

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

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**Economics And Trade Branch
British Columbia Ministry of Forests**

Acknowledgment

Price Waterhouse undertook most of the research, data collection and preliminary analysis for this report. The Ministry of Forests finalized the analysis and report organization. The Ministry of Forests takes sole responsibility for the analysis and conclusions in this report.

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Executive Summary

Introduction

The British Columbia Forest Service is presently conducting a provincial Timber Supply Review to assist the Chief Forester in setting Allowable Annual Cut (AAC) levels in the province's Timber Supply Area (TSAs). Four reports are released for each TSA. The Timber Supply Analysis reports (TSARs) examine the short-term and long-term effects of current forest management practices on the availability of timber for harvesting in the TSAs. The Socio-Economic Analysis (SEA) reports discuss the social, economic, and environmental implications of changing TSA timber harvest levels. The Discussion Papers summarise the first two reports and encourage public comment on the findings. Finally, the AAC Rationale Statements outline the reasoning behind the Chief Forester's AAC determinations.

This SEA report profiles the Lillooet TSA area and discusses the socio-economic and environmental implications associated with two of the timber harvest forecast scenarios presented in the Lillooet TSA Timber Supply Analysis report (or its addendum). These harvest scenarios were chosen to illustrate a range of impacts; they are not meant to suggest preferred AAC levels, nor will they be the only options considered in the AAC determination.

Lillooet TSA Profile

The Lillooet TSA, part of the Kamloops Forest Region, covers 1.1 million hectares in southwestern BC. It is administered from the Lillooet Forest District office in Lillooet.

Communities - The major communities in the TSA are Lillooet, Lytton, Bralorne, Gold Bridge, and Spences Bridge. In 1991, the TSA had an estimated population of about 5680, including First Nations peoples living on reserves.

Economy - The economies of Lillooet and Lytton are primarily forestry-based. The major employers are Ainsworth Lumber and Bridgeside Higa Forest Industries in Lillooet, and Lytton Lumber in Lytton. The economy outside these two communities is more diversified. Other sectors providing employment in the TSA are: tourism, agriculture, rail transport, electricity generation, and mining. The public sector and First Nations Bands are also major employers.

Environmental Setting - The Lillooet TSA lies west of the Thompson-Okanagan plateau, on the east side of the Coast mountains. The area has a great diversity of wildlife and bird species, good stocks of several salmonid and trout species, and significant key features, such as unique grasslands and broad alpine expanses. The diverse ecology of the Lillooet TSA supports a variety of tree species, with spruce, Douglas-fir, and lodgepole pine predominant. Waterbodies in the TSA include Seton, Anderson, Carpenter, and Downton Lakes, and the Fraser, Thompson, Stein, and Bridge rivers. These are of major importance to fish and wildlife in the TSA. Water quality, quantity and flow timing are of local concern because of generally low precipitation levels.

Timber Supply Profile

According to the Timber Supply Analysis report, the current timber harvesting land base is about 278 000 hectares, or 25 percent of the total area. Factors that could significantly impact the future timber harvesting land base include First Nations reserves, management for environmental values, forest management practices, land use planning, and the Protected Areas Strategy (PAS).

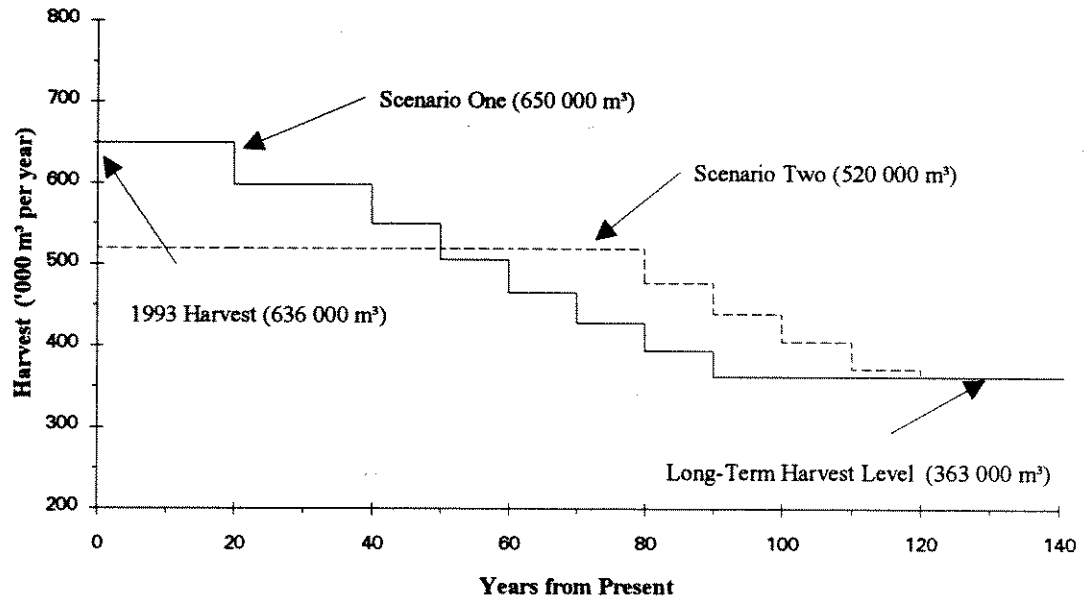
The estimated total volume of timber in the TSA is about 48 million m³. The current Allowable Annual Cut (AAC) of 650 000 m³ is apportioned primarily among Ainsworth (348 168 m³), J.S. Jones (88 510 m³), Lytton Lumber (32 778 m³), and the Small Business Forest Enterprise Program (152 544 m³). In recent years, between 50 percent and 75 percent of the SBFEP wood has remained in the TSA for processing by area mills.

The forest industry harvested around 650 000 m³ in 1990 and 1991, 571 000 m³ in 1992, and 636 000 m³ in 1993. The licensees, in particular Ainsworth, have had on-going difficulties meeting their AAC's for reasons which include lack of long-term access planning and road construction to new harvesting areas, protracted planning processes, and the deferral of areas to accommodate First Nations interests and other resource values.

Timber Harvest Scenarios

This report examines two timber harvest forecast scenarios from the Timber Supply Analysis report, as shown in Figure E.1.

Figure ES.1 Lillooet TSA Timber Harvest Scenarios



Under Scenario One the annual harvest would be maintained at 650 000 m³ for 3 decades, then decline by about eight percent per decade until the long-term harvest level (LTHL) of 363 000 m³ is reached in Year 90. In Scenario Two, the harvest would drop immediately to 520 000 m³, remain unchanged for eight decades, then fall by about eight percent each decade until the LTHL is achieved in Year 120.

Impacts of Harvest Scenarios

Table ES.1 summarizes the impacts of Scenario One and Scenario Two. These are grouped into sections dealing with the economy and government revenues, communities, First Nations, and the environment.

Table ES.1: Summary of Socio-Economic Impacts

Year	1993	Scenario One					Scenario Two		
Harvest (1000 m ³)	636	0	30	50	90		0	80	120
ECONOMIC IMPACTS - FOREST SECTOR									
TSA Employment (Person Years)									
Direct	483	494	454	385	276		395	363	276
Indirect/Induced	159	163	150	127	91		130	120	91
Total	642	657	604	512	367		525	483	367
TSA Employment Income (\$1993 mil.)									
Direct	\$15.0	\$15.3	\$14.1	\$11.9	\$8.6		\$12.3	\$11.3	\$8.6
Indirect/Induced	3.1	3.1	2.9	2.4	1.8		2.5	2.3	1.8
Total	\$18.1	\$18.4	\$17.0	\$14.3	\$10.4		\$14.8	\$13.6	\$10.4
Provincial Employment (Person Years)									
Direct	986	1008	927	784	563		806	741	563
Indirect/Induced	1476	1508	1387	1174	842		1206	1109	842
Total	2462	2516	2314	1958	1405		2012	1850	1405
Provincial Employment Income (\$1993 mil.)									
Direct	\$31.2	\$31.9	\$29.3	\$24.8	\$17.8		\$25.5	\$23.5	\$17.8
Indirect/Induced	33.4	34.1	31.4	26.6	19.1		27.3	25.1	19.1
Total	\$64.6	\$66.0	\$60.7	\$51.4	\$36.9		\$52.8	\$48.6	\$36.9
Government Revenues									
Provincial Government Revenues (\$1993 mil.)	\$20.6	\$21.0	\$19.4	\$16.3	\$11.8		\$16.9	\$15.4	\$11.8
Federal Government Revenues (\$1993 mil.)	14.2	14.5	13.3	11.3	8.1		11.6	10.6	8.1
COMMUNITY IMPLICATIONS									
	•	Three decades lead time for adjustment.					• Moderately adverse immediate impact; some possible out-migration and reduction in living standards.		
	•	Potentially severe consequences for individual displaced workers.					• Potentially severe consequences for individual displaced workers.		
FIRST NATIONS IMPLICATIONS									
	•	Mixed - First Nations peoples are active participants in forest industry, but place great importance on environmental values.					• Mixed - as per Scenario One		
	•	Long-term loss of biodiversity and declines in old growth dependent wildlife populations.					• Preferred scenario because immediate reduction in harvesting until land claims are settled.		
ENVIRONMENTAL IMPLICATIONS									
	•	Long-term loss of biodiversity and declines in old growth dependent wildlife populations.					• Fewer environmental impacts in first 50 years.		
	•	Possible terrain instability and water-related impacts, affecting fish habitat and community water users.					• Greater flexibility for future resource management and land use initiatives.		
	•	Detraction from visual landscape.					• Same long-term impacts as Scenario One.		

TSA Economic Impacts

The TSA-level economic impacts are assumed to occur in proportion to harvest changes. It is estimated that the 1993 harvest level of 636 000 m³ supported 483 PY of direct forest sector employment and an additional 159 PY in indirect/induced employment. The after-tax employment income associated with this would be \$15.0 million (direct) and \$3.1 million (indirect/induced). The impacts presented are discussed with reference to these levels.

Scenario One - Employment and income levels would be approximately two percent higher than 1993 levels for the first three decades, reflecting the slightly higher harvest level. Subsequently, employment levels would track the harvest, declining to 276 direct PY and 91 indirect/induced PY in Year 90 when the LTHL is reached. After-tax income would follow a similar pattern.

Scenario Two - Direct employment would decline immediately by 18 percent (88 PY), from 483 PY to 395 PY, and indirect/induced employment would likewise fall from 159 PY to 130 PY. These employment levels would then be sustained for 80 years, before dropping by about eight percent per decade and reaching the LTHL in Year 120. After-tax income would drop similarly.

Under both scenarios, the transition from the current harvest level to the LTHL would involve the cumulative loss of 207 PY of direct employment and \$6.4 million in annual after-tax direct employment income. The cumulative impact on indirect/induced employment would be 68 PY and \$1.3 million in after-tax income. These cumulative impacts are directly proportional to the 43 percent reduction from the 1993 harvest level to the LTHL.

Provincial Economic Impacts

Timber and primary wood products that are exported from the TSA for processing elsewhere create jobs outside the TSA that would be affected by lower timber harvest levels. This includes employment at J.S. Jones Holdings Ltd. in Boston Bar, at Ainsworth's plywood mill in Savona, at other BC wood processing facilities, and at pulp and paper mills that use chips manufactured from Lillooet TSA wood.

As at the TSA level, the province-wide employment and income impacts (which include those in the TSA) are again assumed to occur in proportion to harvest changes.

Scenario One - For the first three decades, total employment (direct and indirect/induced) would be 2462 PY. Thereafter, total employment would eventually fall to 1405 PY at the long-term harvest level. Total after-tax employment income would be \$66.0 million until Year 30, when it would commence declining to \$36.9 million at the LTHL.

Scenario Two - Total employment would decline immediately by about 18 percent, to 2012 PY, and remain at this level for 80 years before declining to 1405 PY at the LTHL in Year 120. Total after-tax income would follow the same trend, falling to \$52.8 million for the first eight decades

and to \$36.9 million in Year 120.

Under both scenarios, total employment and employment income would ultimately drop by about 43 percent (1057 PY and \$27.7 million, respectively) before reaching sustainable levels at the LTHL.

