, and social objectives of forest use) will continue for the length of the forecast period. These conditions will likely, of course, change in the future.
2. The presentation of impacts suggests that employment and income losses would occur immediately with a change in the quantity of timber harvested. Thus, when the harvest rate declines, employment in harvesting, silviculture, and processing is assumed to immediately decline also. However, the adjustment process would likely occur over a longer time period. The analysis is not able to predict the exact time at which the losses would occur. While direct harvesting activity would likely decline in concert with harvest levels, processing employment, for example, would adjust over a longer period as timber flows adjust to harvest changes occurring throughout the province. Silviculture

employment would not decline immediately either, as a result of a lag-time between harvesting and the completion of basic silviculture.

3. Changes in indirect and induced employment and income would also not occur immediately. While the number of jobs related to the harvest is estimatable, the time at which these 'spin-off' changes will occur is not. Multipliers are static representations of particular economic conditions and do not provide a temporal, or dynamic, insight into the occurrence of impacts.

These qualifications are not the fault of this or any impact analysis, but are the result of theoretical assumptions inherent in any static economic impact assessment technique. As such, the assessment provided here represents the best approximations, given the use of the best available information.

Table B1 shows the TSA and provincial employment coefficients for the Quesnel TSA. Explanations are given in text, and where they differ from the Cariboo CORE estimates an explanation is also given.

Table B1: Quesnel Forestry Based Employment Coefficients

	Person Years/ 000 m ³ Within the TSA	Person Years/ 000 m ³ Total Province
Harvesting (Contractors and company woodlands) (a)	.20	.20
Silviculture (b)	.03	.07
Processing Employment (c,d)	.63 (c)	.64 (d)
Transportation (e)	.03	n/a
Direct Employment Coefficient	.89	.91

(a) Harvesting includes logging, log hauling, road building and maintenance contractors and company personnel involved in harvesting (woodlands operation). We have assumed that all harvesting personnel reside within the TSA.

(b) Silviculture includes forestry contracting services, field assessments, site preparation, planting, stand tending and improvement activities. Based on discussions with the licensees, approximately half of the silvicultural employees normally reside outside the TSA. The socio-economic analyses prepared for the Cariboo-Chilcotin CORE Region⁴¹

⁴¹ The coefficients used for the socio-economic analysis for the Cariboo-Chilcotin CORE table were calculated by the Ministry of Employment and Investment based on two reports: The Economic Impact of

uses two estimates of direct woods employment, one which includes silvicultural employment and one which excludes silvicultural employment. For the purposes of this analysis, silviculture impacts are included as direct and are separated from other woods, or harvesting operations.

- (c) Processing includes sawmills, a plywood plant, pulp mills, and remanufacturing operations. In 1993, the solid wood operations consumed approximately 3.25 million cubic metres of fibre and generated approximately 1695 PYs, or 0.52 PYs/000 cubic metres of fibre consumed. A pulp mill coefficient was calculated separately then added to the solid wood coefficient. Pulpmill employment was adjusted to exclude employment related to non-TSA chips then divided by the 1993 total volumes billed in the Quesnel TSA of 2.447 million cubic metres. Approximately 46 percent of the chips consumed at the Quesnel pulp mills come from TSA harvested timber. The pulp mill coefficient is 0.11/000 cubic metres harvested

All chips resulting from wood processing in the Quesnel TSA (approximately 540 000 bone-dry units - BDUs), as well as chips from other sources, are consumed at Cariboo Pulp and Paper and Quesnel River Pulp, both located in Quesnel.

All remanufacturing jobs in the Quesnel TSA that directly depend on wood from the TSA are considered in the processing employment coefficient.

The socio-economic analyses prepared for the Cariboo-Chilcotin CORE Region uses a range of 0.35 PYs/000 cubic metres to 0.41 PYs/000 cubic metres for wood processing. Both the low and high figures exclude pulp employment on the assumption that other fibre supplies (i.e., chip exports and pulpwood agreements) would be available to offset any chip supplies lost due to a harvest reduction. Also the low estimate of 0.35 PYs/000 cubic metres excludes remanufacturing employment impacts on the basis that milled product would still be available to this sector. For the purposes of this analysis, pulp mill and remanufacturing employment is regarded as directly impacted by harvest reductions; accordingly, it has been included in calculating the TSA processing coefficient. Quesnel TSA mills also tend to be more labour intensive than other mills in the Cariboo Forest Region.

- (d) The provincial processing employment coefficient is 0.64 PYs/000 cubic metres. The provincial coefficient includes the timber volumes harvested by Canfor and processed in the Prince George TSA.

While some of the rough lumber is exported from the TSA and generates reprocessing jobs at remanufacturing plants around the province, we assume that these jobs are not directly dependent on the level of harvest in the Quesnel TSA (i.e., alternate sources of fibre are likely available).

the Cariboo Forest Industry by Price Waterhouse, November 1993 and Cariboo Forest Sector Employment Trends by Savage & Associates, April 1993.

- (e) Transportation includes truck and rail employees based in the TSA who are involved in the transport of finished goods and chips. It excludes workers residing outside the TSA and those involved in general freight transportation. Transportation employment coefficients for the entire province are not estimated because this employment is captured by the provincial multiplier for indirect and induced employment.

Average Income Estimates

The income impacts of changing harvest levels are calculated by multiplying after-tax income by changes in PYs. The employment incomes used for this purpose are as follows:

Direct Forest Industry Employment Income

	Gross Income per Person Year (excluding benefits)(f)	Average Tax Rate (g)	After Tax Income
Harvesting (a)	\$50,000	28.8%	\$35,600
Silviculture (a)	\$40,000	25.8%	\$29,700
Processing (b)	\$43,900	27.1%	\$32,000
Transportation (c)	\$34,000	24.4%	\$25,700
Weighted Average - Forest Industry (d)	\$44,461	27.3%	\$32,314
Supply and Services (e)	\$28,600	22.0%	\$22,300

- (a) This estimate is based on discussions with licensees and contractors.
- (b) Includes compensation paid to hourly and salaried employees of Quesnel area sawmills, pulpmills, plywood plant and remanufacturing operations.
- (c) Statistics Canada Catalogue No. 72-002. Weighted average based on 1992 provincial average truck driver annual income and railway transport operating personnel annual income.
- (d) Weighted average based on percentages of direct forest industry employment in the Quesnel TSA in each of the following industry segments: harvesting, silviculture, processing and transportation.
- (e) Statistics Canada, Annual Estimates of Employment and Average Weekly Earnings, Catalogue No. 72-002.

- (f) Gross income includes vacation pay and excludes non-cash benefits.
- (g) Calculated based on 1992 Revenue Canada tax tables.

Multipliers

Employment multipliers are used to estimate the amount of indirect and induced employment supported by the forest industry. For the TSA assessment, a TSA multiplier of 1.44 was supplied by the Ministry of Employment and Investment and was calculated as part of the Cariboo CORE process. To estimate indirect and induced employment in the entire province, a provincial multiplier of 2.5 was used.⁴² The multipliers should be interpreted such that every PY of direct forestry employment in the province that is supported by the Quesnel TSA harvest creates an additional 1.5 PYs across the province. Within the TSA, every direct forestry PY supported by the Quesnel TSA's harvest creates a further 0.44 PYs.

⁴² The Ministry of Forests uses a provincial multiplier of 2.5, Price Waterhouse in *"The Forest Industry in British Columbia"* uses a multiplier of 3.0.