Government Revenue Impacts

The 1993 Lillooet TSA harvest of 636 000 m³ is estimated to have generated provincial government revenue of \$20.6 million, mostly in stumpage and personal income taxes. Under Scenario One, provincial government revenues would remain at \$21.0 million for three decades, then gradually decline to \$11.8 million at the LTHL. Scenario Two would involve an immediate 18 percent reduction (\$3.7 million), but no further declines would occur until Year 80.

Federal government revenues, mostly personal and corporate income taxes, would decline from the 1993 level of \$14.2 million to \$8.1 million at the LTHL.

Non-Forestry Economic Impacts

Generally speaking, lower levels of harvesting are probably beneficial for tourism and wilderness-based recreation, but the nature of the trade-off is difficult to assess. Agriculture, mining, rail transportation, and hydroelectricity generation would be largely unaffected by the harvest level changes considered in this report.

Community Implications

It is estimated that about 80 percent of the job impacts could occur in the Lillooet area, which has the TSA's most forestry-dependent economy. About 20 percent of the losses would be in the Lytton area, with the other communities being largely unaffected. Under Scenario One, there would be no employment losses for 30 years, providing a long lead time to plan for future harvest reductions. Under Scenario Two, the immediate 18 percent harvest reduction would translate into the loss of about 70 forest sector jobs in Lillooet and about 15 jobs in Lytton (calculated in proportion to the harvest change).

Non-forestry job options, at least in the near future, relate mainly to a proposed co-generation plant at Lytton and to the tourism and outdoor recreation sector. While the tourism sector may generate some employment growth, it would likely replace only a portion of the jobs that would be lost under either of the two scenarios, and these would probably be more seasonal and lower paid than forest sector jobs.

Loss of employment may create some instability and uncertainty at the community level, but would have the most direct impact on the individuals and families involved. However, if TSA communities are aware of the potential loss of forestry jobs, they may be better able to consider how to deal with the situation.

First Nations Implications

The reduced harvest levels under either scenario are consistent with First Nations environmental and wildlife values. First Nations representatives who were interviewed preferred Scenario Two because it immediately reduces the amount of harvesting, which they believe is desirable until such time as land claim issues are settled.

The First Nations community, however, would be negatively affected in economic terms by lower timber harvest levels. Over 35 percent of mill employees within the area are members of First Nations, as are several independent contractors involved in harvesting and silviculture activities. Furthermore, several bands are currently seeking and developing forestry-related opportunities to create employment for their members.

Environmental Implications

Both scenarios would ultimately involve the harvesting of much of the old growth in the TSA. This would probably lead to a loss of biodiversity and declines in the populations and distributions of wildlife species dependent on old growth, but may be beneficial for relatively adaptable species and species that thrive in early successional forests. Logging roads may lead to greater recreational access, placing pressure on wildlife populations and habitat. Disturbance of the forest floor and lower levels of forest cover could lead to terrain instability and water-related impacts, such as the release of sediment, possibly impairing fish habitats and affecting community water users. Harvesting may also detract from the visual landscape.

Many of these impacts would be mitigated by timber harvesting guidelines in place in the TSA and by the Forest Practices Code (which was not incorporated into the timber supply analysis).

Scenario Two, with its immediate harvest netdown, would probably involve lower environmental risk to wildlife and fish habitat and populations, watersheds, terrain, and visual landscapes, and would preserve more flexibility for future resource management and land use initiatives. This conclusion is qualified by the fact that both scenarios share the same resource management assumptions, and that actual environmental impacts would depend mainly on where and how harvesting would occur. It should also be noted that under Scenario One harvesting would be lower after Year 50 than under Scenario Two, and the long-term level would be reached four decades earlier.

Conclusions

The economies of Lillooet and Lytton depend significantly on the forest industry and would be affected by reductions in TSA harvest levels. Both of the harvest forecast scenarios examined in this report would involve significant employment and income losses over the long term. Under Scenario One, impacts would be delayed for thirty years, allowing a considerable lead time to plan for adjustment. Under Scenario Two, there would be an immediate harvest reduction, followed by a long period of stability. The Forest Renewal Plan, announced in April, 1994 was not considered in this report, but may assist in offsetting some of these impacts. While the negative economic impacts on the forest sector were quantifiable, the positive impacts of lower harvesting on the environment were generally not measurable, and were therefore discussed in a qualitative way.

This analysis assumes that factors such as the land base, resource management, harvesting and processing technology, and timber prices remain constant. A change in any of these variables - increasingly likely with time - would require a re-examination of the impacts.

1.0 Introduction

1.1 Background

The British Columbia Forest Service (the Ministry of Forests) is presently conducting a provincial Timber Supply Review to assist the Chief Forester in setting Allowable Annual Cut (AAC) levels in the province's Timber Supply Area (TSAs). Four reports are released for each TSA. The Timber Supply Analysis reports (TSARs) examine the short-term and long-term effects of current forest management practices on the availability of timber for harvesting in the TSAs. The Socio-Economic Analysis (SEA) reports discuss the social, economic, and environmental implications of changing TSA timber harvest levels. The Discussion Papers summarize the first two reports and encourage public comment on the findings. Finally, the AAC Rationale Statements outline the reasoning behind the Chief Forester's AAC determinations.

1.2 Report Organization and Approach

This report profiles the Lillooet TSA area and discusses the socio-economic and environmental implications associated with two of the timber harvest forecast scenarios presented in the *Lillooet TSA Timber Supply Analysis* report, released in December, 1993 (or in the recent addendum report). These harvest scenarios were chosen to illustrate a range of impacts; they are not meant to suggest preferred AAC levels, nor will they be the only options considered in the AAC determination.

The report follows a multiple accounts approach, which focuses on a range of values derived from the forest ecosystem, and recognizes the need to consider a variety of factors when examining options for forest land management. After a presentation of profile information, separate sections (or accounts) of the report discuss the potential economic, provincial government revenue, community, First Nations, and environmental implications associated with the two harvest scenarios. The report is the result of research and interviews with key local stakeholders, including the forestry sector, the tourism/outdoor recreation sector, provincial government agencies, First Nations, and community representatives.

The analysis in this report considers only impacts attributable to changes in the harvest level, and assumes no change in factors such as the land base, management, harvesting and processing technology, and timber prices.

2.0 Socio-Economic Profile of the Lillooet TSA

2.1 General Area Profile

The Lillooet Timber Supply Area (TSA), part of the Kamloops Forest Region, is situated in the southwestern quadrant of the province on the eastern slopes of the Coast mountain range, as indicated in Figure 1. It overlaps the Squamish-Lillooet and Thompson-Nicola Regional Districts and is administered from the Lillooet Forest District office in Lillooet. The TSA is approximately three to four hours drive from Vancouver in the west, and two hours drive from Kamloops in the east. Major road access is provided by Highway 12 from Lytton, Highway 99 from Pemberton, and Highways 1 and 99 from Kamloops. Lillooet, Lytton, Bralorne and Spences Bridge are the major communities in the TSA.

The TSA covers about 1.1 million hectares and contains a variety of landscapes, such as mountain ranges, valleys, lakes and rivers. The TSA includes the Stein Valley, Yalakom Valley, Spruce Lake and the Southern Chilcotin Mountains. It is a prime destination for backcountry tourists. Local recreational opportunities include horse riding, skiing, snowmobiling, rafting, hiking and hunting. The area's economy is largely based on the forest industry, although transportation (BC Rail), tourism, agriculture, mining, and electricity generation (BC Hydro) are also significant employers.

2.2 Population and Communities

2.2.1 TSA Population, Income, and Employment

The population of the Lillooet TSA was 5680 in 1991, an increase of 12.4 percent (625) from 1986. This was slightly less than the 13.8 percent growth in the total population of BC over the same period. Average family income in the TSA was \$44 878 in 1990, about 16 percent below the BC average of \$53 243. The unemployment rate in the TSA was 15.1 percent in 1991, compared with a BC average of 10.3 percent.

These TSA-wide patterns are also evident in the communities of Lillooet and Lytton, as shown in Table 2.1.

Table 2.1: Lillooet and Lytton: Population, Average Income, and Unemployment

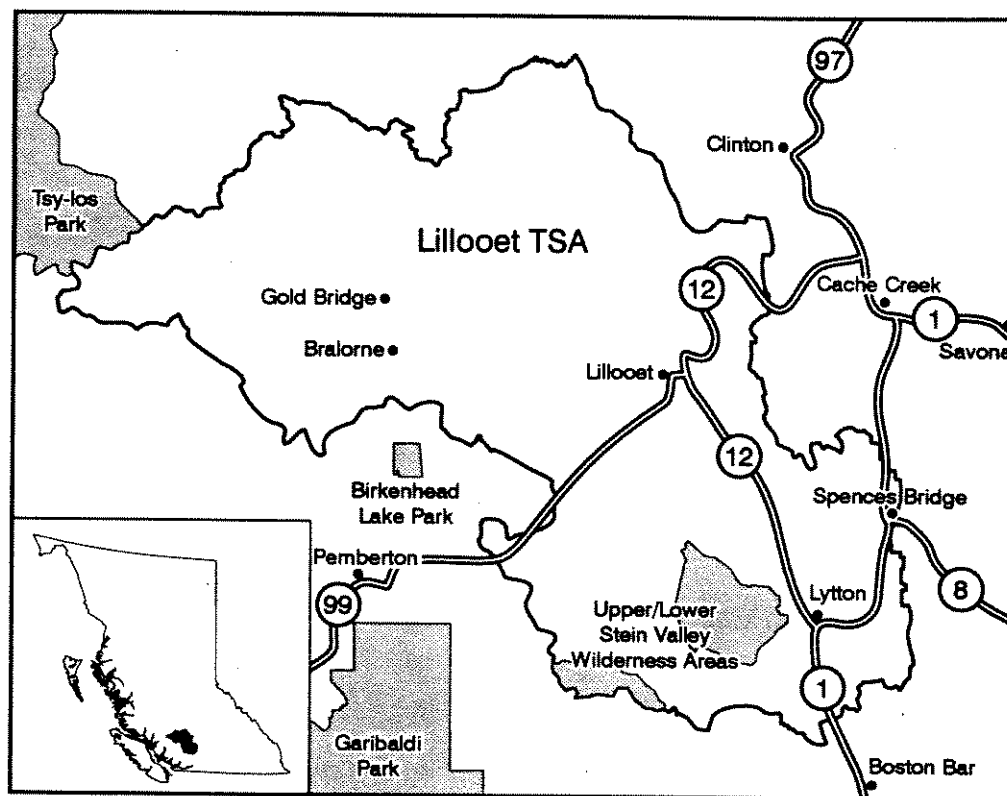
		Lillooet	Lytton	British Columbia
Population	1986	1758	374	2 877 930
	1991	1782	335	3 275 490
	% change	1.4%	(10.4%)	13.8%
Average income 1992		\$18 907	\$14 646	\$25 893
UI claimants 1992 ⁽¹⁾		8.0%	8.2%	6.7%

Source: Statistics Canada, Census data.

Notes:

(1) Percentage of the working age population (ages 15 to 65) claiming Unemployment Insurance benefits.

Figure 1 Map of the Lillooet TSA



Lillooet's population grew by 1.4 percent between 1986 and 1991, while that of Lytton declined by 10.4 percent. The fact that the TSA's total population grew substantially over this period indicates that the growth occurred mainly outside the communities of Lillooet and Lytton. Income and employment levels in the two communities are substantially below the provincial average.¹

Education levels of Lillooet TSA labour force participants (15 years of age and over) are provided in Table 2.2. The TSA clearly has lower overall levels of labour force education than does BC as a whole, with a significantly higher proportion of the labour force having less than a grade nine education, and a lower proportion having attended university.

Table 2.2 1991 Lillooet TSA Education Levels (population 15 and over)

	TSA Total	TSA Percent	BC Percent
Less than grade 9	685	16 %	9 %
Grades 9 - 13 Some high school	1365	32 %	25 %
Grades 9 - 13 High school graduation	570	14 %	14 %
Trade certificate/diploma	155	4 %	4 %
Other non-university	920	22 %	26 %
University without degree	270	6 %	12 %
University with degree	255	6 %	11 %
Total	4220	100 %	100 %

Source: Statistics Canada, 1991 Census Data.