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Red and Blue Listed Species

Examples of Red and Blue Listed Wildlife and Rare Plant Species that may be found in the Quesnel TSA.⁴³

Category	Example of Species/ Rare Plants	
Mammals	Badger California Bighorn Caribou Fisher Grizzly Bear Wolverine (Western)	
Birds	American Bittern American Peregrine Falcon American White Pelican Bald Eagle Bobolink California Gull Great Blue Heron Gyrfalcon Lark Sparrow Lesser Golden Plover Lewis Woodpecker	Long-billed Curlew Oldsquaw Prairie Falcon Red-necked Phalarope Sandhill Crane Sharp-tailed Grouse Surf Scoter Swainson's Hawk Trumpeter Swan Upland Sandpiper Western Grebe
Fish	Brassy Minnow Chiselmouth Chub Giant Pygmy Whitefish Lake Whitefish White Sturgeon	
Vascular Plants	<i>Anemone riparia</i> <i>Arabis nuttallii</i> (rock cress) <i>Carex simulata</i> (sedge) <i>Carex sprengelii</i> (sedge) <i>Carex xerantica</i> (sedge) <i>Chenopodium atrovirens</i> (goosefoot) <i>Cystopteris montana</i> (mountain bladder fern) <i>Juncus bolanderi</i> (Bolander's rush) <i>Myosurus minimus</i> (mousetail) <i>Pedicularis parviflora ssp. parviflora</i> (small-flowered lousewort) <i>Pyrola elliptica</i> <i>Salix boothii</i> (willow) <i>Stellaria obtusa</i> <i>Stipian spartea</i> <i>Viburnum opulus ssp. trilobum</i>	

Note: Species on the red list include the mammals, birds, fish and reptile species in bold type as well as all of the vascular plants. The others are on the blue list.

Source: Environment Base Case for the Cariboo Part II, Prepared by the CORE Regional Technical Group, 1993 and discussions with Ministry of Environment.

⁴³ The source for this information was organized by ecosection and included specific ratings for distribution and population significance. Some of the species listed above may not be found within the Quesnel TSA, or their range within the TSA may be very limited.

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Appendix F: Incremental Economic Impacts of the Quesnel TSA Timber Harvest Forecasts

Decade	Harvest '000m ³	TSA					Province					Government Revenues	
		Employment (PYs)			Income (\$ millions)		Employment (PYs)			Labour Income (\$ millions)		Provincial	Federal (\$ millions)
		Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced		
Current Level	2266	2017	887	2904	65.6	19.8	2062	3093	5155	67.2	69.0	64.0	32.0
Scenario 1													
1-7	0	0	0	0	0	0	0	0	0	0	0	0	0
8	-230	-205	-90	-295	-6.7	-2.0	-209	-314	-523	-6.8	-7.0	-6.5	-3.2
9	-80	-71	-31	-102	-2.3	-0.7	-73	-109	-182	-2.4	-2.4	-2.2	-1.2
10+	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Change	-310	-276	-121	-397	-9.0	-2.7	-282	-423	-705	-9.2	-9.4	-8.7	-4.4
Scenario 2													
1	-310	-276	-121	-397	-9.0	-2.7	-282	-423	-705	-9.2	-9.4	-8.7	-4.4
2+	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Change	-310	-276	-121	-397	-9.0	-2.7	-282	-423	-705	-9.2	-9.4	-8.7	-4.4
Scenario 3													
1	+634	+564	+249	+813	+18.3	+5.6	+577	+866	+1443	+18.9	+19.3	+17.9	+9.0
3	-294	-262	-115	-377	-8.5	-2.6	-268	-401	-669	-8.8	-8.9	-8.3	-4.2
4	-260	-231	-102	-333	-7.5	-2.3	-236	-356	-592	-7.7	-8.0	-7.3	-3.7
5	-230	-205	-90	-295	-6.7	-2.0	-209	-314	-523	-6.8	-7.0	-6.5	-3.2
6	-160	-142	-63	-205	-4.6	-1.4	-146	-218	-364	-4.8	-4.8	-4.5	-2.3
7+	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Change	-310	-276	-121	-397	-9.0	-2.7	-282	-423	-705	-9.2	-9.4	-8.7	-4.4