Table 2.3 shows the experienced labour force in the Lillooet TSA for individual sectors of the economy, and provides a comparison with the overall BC economy. The large role of forestry in the local economy is apparent. Logging and woodlands jobs, together with mill operations (which comprise the majority of manufacturing in the TSA) account for a large proportion of employment. Tourism, agriculture and the public sector are also significant areas of employment in the TSA.

¹ The provincial average is strongly influenced by the Lower Mainland and Victoria, which have higher income levels and lower unemployment rates than many other parts of BC.

Table 2.3 Experienced Labour Force² by Sector in the Lillooet TSA (1991)

Employment Category	Number of Employees	Percent of Total Lillooet TSA	BC Total Percent
Logging/woodlands	265	10 %	2 %
Agriculture	140	5 %	2 %
Mining	30	1 %	1 %
Manufacturing	290	10 %	11 %
Transportation	285	10 %	5 %
Construction	95	4 %	8 %
Communication & Utilities	60	2 %	3 %
Government Service	335	12 %	7 %
Education	255	9 %	6 %
Health & Social Service	225	8 %	9 %
Retail	260	9 %	13 %
Business Services	75	3 %	6 %
Accommodation	270	10 %	8 %
Other	190	7 %	19 %
Total	2775	100 %	100 %

Source: Statistics Canada Census of Canada, 1991.

This information is complemented by Table 2.4, which illustrates the basic sector dependencies for the Lillooet TSA. This information shows the region's dependence on the major producing sectors of the economy and further reveals the importance of forestry to the area. Basic sectors drive the local economy by bringing in income from outside the region. For forestry, the basic sector includes persons directly involved in the forest sector and those indirectly associated with the forest sector, such as through supplying of goods and services. Non-basic employment is comprised of employment that results from the basic sector employees spending their wages and salaries, for example, on food, clothing, and personal services. Non-basic employment is also referred to as "induced" employment.

² Labour force data from the Statistics Canada Census of Canada, 1991. The Experienced Labour Force was defined as persons 15 years of age and over who, during the week prior to June 4, 1991, were employed or unemployed but who had worked since January 1, 1990.

Table 2.4 Basic Sector Dependence in the Lillooet TSA (1991)

	Basic Employment			Non-Basic Employment	Total Employment ⁽⁵⁾	Sector Percent of total employment ⁽¹⁾
	<u>Direct</u>	<u>Indirect</u>	<u>Total</u>			
Forestry	392	59	451	76	527	27 %
Minerals and Petroleum	43	16	59	12	70	4 %
Agriculture and Food	100	6	106	11	116	6 %
Tourism	235	2	237	17	254	13 %
Public Sector ⁽²⁾	427	4	431	63	494	26 %
Construction	60	8	68	11	79	4 %
Other ⁽³⁾	195	59	254	43	296	15 %
Non-Employment ⁽⁴⁾				90	90	5 %
Total ⁽⁵⁾	1450	152	1602	323	1926	100 %

Source: Ministry of Finance and Corporate Relations.

Notes:

- (1) Sector percentage is found by dividing the total employment for the sector by the total employment of all sectors.
- (2) The Public Sector includes all government employees, hospital workers, and teachers, i.e., all employees who receive income from the provincial or federal governments.
- (3) Includes some manufacturing, transportation and construction.
- (4) The Non-Employment sector employment is generated through the spending of pension income, investment income, unemployment insurance, and other social transfer payments. It is employment generated by the local spending of non-employment income.
- (5) Some rows and columns do not add to totals, due to rounding.

In the Lillooet TSA, about 27 percent of all employment results from forestry related activities: logging, transportation, silviculture, milling, supply and service industries, and employment related to consumer spending. The public sector is the next largest contributor, with 26 percent of total employment, followed by tourism, estimated at 13 percent.

Table 2.5 presents these basic sector dependencies by community, and shows percentages as well as total employment levels. (Note that the percentages refer to basic sector employment, and not to total employment.) While forestry is important across the TSA, the Lillooet economy is clearly the most forestry-based. The greatest share of basic employment in Lytton is provided by the public sector. The areas outside Lillooet and Lytton have more diversified economies.

Table 2.5 Basic Sector Dependence by Community (1991)

	Lillooet	Squamish-Lillooet, Subdiv. A ⁽¹⁾	Lytton	Thompson-Nicola, Subdiv. D ⁽¹⁾	Lillooet TSA ⁽²⁾
Forestry	35 %	24 %	25 %	20 %	28 %
Mining & Petroleum	0 %	7 %	0 %	6 %	4 %
Agriculture & Food	4 %	5 %	0 %	20 %	7 %
Tourism	15 %	12 %	16 %	22 %	15 %
Public Sector	27 %	27 %	45 %	15 %	27 %
Other	18 %	25 %	13 %	16 %	20 %
All Basic	632	617	127	227	1602
Non-Basic	168	103	13	39	323
Total	800	720	140	266	1926

Source: Ministry of Finance and Corporate Relations

Notes:

(1) Census subdivisions.

(2) Percentages indicate shares of basic sector employment.

2.2.2 Community Profiles

The major non-Native communities in the area are briefly profiled below. First Nations communities are profiled in Section 2.3.

Lillooet (pop. 1782) - Located at the confluence of the Fraser River and Cayoosh Creek in southwestern BC, the Village of Lillooet is the main trade and service centre for the surrounding area. The Bridge River, Cayoosh, and Lillooet First Nations reserves are within a few kilometres of Lillooet.

Lillooet was a gold mining boom town in the late 1800s. Its economy is now largely based on the forest industry, which in 1992 provided about 25 percent of local employment. Major employers in 1992 included Ainsworth Lumber (164 mill jobs), Bridgeside Higa Forest Industries (68 jobs), BC Rail (100 jobs), and BC Hydro (13 jobs). Other sectors employ the following proportions of the labour force: 14 percent in transportation; 11 percent in retail and wholesale trade; and 11 percent in accommodation, food and beverage.³

A variety of outdoor recreational opportunities are available in Lillooet, including fishing and trail riding in the warmer months, and skiing and snowmobiling in winter. The possibility of a ski

³ Source: Statistics Canada 1991 census data.

resort in the Melvin Creek area, just south of Lillooet, has been discussed.

Lytton (pop. 331) - Considered the "Gateway to the Stein," Lytton lies approximately 69 kilometres southeast of Lillooet and 85 kilometres south of Cache Creek, at the junction of Highway 1 and Highway 12. Much of the land surrounding Lytton is home to members of the Nlaka'pamux nation.

The forest industry is the most important economic sector, and Lytton Lumber is Lytton's largest employer, with about 50 mill employees in 1992. Tourism in Lytton is facilitated by the proximity of the TransCanada Highway. Tourist activities include kayaking and river rafting on the Thompson and Fraser Rivers, fishing for steelhead from October to December, hiking, gold panning and skiing.

A major project that could draw migration to the area is a proposed \$10 million co-generation plant that could provide the community with approximately 20 jobs. Other projects have been proposed, including the expansion of the local retail mall and the construction of a new health care facility.

Bralorne (pop. 78) - Bralorne is situated approximately 115 kilometres west of Lillooet. The Bralorne area is the site of the abandoned Bralorne-Pioneer Mine, a rich gold mine that closed in 1970 and which is now scheduled to re-open. The tourism industry is now the major full-time employer. Tourist activities in the area include snowmobiling, skiing, guide-outfitting, hunting, hiking, and other outdoor activities. The community has a fire hall, a store, and a postal box outlet.

Gold Bridge (pop. 68) - Gold Bridge is located at the Carpenter Lake headwaters and is near to Downton Lake. It is at the junction of the summer road to Pemberton and the highway to Lillooet. It serves the local area with a hotel, gas station, store, schools, postal service, and a seasonal Forest Service facility. Local employment is found in the tourism and natural resource industries and in natural resource management.

Spences Bridge (pop. 165) - Spences Bridge is located at the junction of the Thompson and Nicola Rivers approximately 40 kilometres from Lytton via the TransCanada Highway and 65 kilometres from Merritt via Highway 8. The main economic activity of the community is tourism. The area is renowned for its steelhead fishing and mountain sheep. White water rafting and sport fishing on the Thompson River are popular among visitors and locals. The TransCanada Highway brings additional in-transit tourist traffic to the area.

2.3 First Nations Communities⁴

There are 13 bands within three nations with reserve land in the Lillooet TSA. The three nations represented in the TSA are the Stl'atl'imx, the Nl'aka'pamux, and the Shuswap nations. The 13 First Nations bands within the TSA are the Bridge River, Seton Lake, Cayoose Creek, Lillooet, Lytton, Pavilion, Fountain, High Bar, Cook's Ferry, Siska, Kanaka Bar, Nicoamen and Skuppah bands.

Most of the bands' reserve lands are along the Fraser and Thompson rivers and Seton Lake, near to Lillooet and Lytton. In addition, external bands with an interest in the TSA include the Anderson Lake, Ashcroft, Boothroyd, Boston Bar, Oregon Jack, Alkali Lake, Spuzzum, and Canoe Creek bands. The Canoe Creek band is part of the Ts'ilhquot'in (Chilcotin) Nation, which has an interest area in the TSA (although there are not Chilcotin reserves within the TSA).

2.3.1 First Nations Bands, Populations, and Economic Activities

In 1992, an estimated 2672 band members lived on reserves in the Lillooet TSA.⁵ Actual band membership, including those not living on the reserve, was estimated at approximately 4600. For example, only 30 percent of the Cook's Ferry Band's 265 members live on the reserve, while approximately 60 percent of the Lytton Indian Band's 1486 members reside on reserve land.

The three major First Nations communities are briefly described below.

X'axlip (Fountain) Indian Band - The community of the X'axlip is located in the Fountain Valley, approximately 18 kilometres north of Lillooet along Highway 12. Of the 700 band members, 485 live on-reserve. The community has its own fire hall and child care facility. The main sources of employment are a lime plant, the forest sector, band administration, and the fibreglass manufacturing facility located on the reserve. Agriculture is also an important economic activity.

Pavilion Indian Band - The Pavilion community has a church, a general store, and a school. There are 380 registered band members, with 253 living on the reserve full-time. Many residents work at a lime plant that is located on one of the Pavilion band's reserves outside the TSA. Other economic activities include work in agriculture and the forest sector.

Seton Portage/Shalalth - These may be considered as one community. As a unit, it is fairly isolated, with access by logging road, train, or boat. It is located 75 kilometres west of Lillooet by road, on the north shore of Seton Lake. The community is serviced by a local fire department, library, general store, restaurants, and the Bridge River school and Shalalth Continuing Education

⁴ This section presents information obtained from interviews conducted with the Lillooet Tribal Council, the Cook's Ferry Indian Band, the Lytton Indian Band and the Seton Lake Indian Band.

⁵ Source: Schedule of Indian Bands, Reserves, and Settlements, Department of Indian and Northern Affairs Canada, December 1992.

(although high school students travel to Lillooet by train for their schooling). The primary employer is BC Hydro. The Lillooet District of the Forest Service has a native unit fire-fighting crew stationed in the Seton Portage/Shalalth area. Seton Portage/Shalalth has a population of about 500, of whom 226 are Seton Lake Band members living on the reserve. The band has a total membership of 503, many of whom return regularly to the community.

The forest industry is a major employer for the region and for the First Nations population. The Ainsworth, Bridgeside Higa and Lytton Lumber mills collectively employ 107 First Nations people, which represents about 35 percent of the total forest products processing labour force in the TSA.⁶ In addition, J.S. Jones employs 16 First Nations people in its sawmills outside the TSA and 45 in its logging operations in both Lillooet and Fraser TSAs. There are also two First Nations-managed contracting businesses. Siwash Silviculture, a 10-year old operation, employs between six and 12 people, depending on the season (approximately half are Native). N'Quatqua Logging Company Ltd., a logging operation, employs approximately seven people during peak season, all but one being Native. The company has been in operation for over 20 years.

Many First Nations people are also employed with their respective band offices and educational programs. For example, the offices of the Lytton and Seton Lake bands employ 30 individuals each, the majority of whom are Native.

Other major employers of First Nations people in the area include BC Rail and to a lesser extent the tourism industry. Several Native people are involved in guiding trail rides for tourists and see significant opportunity to further this and other tourism activities, such as raft guiding, in the Stein Valley.⁷

Several of the bands in the TSA are in the planning and proposal stages of business endeavours, including: the possibility of restocking local salmon runs; establishing a trout farm on reserve land; applying for forest licences to access forest tenures for logging purposes; establishing silviculture operations; and creating a partnership in the power and co-generation sector.

2.3.2 First Nations Values and Concerns

First Nations people residing in the Lillooet TSA maintain many of their traditional, cultural, and spiritual uses of the land. These uses include hunting and trapping for food, fishing in nearby creeks, lakes, and rivers, digging roots, and collecting berries and mushrooms from the land. In addition, according to the Lillooet Tribal Council, many of the bands within the Lillooet TSA are embarking on a renewed path of self-discovery to restore traditions and pride in their heritage. For example, sweat lodges are being revived to encourage the First Nations community to become more aware of its heritage and spirituality.

The various bands in the Lillooet TSA hold concerns that are related to both the environment and

⁶ Ainsworth Lumber reported 64 First Nations employees; Bridgeside Higa estimated that about 15 of their employees were Natives; and Lytton Lumber reported employing 28 Natives (total employment at the mills was 164, 68, and 50, respectively).

⁷ Source: John Sam, Economic Development Officer, Lytton Indian Band, Lytton.

the forest industry. The First Nations people interviewed expressed concern over watershed management and certain logging practices. In particular, clearcutting was mentioned as a concern by some First Nations representatives. Due to their great reverence for the land, the bands in the region are becoming more involved in the education of their members in renewable resource management.

The First Nations of the TSA are also interested in the long-term prosperity of the forest industry, as many bands are preparing or considering forestry-related business ventures to improve their employment and financial situations.

Treaty negotiations are an important issue for most First Nations bands across BC, and this is also the case for bands based in the Lillooet TSA.

2.4 Major Economic Activities

2.4.1 Forestry

Forest Company Profiles

Forestry is the main industry in the Lillooet area. There are three companies with mills in the Lillooet TSA: Ainsworth Lumber, Bridgeside Higa Forest Products and Lytton Lumber. The combined revenues of the three mills was about \$33 million in 1992. A fourth mill, J.S. Jones Holdings, is also a major licensee in the Lillooet TSA, but its mill is at Boston Bar, just outside the TSA. The major characteristics of these four operations are summarized in Table 2.6 and then described in more detail below.

Table 2.6: Major Wood Products Manufacturers in the Lillooet TSA

Company	Number of Employees in 1992^{(1),(2)}	Type of Operation	AAC From Lillooet TSA
Ainsworth Lumber	181	Sawmill and Veneer Mill on the Lillooet and Cayoose Creek Reserve	348 168 m ³
Bridgeside Higa Forest Industries	68	Manufactures home components for the Japanese market	SBFEP Timber Sales (<100 000 m ³)
Lytton Lumber	65	Sawmill located in Lytton and a small remanufacturing plant	32 778 m ³
J.S. Jones ⁽³⁾ Holdings Ltd. (in Boston Bar but dependent on Lillooet TSA)	208	Sawmill in Boston Bar produces small cuttings and dimension lumber	88 510 m ³

Notes:

- (1) Includes mill and company woodlands employees.
- (2) Totals, not pro-rated to Lillooet TSA share.
- (3) 1993 employment is presented for J.S. Jones. 1992 was not a representative year for J.S. Jones, due to a change in mill ownership.

- **Ainsworth Lumber Co. Ltd.** - Ainsworth was founded in 1950, and before 1987 consisted of a sawmill at 100 Mile House, a sawmill near Clinton, and a finger-jointing plant at Abbotsford.

In 1987, Ainsworth purchased, from Evans Products Company Ltd., a sawmill and veneer mill at Lillooet, a sawmill and specialty plywood plant at Savona, and two forest licences, one of which is in the Lillooet TSA. Ainsworth maximizes the end product value of its logs through a system of transfers, thereby linking all of the plants to the company-wide timber supply. In addition, Ainsworth has constructed a \$93.3 million oriented strand board mill near 100 Mile House, which began production by October, 1994.

The sawmill and veneer mill are located on the Lillooet and Cayoose Creek Indian reserves near Lillooet. The veneer plant produces a high quality veneer that is used in the production of plywood at the company's Savona plywood mill. From the logs that are unsuitable for veneer production, the sawmill produces stud lumber as well as specialty sizes for Bridgeside Higa.

The veneer mill's capacity is 145 million square feet (3/8" basis) when operating three full operating shifts per day. In 1994 the sawmill was producing about 38 MFBM annually on a one-shift basis. The sawmill shifting was reduced from two shifts to one shift per day in 1988, due to a major reduction in harvest levels in the Lillooet TSA. At that time, the total

Lillooet TSA AAC level was reduced by 19 percent from 800 000 m³ to 650 000 m³, when a temporary uplift to allow the harvesting of beetle-infested timber was ended. Ainsworth's forest licence portion was reduced by 23 percent, from 451 000 m³ to 348 000 m³. Recent plant statistics are as follows:

Year	Total Consumption (m ³)	Veneer Production (Msf 3/8)	Lumber Production (mfbm)	Chips Production (BDU)
1992	333 707	128 400	20 043	42 808
1993	400 215	141 660	31 455	51 369

In 1992, Ainsworth's Lillooet division provided 181 person-years (PY) of employment, including 164 at the mill and 17 in the woodlands operation. These PY measures correspond closely to the number of people working in these jobs.⁸

- **Bridgeside Higa Forest Industries Ltd.** - In 1986, Bridgeside Wood Products Ltd. commenced operating a value-added mill in Lillooet. The mill manufactures home components for the Japanese prefabricated housing industry. In June 1992, Y. Higa Corporation of Japan purchased a 49 percent interest in Bridgeside and took responsibility for marketing the components in Japan. Bridgeside has grown steadily and employed about 68 full-time workers in 1993.

The mill has a capacity of 2.2 million board feet and operates at approximately 80 percent capacity. As a secondary manufacturer, Bridgeside purchases lumber from primary lumber manufacturers such as Ainsworth Lumber and Weldwood of Canada. Bridgeside trades logs from its SBFEP timber sales for equivalent volumes of lumber from the primary producers.

- **Lytton Lumber** - Lytton Lumber is a family-owned forest company with a sawmill three kilometres south of Lytton. The mill started operation in 1963. In 1992, production was approximately 15 000 MFBM of lumber and 10 000 BDU of wood chips.⁹

Lytton Lumber recently undertook a \$1.35 million modernization and expansion program. In 1992, the company installed a dry kiln and began work on a remanufacturing facility to produce joinery components for the Japanese market and pine millwork for the US market. The remanufacturing plant began operating in January, 1994.

The mill had 75 full-time employees until 1989, when it switched from running two eight

⁸ A PY is a standard measure of employment that allows comparison of full-time, part-time and seasonal work. In this report, a PY represents the equivalent of between 9 and 12 months of full-time work, so that forest sector job totals generally correspond to PY totals (with the exception of silviculture which has a large seasonal and part-time component).

⁹ A Bone Dry Unit (BDU) is equal to 2400 pounds of pulp chips with zero moisture content.

hour shifts per day to one eight hour shift per day. In 1992, Lytton Lumber employed about 50 people in the mill and 15 in company woodlands operations. The company indicated that it would hire an additional six to seven people when its remanufacturing plant achieved full-scale operation.

Lytton Lumber has an AAC of 32 778 m³, which is about 36 percent of its estimated 1993 throughput of approximately 90 000 m³ (and about 42 percent of its 1992 throughput of 77 844 m³).

- **J.S. Jones Holdings Ltd.** - In April 1993, Fletcher Challenge Canada Ltd. sold its sawmill in Boston Bar and its associated harvesting rights in the Lillooet and Fraser TSAs to Teal Cedar Products Ltd. of Surrey. Including the Boston Bar operation, Teal operates eight sawmills in BC. The mill in Boston Bar operates as J.S. Jones Holdings Ltd.

The Boston Bar mill is located outside the TSA, but relies heavily on wood harvested within the Lillooet TSA. The mill has an annual capacity of 130 000 MFBM. Its production in 1993 was 87 360 MFBM and 90 000 volumetric units of wood chips (about 72 000 BDU, using a conversion factor of 0.8). The sawmill produces small cuttings and dimension lumber for European, Asian and Canadian markets.

The company's Lillooet TSA forest licence is for 88 510 m³, and its Fraser TSA forest licence is for 386 960 m³. There were about 181 jobs at the mill in 1993, of which about 30 were related to wood harvested in the Lillooet TSA. The mill operated with two shifts from July, 1993 through October, 1993 and with one shift for the balance of the year. J.S. Jones also had 27 company woodland jobs.

The Small Business Forest Enterprise Program (SBFEP) has the second largest apportionment in the TSA, with 152 544 m³, (approximately 23 percent) of the total Lillooet TSA AAC. The SBFEP is operated by the Ministry of Forests, which makes timber available through Timber Sales for harvesting by individuals and small mill operators (non-quota holders). A portion of this timber (approximately 30 percent the Lillooet TSA) is allocated only to those operators committed to using the wood for value-added purposes. The main objectives of the program are to provide new opportunities to individuals and firms to enter the industry, to encourage diversification into high value forest products, and to generate employment. According to the Lillooet Forest District, in 1992, 75 percent of the SBFEP timber was sold to buyers within the TSA, such as Bridgeside Higa Forest Industries. However, this proportion can vary widely from year to year, and in 1993 the figure was 50 percent.

Forestry Employment Summary

The Lillooet TSA timber harvest employs people both within and outside the TSA. As shown in Table 2.7, in 1992 the local forest industry generated 528 person years (PY) of employment inside the Lillooet TSA (excluding employment at the Ministry of Forests), of which 502 PY depended on the wood harvested from the Lillooet TSA (the remainder were related to non-TSA wood). Further details on these employment estimates are provided in Appendix B.

Table 2.7: Forest Sector and Related Indirect Employment in the Lillooet TSA (1992)

	Linked to Lillooet TSA	Linked to Private Wood and Adjacent TSAs	Total Employment in Lillooet TSA
Harvesting and silviculture ⁽¹⁾	176	-	176
Processing ⁽²⁾	256	26	282
Transportation ⁽³⁾	31	-	31
Repair/maintenance/other services ⁽⁴⁾	39	-	39
Total ⁽⁵⁾	502	26	528

Notes:

- (1) Includes Ainsworth Lumber's and Lytton Lumber's woodland operations and companies that do contract logging, hauling, road building and maintenance within the TSA, mainly in Lillooet. Two silvicultural contracting companies are based in the TSA.
- (2) Includes Lytton Lumber (50 PY), Ainsworth (164 PY), and Bridgeside Higa (68 PY).
- (3) Employment in the transportation of finished lumber is considered "indirect" in the impact assessment presented in Section 5.0.
- (4) Includes suppliers of goods and services to the forest industry that depend on the Lillooet TSA timber harvest. The major forest products companies in the area estimate that approximately two to five percent of their operating materials and supplies are purchased in the TSA (for example, from local trades persons, machine shops, automotive repair shops, restaurants, and hotels). A telephone survey of 21 local suppliers, conducted by Price Waterhouse, identified 39 PY in the TSA that were dependent on forest industry business (discussed in Appendix C). This employment is considered "indirect".
- (5) Does not include 46 Lillooet Forest District jobs (44 linked directly to the Lillooet TSA, and two linked to private wood and adjacent TSAs), or approximately 10 positions related to the Lillooet TSA at the Ministry of Forests' Regional Office in Kamloops. Also does not include employees at J.S. Jones Holdings in Boston Bar and other non-TSA residents whose jobs depend on the Lillooet TSA.

2.4.2 Tourism and Recreation

Tourism is becoming increasingly important in the Lillooet TSA, due largely to improved highway access to the area via the Duffey Lake Road (Highway 99) and the nearby Whistler ski resort. The Village of Lillooet alone had an increase of almost 57 percent in the number of visitors between 1991 and 1992 (8860 visits in 1991, rising to 13 880 in 1992). In addition, the Travel BC Infocentre reported 146 bus tours through the Lillooet area for the year 1991 - 1992, a substantial increase over previous years.¹⁰

The recently promoted "Coast Mountain Circle Tour" is increasing the number of visitors to the area. However, the local communities face the challenge of capitalizing on these in-transit visitors. The circle tour features a scenic circular road tour of Vancouver, Hope, Lytton, Cache Creek, Lillooet and Whistler, which can be completed in one or two days. Few visitors passing through Lillooet stay longer than an hour or two. There are only a limited number of smaller hotels and restaurants in the region. Most of the tourists who stay longer are those wishing to enjoy the wilderness.

With an abundance of scenery and a varied landscape, the Lillooet TSA offers tourists and recreationists many opportunities. Key tourism activities include:

- fishing, particularly for steelhead, sturgeon, trout and salmon;
- hunting, especially for California big horn sheep, mule deer, and mountain goats;
- mountain climbing, hiking, mountain biking, camping, trail riding and nature viewing;
- white water rafting; and
- skiing and snowmobiling.

The main summer and winter activities in the Lillooet TSA are described in more detail below.

Summer Activities

Fishing, Guide Outfitting and Hunting - The Lillooet TSA, has numerous lakes and rivers that are destinations for trout and salmon fishing. The Thompson and Fraser Rivers are popular sites for steelhead and sturgeon fishing (numerous fishers line the shores of the Thompson River at Spences Bridge to catch steelhead during the months of September through to December. The TSA has two angling guides, two satellite fishing camps, and several guide outfitters whose clients may engage in fishing during a packing expedition.

There are two primary guide outfitting operations located in the TSA, and two others that tour the area. Guide outfitting encompasses packing, hunting, and/or fishing excursions. In general, guide outfitters do most of their touring in the alpine areas above the treeline, which they access by logging roads.

There are estimated to be an average of 253 client days per guide outfitting operation in the

¹⁰ Source: Hilda Bryson, Curator of the Lillooet Museum, and the Travel Infocentre.

southern region of BC, which includes the Lillooet TSA and areas such as Kamloops, Golden, Kelowna, Vancouver and Victoria. While this figure may not be truly representative of the particular operations in the Lillooet TSA, it provides a useful estimate. Together, the two operations in the TSA generate approximately 15 to 20 jobs at high season, or approximately 10 PY of employment.

Hiking, Camping, Trail Riding and Nature Viewing - The main attraction of the area to visitors is the remote and pristine wilderness experience.¹¹ With numerous picturesque lakes framed by mountainous terrain, the Lillooet TSA serves as a prime area for mountain climbers and hikers. The Southern Chilcotin Mountains, Lower Stein and Spruce Lake Areas are popular destinations for backcountry tourism and recreation. For example, in 1992 there were approximately 4588 visitor days for the Spruce Lake area, compared to 3223 visitor days in 1989, an increase of over 40 percent. The increase was due to longer visits rather than a larger number of visitors.

One resort location near Gold Bridge provides heli-hiking and heli-skiing experiences. In addition, throughout the Lillooet TSA, there are over 30 recreational sites for fishing and overnight camping.

Trail riding in the TSA occurs in the alpine areas where there are few trees and where the tourism potential and value is very high. In general, trail riders use the access roads built for logging purposes to reach the alpine regions. Nature viewing and photography are popular in the area, due to the high scenic values and diverse wildlife and habitats.

White Water Rafting - White water rafting on the Thompson and Fraser Rivers continues to grow in popularity. There are four to five rafting establishments in the area, which during the peak non-winter months generate employment for 40 to 50 people, or approximately 15 PY. These operations have some 12 000 user days per year in total. The largest rafting operation in the TSA is Kumsheen Raft Adventures, of Lytton, which has about 6000 user days per year. The Lower Mainland provides 80 percent of the users, with European visitors generally comprising the remainder. Approximately 80 percent of these visitors are on one-day trips. The clients pay about \$100 per person per river rafting expedition.¹²

Winter Activities

Skiing and Snowmobiling - The Lillooet TSA is a favoured spot for cross-country skiing and heli-skiing. Fountain Valley, near Lillooet, and the valleys along the Duffey Lake corridor, such as Cerise Creek, the Upper Cayoosh, and the Joffe Lakes area, are popular cross-country skiing areas. The Tyax Mountain Lake Resort, located approximately 30 kilometres from Gold Bridge, offers a full range of summer and winter recreational opportunities, including heli-skiing. Together with TLH Heli-skiing, Tyax offers its services to over 6000 guests per year. Although employment is seasonal, the two operations together account for approximately 25 PY of

¹¹ Ministry of Forests, Spruce Lake Survey Report, 1992.

¹² Rafting data presented is based on information provided by Kumsheen Raft Adventures Ltd., Lytton.

employment.¹³

NGR Resort Consultants Inc. have received approval from the provincial government to study the feasibility of developing a ski resort at Melvin Creek, situated 50 kilometres south of Lillooet on Highway 99. The project is currently on hold and its future is uncertain due to environmental and land use issues.¹⁴

During the winter, the frozen mountain lakes surrounding Gold Bridge and Bralorne are popular for snowmobiling.¹⁵ There are extensive trails around Gun Lake, Lone Goat Valley, Slim Creek and the Taylor Basin. A back-country lodge is located in the Lone Goat Valley for snowmobilers, and this area alone has over 700 snowmobiling user days per year. Approximately 200 to 250 local snowmobiles in Bralorne and Gold Bridge, and an additional 60 or so from Lillooet, are active during the winter months in the northern regions of the Lillooet TSA. Currently, there are two organized snowmobile rental and guiding operations in the TSA that cater to tourists and locals: Tyax Mountain Lake Resort and Eldorado Snowmobile Tours. Both operations combined account for rentals of approximately 25 to 30 machines at a rental cost of approximately \$125 per machine.

Employment Estimates

On the basis of the above information, the number of person years linked to wilderness tourism in the area is estimated to be as follows:

Guiding operations	10 PY
Rafting	15
Tyax, TLH heli-skiing and other	<u>25</u>
Total	<u>50 PY</u>

This estimate excludes employment related to the motels and restaurants in the area that depend on local businesses, the local population, and tourists driving through the area.

2.4.3 Agriculture

The largest agricultural employer in the TSA is the Chai-Na-Ta Ginseng Products operation in the Lillooet area. The operation is four years old and employs locals on a seasonal basis. During the summer, employment reaches a high of about 40. Although the ginseng operation is of significant size, its future could be uncertain. It is believed that after about seven years ginseng can no longer be grown from the same soil, due to the toxins that it deposits (the toxins are not thought to affect the growing of other crops).¹⁶ There is no guarantee that the ginseng operation will

¹³ Source: Gus Abel, Manager/Owner of Tyax Mountain Lake Resort.

¹⁴ Information based on an interview with Al Raine of NGR Consultants Inc.

¹⁵ Information from Paul Spencer, Snowmobile Club, Bralorne.

¹⁶ Information from interviews with Mr. and Mrs. Waters, Chai-Na-Ta Ginseng Products, and Helen Nemeth, Economic Development Officer, Bob Dew, Mayor of Lillooet, and Terry Johnson, Lillooet Village Administrator.

move to another location in the Lillooet TSA.

Other farming and ranching operations are on a small scale and provide less local employment.

2.4.4 BC Rail and BC Hydro

BC Rail accounts for approximately 100 PY of employment in Lillooet. It transports passengers, tourists, general freight and forest products from Lillooet and surrounding areas. Over the past several years, there has been a notable increase in the amount of passenger and tourist traffic through the area.¹⁷

BC Hydro has a hydroelectric generation facility east of Lillooet at Seton Lake. The corporation employs 1 PY at its generating plant and 12 PY at its customer service branch in Lillooet. Concern has been expressed over the fluctuations in water levels at Carpenter Lake caused by the BC Hydro generation facility. Due to these fluctuations (high water levels in the Spring and very low water levels in the Fall) Carpenter Lake is not used to its full recreational potential.

2.4.5 Mining

Mining was formerly a major industry for several smaller communities in the Lillooet TSA, such as Gold Bridge and Bralorne. Virtually all of the gold mining that existed in these villages in the first half of this century has ceased, although it has recently been announced that the gold mine near Bralorne will re-open, and small placer mines continue to start up from time to time. For example, a small placer mine across the Fraser River from Lytton has been operating for about five years; it employs fewer than five people. The main mineral deposits in the area are gold, silver, copper and zinc.

Although there is no significant mining activity in the TSA, mineral exploration still occurs on a small scale. Currently, there are about 30 people working in mining-related industries in the TSA¹⁸. The higher elevations of the Southern Chilcotin Wilderness, encompassing Eldorado Mountain and the Spruce Lake area, are partially covered by mineral claims, although none are as yet commercially viable.

The revitalization of the mining industry in the Lillooet TSA area has been rumoured in recent years; however, this remains a sensitive issue with the environmentalists and tourists that frequent the wilderness areas of the Southern Chilcotin Mountains.

In the area surrounding Lillooet village, semi-precious gems can be found, such as rhodonite, garnet, magnesite, and jade. Rock hounding of these semi-precious stones is common.

¹⁷ Information based on interviews with Morris Isackson of BC Rail, Lillooet.
¹⁸ Statistics Canada, 1991 Census data as compiled by BC Stats.

3.0 Environmental Profile¹⁹

This section briefly describes the topography and ecology of the Lillooet TSA. A discussion of how these environmental attributes may be affected by timber harvesting is provided in Section 8.

3.1 Environmental Setting

Two environmental classification systems have been developed to describe the ecosystems in BC: the Ecoregion Classification system adopted by the Ministry of Environment, Lands and Parks, and the Biogeoclimatic Ecosystem Classification used by the Ministry of Forests. The Ecoregion Classification stratifies the province's terrestrial and marine ecosystems into discrete geographical units at five different levels. The three lowest levels, ecoprovinces, ecoregions and ecosections, are progressively more detailed and narrow in scope and relate segments of the province to one another. They describe areas of similar climate, physiography, hydrology, vegetation and wildlife potential²⁰. The Biogeoclimatic Classification focuses on the province's terrestrial ecosystems and incorporates primarily climate, soil, and vegetative data (vegetation is considered to be the best integrator of the combined influence of a variety of environmental factors affecting a site).²¹

3.1.1 Ecoregions

The Lillooet TSA falls mainly within the Interior Transition Ranges ecoregion. This is part of the Southern Interior ecoprovince, located west of the Thompson-Okanagan plateau and on the east side of the Coast mountains. Within the TSA, the Interior Transition Ranges ecoregion is characterized by three ecosections:

- **Leeward Pacific Ranges** - Characterized by mountains with deep, narrow valleys.
- **Pavilion Ranges** - Recognizable for the Bunchgrass and Ponderosa Pine that predominate in the lower mountain areas.
- **Southern Chilcotin Ranges** - Identifiable by rounded mountains in the north and higher more serrated peaks in the south; also features numerous lakes, streams and extensive Alpine tundra.

In addition, the northern portion of the TSA lies in the Central Interior ecoprovince, and includes two ecosections: the Central Chilcotin Ranges, to the northwest, and the Fraser River Basin ecosection, which covers a small area in the north of the TSA along the Fraser River. The key features of provincial significance within the Central Chilcotin Ranges ecosection are broad alpine expanses rich in vegetation, while the Fraser River Basin ecosection contains unique grasslands.

¹⁹ The following is based mainly on information provided by the Fish and Wildlife Section, Kamloops Region, Ministry of Environment, Lands and Parks.

²⁰ For an explanation of the ecosystem classification system see Dennis Demarchi, An Introduction to the Ecoregions of British Columbia, 1993.

²¹ For an explanation of the biogeoclimatic classification system see D. Meidinger and J. Pojar (editors), Ecosystems of British Columbia, BC Ministry of Forests, 1991.

3.1.2 Biogeoclimatic Zones

The diverse ecology of the Lillooet TSA supports a variety of tree species, with spruce, Douglas-fir, and lodgepole pine predominant. Hemlock, balsam, red cedar, ponderosa pine, cottonwood, and aspen also occur, but are less common.

The vegetation in the Lillooet TSA reflects the variations in the area's climate. The drier areas within the TSA, such as the Sackum and Lower Murray Creek drainages, are included in the Interior Douglas-fir and Ponderosa Pine biogeoclimatic zones. Areas with higher precipitation, such as Hurley River and upper Cayoosh Creek are generally characterized by Engelmann Spruce-Subalpine Fir and Montane Spruce biogeoclimatic zones, although small areas also lie in the Coastal Western Hemlock zone. Alpine Tundra covers the ridges and mountain tops above 2000 metres in elevation, and includes bare rock, flower meadows, and alpine grasslands.

3.2 Soils²²

Soils are the base material upon which depend the region's characteristic vegetation and wildlife. Stability and conservation of soils are highly important for the production of renewable forest resources.

The Lillooet TSA is part of the Coast Mountain physiographic region, with the Fraser and Thompson Plateaus to the northeast and east, respectively. There are two major geological groups: intrusive igneous rocks, and folded and faulted volcanic and sedimentary rocks (all glaciated).

Soils range from sub-arid along the Fraser and Thompson Rivers and semi-arid in the extreme north-east of the TSA, to sub-humid in the north-west and humid in the Stein area.

East and west of the Fraser River are brunisols, with river benches north of Lillooet made of chernozems, a black soil rich in humus and carbonates. Towards the wetter western end of the TSA, there is a transition to podzols, a type of soil characteristic of coniferous forest regions that has a greyish-white colour in its upper layers. In moving from chernozems, to brunisols, to podzols, the soils in the Lillooet TSA change from little-developed grassland soils to transitional stages to older forest soils.

In limited areas (two to five percent of the TSA, but especially in the Yalakom River area), the geology includes serpentine or ultramafic rock, which is a special soil case within select areas of BC and the Lillooet TSA. Ultramafic rock is low in silica and high in magnesium and iron silicates. It is also low in calcium and high in nickel and chromium. This unbalanced nutrient supply results in very poor soils. The ultramafic rock is covered by a 25 centimetre layer of volcanic ash, which shields the unproductive properties of this rock. There have been concerns in

²² Sources: Yalakom Local Resource Use Plan, Draft #3, September 9, 1993, and the Fish and Wildlife Section, Kamloops, Ministry of Environment, Lands and Parks.

the past that disturbance of the ash cover (such as through road building) could expose the ultramafic rock and result in the leakage of toxic levels of nickel and chromium into watersheds. However, recent research indicates that the risk of this occurring is very slight.²³

A soil resource problem that could have impacts on timber harvest levels is related to the volcanic ash soils found in the northern and western portions of the TSA. When disturbed, these soils have a very low angle of repose, and in steep terrain are not stable enough for vegetation to take hold. With these ash soils there can be potential reforestation and site disturbance problems.

3.3 Water

Major waterbodies in the TSA include Seton, Anderson, Carpenter, and Downton Lakes, and the Fraser, Thompson, Stein, and Bridge rivers. In addition, there are many smaller rivers, streams and lakes. Some rivers and creeks can be subject to very low water flows in the summer. This is a concern for crop irrigation and for spawning areas for salmon and resident fish species.

Local residents are concerned about water flow timing, as well as water quality and quantity, particularly given the area's low average annual levels of precipitation. Water is in demand in the Lillooet TSA for industrial and household use, as well as for the irrigation of crops. Many residents believe that long-term planning is critical for adequate protection of water resources and that this requires proper management of the land base (such as management of soil disturbance, forest cover maintenance, and water flow rates).

3.4 Wildlife and Fisheries

The Lillooet TSA is home to much of the wildlife common to the Southern Interior ecoprovince. There is a diverse array of species, which includes the major groups discussed below. A number of the TSA's wildlife species are considered to be "at risk" by BC Environment, Lands and Parks, and have been classified as Red-listed or Blue-listed, depending on the degree of vulnerability. Those species are shown in Appendix E.

Mammals - The TSA has an abundance of ungulates, or hoofed mammals, including mule deer, California big horn sheep, and mountain goat. The area is also home to grizzly bear, black bear, hoary marmot, fisher, wolverine, and localized moose and elk populations. All these mammals move throughout the Lillooet TSA, most using different ranges in summer than in winter, some preferring the high country and alpine regions, others preferring the open timbered ranges, and still others preferring grasslands and needing some mature forest cover. Migration corridors between seasonal ranges are important for species such as mule deer and big horn sheep.

Birds - The region has a great diversity of bird species. The Southern Interior ecoprovince contains approximately 70 percent of the bird species known to breed in British Columbia. Species such as grouse, ptarmigan, Steller's jay, and great horned owl are year-round resident birds in the Spruce Lake area. Other bird species, such as the ferruginous hawk, prairie falcon

²³ Information provided by the Lillooet Forest District.

and flammulated owl do not breed outside the Southern Interior ecoprovince.

Reptiles - The western racer and western rattlesnake are characteristic reptiles in the southern portion of the TSA, and are found along the Thompson and Fraser rivers.²⁴ The rubber boa, western rattlesnake and Great Basin gopher snake are the Blue-listed species identified by BC Environment.

Fish - The Lillooet TSA has good populations of pink salmon, coho, and sockeye, and more threatened, limited populations of steelhead and chinook. Rainbow trout and whitefish are present in rivers and smaller streams, while the colder streams support bull trout. Lakes within the TSA also support rainbow trout, kokanee and bull trout. White sturgeon in the Fraser River are a main attraction for tourists and local residents. The Fraser, Thompson, Stein, and Bridge rivers, Spruce Lake, and numerous other smaller rivers, streams, and lakes are of major importance to fisheries habitat in the Lillooet TSA.

Forest harvest patterns can seriously affect plant and animal communities, as discussed in Section 8.

²⁴ Source: Demarchi, Dennis, An Introduction to the Ecoregions of British Columbia, 1993.

4.0 Timber Supply Profile

4.1 Timber Harvesting Land Base

The Lillooet TSA covers about 1.1 million hectares, of which approximately 25 percent is currently considered available for timber harvesting according to the Lillooet TSA timber supply analysis as shown in Table 4.1.²⁵

Table 4.1: Land Base For Timber Harvesting in Lillooet TSA

Classification	Area (hectares)	Percent of total area	Percent of Crown forest area
Total land base	1 123 827	100.0	n/a
Less:			
Non-Crown land	110 821	9.9	n/a
Non-forest land	483 854	43.0	n/a
Reductions to Crown Forest (1)	266 034	23.7	50.3
Initial timber harvesting land base	263 118	23.4	49.7
Additions:			
NSR - not satisfactorily restocked (2)	15 060	1.3	2.9
Total current timber harvesting land base	278 178	24.7	52.6
Future reductions:			
Future roads, trails, landings	20 357	1.8	3.9
Long-term timber harvesting land base	257 821	22.9	48.7

Notes:

- (1) Includes environmentally sensitive areas, deciduous trees, non-commercial cover and NSR.
- (2) The NSR land was initially subtracted. The portion of NSR area considered available for timber production, as recorded in silviculture history records, was then added to the harvesting land base to reflect its potential contribution to future timber supply. NSR can be created by natural forces - particularly fire - as well as logging, and some is not operable for harvesting.

²⁵ Source: Lillooet TSA Timber Supply Analysis Addendum, Ministry of Forests, 1995.

4.2 Land Base and Timber Supply Issues

Various areas within the Lillooet TSA have been the subject of intense debate over land use. Conflicting resource values, such as recreation, timber harvesting, mining, water use, wildlife and fisheries, scenery, history, and culture have led to considerable dissention among various interest groups. For example, the Stein River, which flows through the TSA, was the subject of debate and planning throughout the 1970s and much of the 1980s. The Lower and Upper Stein were eventually designated as wilderness areas where timber harvesting is prohibited. The main conflicts among resource uses in the TSA focus on backcountry recreation, scenery, fish and wildlife, mining and forestry.²⁶

As indicated in Table 4.1, the future timber harvesting land base is estimated to be 257 821 hectares, or 23 percent of the total available landbase. However, the timber supply analysis considered only current resource management practices and land use designations. Various outstanding issues were not accounted for in the Ministry's calculation of the future timber harvesting land base and could reduce the land base available for timber harvesting. These include:

- **First Nations Issues** - The inability to access parts of the land base because of the difficulty gaining access across First Nations reserves could reduce the amount of forest land available for harvesting. Factors related to aboriginal rights and First Nations treaty negotiations could also reduce the harvestable land base.
- **Wildlife Concerns** - In the timber supply analysis harvesting constraints within the various zones take some account of the habitat requirements of wildlife. However, the analysis does not include specific areas that are set aside to protect wildlife. Should such areas be set aside in future, the timber harvesting land base would be reduced.
- **Old Growth Reserves** - In the timber supply analysis, areas were not explicitly designated for old growth protection (although old growth is protected under other headings, such as Environmentally Sensitive Areas). A system of old growth reserves could reduce the available land base.
- **Recreational Values** - The timber supply analysis considers recreational values only in so far as they relate to visual quality objectives and Environmentally Sensitive Areas. Greater emphasis on recreational uses of land could reduce the area available for timber harvesting.
- **Riparian Areas and Biodiversity** - The timber supply analysis considers riparian areas and biodiversity indirectly through constraints on mature forest covers. However, these two factors are not identified as separate constraints on harvesting.
- **Protected Areas Strategy** - The BC government's Protected Areas Strategy (PAS) has the objective of protecting 12 percent of the provincial land base by the year 2000. The goal of

²⁶ Source: Lillooet Forest District.

the PAS is to protect the diverse natural, cultural, heritage and recreational values of the province.

A list of PAS study areas announced in mid-1992 included two areas in the Lillooet TSA: the Middle Stein and Spruce Lake. These are estimated to contain approximately 12 percent of the merchantable timber in the TSA.²⁷ Resource development in the study areas has been deferred until public planning processes develop land use recommendations for the BC government.

The PAS analysis has identified another 18 candidates for protected area status. Altogether, these areas of interest and study areas cover approximately 24 percent of the TSA's landbase. However, no calculation has yet been made of how much of the timber harvesting land base could be affected. Land management issues in the Stein River and Spruce Lake have tied up a significant part of the Lillooet TSA for many years, resulting in a concentration of harvesting in other areas. This has been compounded by First Nations issues, wood flow constraints, access problems, and insect infestations.

The longer harvesting is deferred from the study areas, the greater will be the concentration of harvesting in the remainder of the TSA. Timber available to harvest in the remainder of the TSA is diminishing rapidly, due to its being harvested at a rate predicated upon the timber within the study areas being available. Therefore, should the study area timber resources be permanently excluded from the harvest, the impact would be significantly greater than the immediate volume reduction. On the basis of interviews with licensees in the area, reductions to the landbase available for timber harvesting is the most serious business concern that they face.

- **Forest Management Practices** - The Ministry of Forests implemented timber harvesting forest management guidelines for the Lillooet TSA in October, 1993, in order to provide an overall framework for integrated resource management decision making. In addition, sections of the British Columbia Forest Practices Code may also result in important changes in forest management in the TSA (for example, with respect to silvicultural systems, timber harvesting practices, planning, and road access into currently inaccessible areas of the TSA).

Allocation of AAC Changes

There are differences of opinion among the licensees in the TSA regarding how changes in the AAC, should they occur, would be allocated among the licensees, the SBFEP, and other cutting licences. Under the Forest Act, AAC reductions may be allocated proportionately among licensees, although this is not a requirement. One point of view is that any reduction in timber should protect the smaller independent forest licensees, which generally have smaller quotas relative to throughput, and therefore rely more heavily on purchased wood, which has a higher cost. Another point of view is that cuts in the AAC should fall more heavily on the SBFEP

²⁷ Source: Lillooet Forest District.

because timber harvested under this program is often processed outside the TSA, whereas the major licensees tend to process their harvest locally, thereby creating local employment.

4.3 Current Timber Supply Situation

The estimated total volume of timber in the TSA is about 48 million cubic metres, while the current AAC for the TSA is 650 000 cubic metres. The Chief Forester lowered the AAC from 800 000 m³ effective January 1, 1988, a 19 percent reduction, when a temporary uplift to allow the harvesting of beetle infested timber was ended.

The forest industry harvested around 650 000 m³ in 1990 and 1991, while in 1992 the cut dropped to about 571 000 m³.²⁸ The undercutting in 1992 was largely attributable to Ainsworth Lumber having difficulties securing cutting permits. The reasons for this included lack of long-term access planning and road construction to new harvesting areas, protracted planning processes, and the deferral of areas to accommodate First Nations interests and other resource values. The Ministry of Forests authorized Ainsworth to carryover 120 000 m³ from the previous cut control period to the current period. In 1993, the TSA harvest was 636 000 m³.

²⁸ The actual volume of timber harvested under a forest licence in any year may vary up to 50 percent above or below the AAC under that licence, but the average annual cut over a five-year period must be within 10 percent of the AAC for that period.

The apportionment of the AAC is as follows:

Table 4.2: Lillooet TSA AAC Apportionment

	Coniferous m ³	Percentage
Forest Licences:		
Ainsworth Lumber Co. Ltd.	348 168	53.6
J.S. Jones Holdings Ltd.	88 510	13.6
Lytton Lumber Ltd.	32 778	5.0
Sub-total of Forest Licences	469 456	72.2
SBFEP - Category 1 (Section 16)	99 930	15.4
SBFEP -- Bid Proposals (Section 16.1)	45 336	7.0
SBFEP -- TSL to the N'Quatqua Logging Co.	7 278	1.1
Forest Service Reserve	6 500	1.0
Woodlot Licence	6 500	1.0
Temporary Licences	15 000	2.3
Total ⁽¹⁾	650 000	100.0

Notes:

- (1) In addition to the wood apportioned under Section 8 of the Forest Act, a portion of the Lillooet TSA is covered by a Pulpwood Agreement. Under the terms of this agreement, timber may be harvested when there is insufficient fibre supply from other sources.

As shown in Table 4.2, the SBFEP holds 23.5 percent of the total Lillooet AAC and is the second largest licence holder in the area, after Ainsworth Lumber. In 1991 and 1992, approximately 75 percent of the SBFEP wood remained in the TSA for processing by area mills. However, this proportion fluctuates, and in 1993 dropped to about 50 percent.²⁹

As indicated in Table 4.3, the mills operated by licensees obtain between 17 percent and 67 percent of their fibre from forest licences in the Lillooet TSA. The balance of their fibre comes from the SBFEP, adjacent TSAs, and private wood.

²⁹ Based on discussions with the Lillooet Forest District, Lytton Lumber, Ainsworth Lumber, and Bridgeside Higa.

Table 4.3: Total Fibre Consumption of Mills in the Lillooet Area

	1992 Total Fibre Consumption (m³)	1992 Fibre Supplied by Lillooet TSA Licences	1992 Lillooet Forest Licences as a percentage of Total Fibre Consumed
Ainsworth Lumber ⁽¹⁾	333 707	224 485	67 %
Lytton Lumber	77 843	29 466	38 %
J.S. Jones Holdings ⁽²⁾	459 789	80 254	17 %
Total	871 339	334 205	38 %

Notes:

(1) Ainsworth Lumber reported a throughput of 400 215 m³ for 1993.

(2) Data for J.S. Jones Holdings is based on 1993 statistics. The J.S. Jones mill is at Boston Bar, outside the Lillooet TSA.

Ainsworth Lumber holds three forest licences in three TSAs: the 100 Mile House TSA, the Kamloops TSA, and the Lillooet TSA. Ainsworth estimates that, on average, these meet 80 percent of the timber requirements for its mills. Ainsworth has opened an Orientated Strand Board plant in 100 Mile House that will use fibre from Pulpwood Agreement 16, which covers a portion of the Lillooet TSA (as well as parts of the Kamloops, 100 Mile House, and Williams Lake TSAs).

Lytton Lumber holds only one forest licence, with the balance of its timber requirements being met by purchases from other sources.

J.S. Jones has a second forest licence, in the Fraser TSA, for 386 960 m³. J.S. Jones obtains all its wood requirements from its two forest licences.

Although Bridgeside Higa does not hold a forest licence, it has successfully won four Timber Sale Licences, under Section 16.1 of the SBFEP.³⁰ It has then traded the logs harvested from these areas for equivalent volumes of rough lumber from companies such as Ainsworth Lumber and Weldwood of Canada.

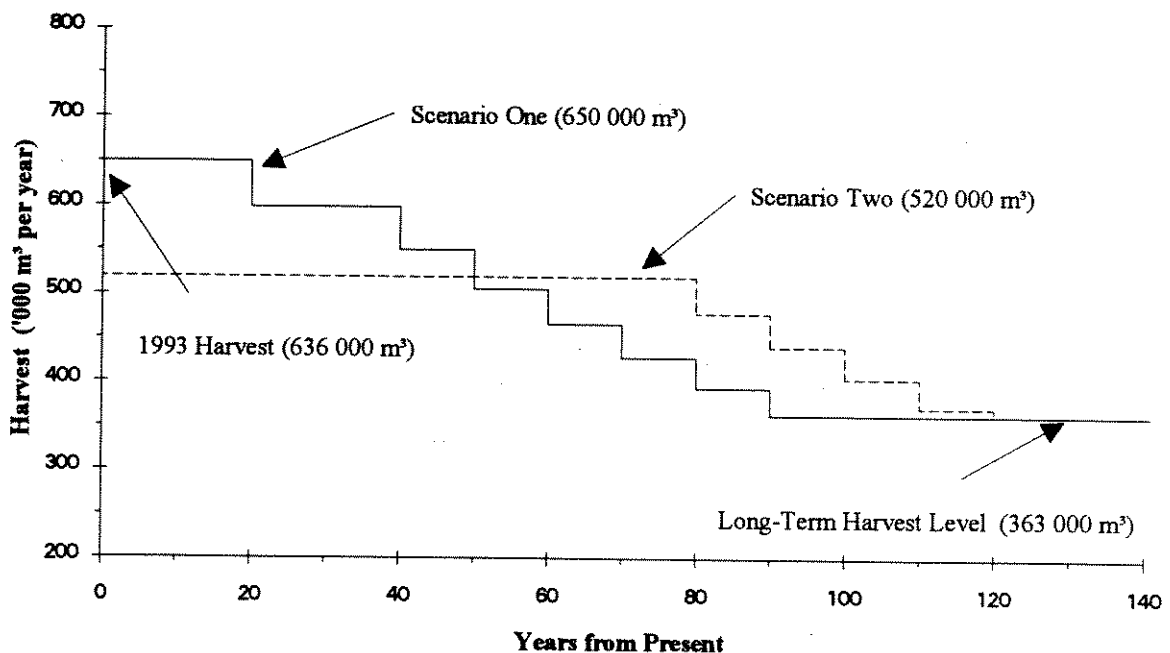
It can be seen then, that forest industry operations in the Lillooet TSA are significantly influenced by harvest levels in other areas, and similarly, the Lillooet TSA's harvest level influences operations in other areas of the province.

³⁰ A Timber Sale Licence allows the holder to harvest timber within a certain area.

4.4 Harvest Scenarios

This SEA report focuses on two timber harvest forecast scenarios from the timber supply analysis. These forecasts were chosen to illustrate a range of social, economic, and environmental impacts, and are not "preferred" scenarios or AAC recommendations.

Figure 4.1 Lillooet TSA Timber Harvest Scenarios



Scenario One. The harvest remains at 650 000 m³ for three decades, then declines by about eight percent per decade until the long-term harvest level of 363 000 m³ is reached in Year 90. This is the Base Case in the addendum to the Timber Supply Analysis report.

Scenario Two. The harvest drops immediately to 520 000 m³ (80 percent of the current AAC), stays constant for eight decades, then drops by about eight percent each decade until the long-term harvest of 363 000 m³ is achieved in Year 120.

The impacts associated with these timber harvest scenarios are grouped into sections dealing with economic impacts, community implications, First Nations implications, and environmental implications. These are presented in Sections 5, 6, 7, and 8, respectively.

5.0 Economic Impacts

This chapter presents the estimated economic impacts associated with the two harvest forecast scenarios. These include impacts on employment, employment income, and provincial government revenues. Impacts are discussed in the context of the Lillooet TSA and the province as a whole. While the chapter is focused on the forest sector, impacts on other sectors are also discussed.

5.1 Forestry Sector

Methodology and Assumptions

The Lillooet TSA timber harvest generates "direct" employment and employment income in the harvesting, silviculture, and processing sectors, which was estimated for 1992 based on information collected directly from forest companies (more detail is provided in Appendix B). In addition, "indirect" employment is created in sectors supplying inputs to the forest industry and "induced" employment is supported by the local spending of forestry-related "direct" and "indirect" employment income. Indirect and induced employment were estimated using employment multipliers, which are explained in more detail in Appendix B. For the Lillooet TSA, indirect employment was also estimated by Price Waterhouse through surveys of the local transportation and forest industry supply sectors.³¹ The survey-based estimates correspond closely to the estimates arrived at below using the employment multipliers. Impacts are presented in \$1993.

Several qualifiers apply to the impacts discussed below. The analysis assumes a linear relationship between employment and harvest levels. While this is probably reasonably accurate for harvesting employment, it is more likely that processing employment at specific mills may not change until mill inputs drop below a threshold level. If a threshold level is reached, one or two shifts, or even an entire mill could possibly shut down. The point at which a threshold is reached would depend on a number of complex interrelated operational factors, as well as on the availability of private wood and logs from outside the TSA. As a simplification, this analysis assumes smooth employment declines over time, whereas in reality, employment declines maybe larger and more sudden, but would occur at less frequent intervals. It is assumed that over the longer term the cumulative impacts would likely be the same. The approach used here also assumes a linear relationship between harvesting and indirect employment. This, again, is a simplification of the more likely occurrence that businesses would close if communities become too small to support certain services. It is also assumed that there would be no job losses due to technological change. Finally, the impacts were calculated without considering the cushioning effects of various income support mechanisms, particularly Unemployment Insurance, which would mitigate short-term losses.

³¹ These estimates are shown in Table 2.7. The survey of forest industry suppliers is described in Appendix C.

5.2 Lillooet TSA Impacts

This analysis estimates economic impacts using coefficients that provide measures of employment and employment income in terms of thousand cubic metres of timber harvested. These coefficients are based on data for 1992, when the harvest level was 571 000 m³. In 1993, the harvest level was 636 000 m³, and this is used as the base year for the analysis. The 1993 harvest level is estimated to support 483 PY of direct forest sector employment in the TSA. This employment falls into the categories shown in Table 5.1, which also shows the relationship between employment and harvest levels.

Table 5.1 Lillooet TSA Employment

Sector	TSA Employment Coefficient (PY/000 m ³)	TSA Employment (PY)
Harvesting	0.30	191
Silviculture	0.01	6
Wood Processing	0.45	286
Total	0.76	483

In addition to employment directly in the forestry sector, there were approximately 159 PY in indirect/induced employment. This was calculated based on multipliers provided by the Ministry of Finance and Corporate Relations.

The gross economic impacts are presented in Tables 5.2 and 5.3. (Incremental, or decade-by-decade, changes are provided in Appendix D). Tables 5.2 and 5.3 are based on the coefficients shown below:

Information for calculating employment and income impacts for Lillooet TSA harvest forecasts	
TSA direct employment coefficient (PY/000 m ³)	0.76
TSA indirect/induced employment coefficient (PY/000 m ³)	0.25
TSA direct income coefficient (\$/000 m ³)	\$ 23 600
TSA indirect/induced income coefficient (\$/000 m ³)	\$ 4 840

Table 5.2 Scenario One: Lillooet TSA Employment and Income Impacts

Year	Harvest (<i>'000 m³/year</i>)	Employment			Income		
		Direct (PY)	Indirect/ Induced (PY)	Total (PY)	Direct (\$1993 mil.)	Indirect/ Induced (\$1993 mil.)	Total (\$1993 mil.)
1993	636	483	159	642	\$ 15.0	\$ 3.1	\$ 18.1
0 - 29	650	494	163	657	\$ 15.3	\$ 3.1	\$ 18.4
30	598	454	150	604	\$ 14.1	\$ 2.9	\$ 17.0
40	550	418	138	556	\$ 13.0	\$ 2.7	\$ 15.7
50	506	385	127	512	\$ 11.9	\$ 2.4	\$ 14.3
60	466	354	117	471	\$ 11.0	\$ 2.3	\$ 13.3
70	428	325	107	432	\$ 10.1	\$ 2.1	\$ 12.2
80	394	299	99	398	\$ 9.3	\$ 1.9	\$ 11.2
90 - 200	363	276	91	367	\$ 8.6	\$ 1.8	\$ 10.4

Table 5.3 Scenario Two: Lillooet TSA Employment and Income Impacts

Year	Harvest (<i>'000 m³/year</i>)	Employment			Income		
		Direct (PY)	Indirect/ Induced (PY)	Total (PY)	Direct (\$1993 mil.)	Indirect/ Induced (\$1993 mil.)	Total (\$1993 mil.)
1993	636	483	159	642	\$ 15.0	\$ 3.1	\$ 18.1
0 - 79	520	395	130	525	\$ 12.3	\$ 2.5	\$ 14.8
80	478	363	120	483	\$ 11.3	\$ 2.3	\$ 13.6
90	440	334	110	444	\$ 10.4	\$ 2.1	\$ 12.5
100	405	308	101	409	\$ 9.6	\$ 2.0	\$ 11.6
110	372	283	93	376	\$ 8.8	\$ 1.8	\$ 10.6
120 - 200	363	276	91	367	\$ 8.6	\$ 1.8	\$ 10.4

Scenario One - The harvest level for the first 30 years would be 650 000 m³, about two percent higher than the 1993 actual harvest of 636 000 m³. Employment and income levels would therefore be approximately two percent higher than 1993 levels for the first three decades. Subsequently, employment levels would track the drop in harvest levels, declining to 276 direct PY and 91 indirect/induced PY in Year 90 when the LTHL is reached. The after-tax income associated with these employment levels would follow a similar pattern. Income from direct employment would drop from \$15.0 million in the first three decades, to \$8.6 million at the LTHL. Indirect/induced income would decrease from \$3.1 million in Year 0 to \$1.8 million in Year 90.

Scenario Two - Under Scenario Two, direct TSA employment would decline immediately by 18 percent (88 PY), from 483 PY to 395 PY, and indirect/induced employment would likewise fall from 159 PY to 130 PY. These employment levels would then be sustained for 80 years, before dropping by about eight percent per decade and reaching the LTHL in Year 120. Income from direct employment would initially drop from \$15.0 million to \$12.3 million, and

indirect/induced income would fall from \$3.1 million to \$1.8 million. These levels would remain unchanged until Year 80, and, as under Scenario One, would ultimately drop to \$8.6 million (direct) and \$1.8 million (indirect/induced) at the LTHL in Year 120.

Under both scenarios, the transition from the current harvest level to the LTHL would involve the cumulative loss of 207 PY of direct employment and \$6.4 million in annual after-tax direct employment income. The cumulative impact on indirect/induced employment would be 68 PY and \$1.3 million in after-tax income. These cumulative impacts are directly proportional to the 43 percent reduction from the 1993 harvest level to the LTHL.

5.3 Provincial Impacts

Timber and primary wood products that are exported from the TSA for processing elsewhere create jobs outside the TSA that would be affected by lower timber harvest levels. Processing employment based outside the TSA, but which is directly linked to the Lillooet TSA, includes employment at the following mills: J.S. Jones Holdings Ltd. in Boston Bar; Ainsworth's plywood mill in Savona, which uses veneer produced from the Ainsworth mill in Lillooet; employment at other BC plywood facilities using Ainsworth's veneer; and pulp and paper mills that use chips manufactured from wood from the Lillooet TSA.

Including jobs in the TSA, the 1993 harvest level of 636 000 m³ is estimated to support 986 PY of direct forest sector employment. This employment is allocated as shown in Table 5.4

Table 5.4 Provincial Employment

Sector	TSA (PY)	Outside TSA (PY)	Provincial Employment (PY)	Provincial Employment Coefficient (PY/'000 m ³)
Harvesting	191	32	223	0.35
Silviculture	6	51	57	0.09
Wood Processing	286	312	598	0.94
Pulp and Paper	0	108	108	0.17
Total	483	503	986	1.55

In addition, there were an estimated 1476 PY of indirect/induced employment, based on the application of a provincial employment multiplier of 2.5.

The provincial employment and employment income impacts of the two harvest scenarios are set out in Tables 5.5 and 5.6 (incremental impacts are presented in Appendix D). These tables are based on the following coefficients:

Information for calculating provincial employment and income impacts for Lillooet TSA harvest forecasts	
Provincial direct employment coefficient (PY/000 m ³)	1.55
Provincial indirect/induced employment coefficient (PY/000 m ³)	2.32
Provincial direct income coefficient (\$/000 m ³)	\$ 49 080
Provincial indirect/induced income coefficient (\$/000 m ³)	\$ 52 480

Table 5.5 Scenario One: Provincial Employment and Income Impacts

Year	Harvest (000 m ³ /year)	Employment			Income		
		Direct (PY)	Indirect/ Induced (PY)	Total (PY)	Direct (\$1993 mil.)	Indirect/ Induced (\$1993 mil.)	Total (\$1993 mil.)
1993	636	986	1476	2462	\$ 31.2	\$ 33.4	\$ 64.6
0 - 29	650	1008	1508	2516	\$ 31.9	\$ 34.1	\$ 66.0
30	598	927	1387	2314	\$ 29.3	\$ 31.4	\$ 60.7
40	550	853	1276	2129	\$ 27.0	\$ 28.9	\$ 55.9
50	506	784	1174	1958	\$ 24.8	\$ 26.6	\$ 51.4
60	466	722	1081	1803	\$ 22.9	\$ 24.5	\$ 47.4
70	428	663	993	1656	\$ 21.0	\$ 22.5	\$ 43.5
80	394	611	914	1525	\$ 19.3	\$ 20.7	\$ 40.0
90 - 200	363	563	842	1405	\$ 17.8	\$ 19.1	\$ 36.9

Table 5.6 Scenario Two: Provincial Employment and Income Impacts

Year	Harvest (000 m ³ /year)	Employment			Income		
		Direct (PY)	Indirect/ Induced (PY)	Total (PY)	Direct (\$1993 mil.)	Indirect/ Induced (\$1993 mil.)	Total (\$1993 mil.)
1993	636	986	1476	2462	\$ 31.2	\$ 33.4	\$ 64.6
0-79	520	806	1206	2012	\$ 25.5	\$ 27.3	\$ 52.8
80	478	741	1109	1850	\$ 23.5	\$ 25.1	\$ 48.6
90	440	682	1021	1703	\$ 21.6	\$ 23.1	\$ 44.7
100	405	628	940	1568	\$ 19.9	\$ 21.3	\$ 41.2
110	373	578	865	1443	\$ 18.3	\$ 19.6	\$ 37.9
120 - 200	363	563	842	1405	\$ 17.8	\$ 19.1	\$ 36.9

Province-wide, direct employment related to the Lillooet harvest accounts for 40 percent of total employment, whereas in the TSA direct employment accounts for about 75 percent of the total. This reflects the fact that much of the indirect and induced employment associated with the Lillooet TSA harvest is located outside the TSA. Indirect employment outside the TSA would include employment in companies supplying the TSA's forest industry with, for example, metal fabricators, sawmill and woodworking machinery supplies, and forestry consulting services. It would also include lumber transportation employment, such as truckers, and rail workers. Induced employment outside the TSA relates to the jobs supported outside the TSA by the spending of forest sector employees whose jobs are related to the Lillooet TSA harvest. This would include, for example, jobs at car dealerships and at retail outlets selling household furnishings and appliances. Many of these indirect or induced jobs are in Kamloops, the Fraser Valley, and the Lower Mainland.

As at the TSA level, province-wide employment and employment income impacts would follow the changes in harvest levels.

Scenario One - For the first three decades, total employment (direct and indirect/induced) would be 2462 PY. Thereafter, total employment would eventually fall to 1405 PY at the long-term harvest level. Total employment income would be \$66.0 million until Year 30, when it would commence declining to \$36.9 million at the LTHL.

Scenario Two - Total employment would decline immediately by about 18 percent, to 2012 PY, and would remain at this level for 80 years before declining to 1405 PY at the LTHL in Year 120. Total income would follow the same trend, falling to \$52.8 million for the first eight decades and to \$36.9 million in Year 120.

Under both scenarios, total employment and employment income would ultimately drop by about 43 percent (1057 PY and \$27.7 million, respectively) before reaching sustainable levels at the LTHL.

As discussed in the TSA impacts section, this analysis assumes a linear relationship between harvest levels and employment.

5.4 Government Revenue Impacts

5.4.1 Provincial Government Revenues

Provincial government revenues from a number of sources would fall if the timber harvest level is reduced. The major revenue sources affected would be stumpage and other forestry-related charges, and personal income taxes. These impacts are shown in Tables 5.7 and 5.8, which are based on the coefficients below (these are explained further in Appendix B).

Information for calculating government revenue impacts for Lillooet TSA harvest forecasts	
BC Personal Income Tax coefficient (\$/000 m ³)	\$ 10 680
BC Stumpage, Rent and Fees coefficient (\$/000 m ³)	\$ 15 710
Other BC Forest Sector Taxes coefficient (\$/000 m ³)	\$ 5 940
Federal Personal Income Tax coefficient (\$/000 m ³)	\$ 21 360
Other Federal Taxes coefficient (\$/000 m ³)	\$ 910

Table 5.7 Scenario One: Government Revenue Impacts

Year	Harvest (000 m ³ /year)	BC Government Revenues				Federal Government Revenues		
		Stumpage, Rent & Fees (1993 mil.)	Other Forestry Taxes (1993 mil.)	Personal Income Tax (1993 mil.)	BC Total (1993 mil.)	Personal Income Tax (1993 mil.)	Other Federal Taxes (1993 mil.)	Federal Total (1993 mil.)
1993	636	\$ 10.0	\$ 3.8	\$ 6.8	\$ 20.6	\$ 13.6	\$ 0.6	\$ 14.2
0 - 29	650	\$ 10.2	\$ 3.9	\$ 6.9	\$ 21.0	\$ 13.9	\$ 0.6	\$ 14.5
30	598	\$ 9.4	\$ 3.6	\$ 6.4	\$ 19.4	\$ 12.8	\$ 0.5	\$ 13.3
40	550	\$ 8.6	\$ 3.3	\$ 5.9	\$ 17.8	\$ 11.7	\$ 0.5	\$ 12.2
50	506	\$ 7.9	\$ 3.0	\$ 5.4	\$ 16.3	\$ 10.8	\$ 0.5	\$ 11.3
60	466	\$ 7.3	\$ 2.8	\$ 5.0	\$ 15.1	\$ 10.0	\$ 0.4	\$ 10.4
70	428	\$ 6.7	\$ 2.5	\$ 4.6	\$ 13.8	\$ 9.1	\$ 0.4	\$ 9.5
80	394	\$ 6.2	\$ 2.3	\$ 4.2	\$ 12.7	\$ 8.4	\$ 0.4	\$ 8.8
90 - 200	363	\$ 5.7	\$ 2.2	\$ 3.9	\$ 11.8	\$ 7.8	\$ 0.3	\$ 8.1

Table 5.8 Scenario Two: Government Revenue Impacts

Year	Harvest (<i>'000 m³/year</i>)	BC Government Revenues				Federal Government Revenues		
		Stumpage, Rent & Fees (<i>\$1993 mil.</i>)	Other Forestry Taxes (<i>\$1993 mil.</i>)	Personal Income Tax (<i>\$1993 mil.</i>)	BC Total (<i>\$1993 mil.</i>)	Personal Income Tax (<i>\$1993 mil.</i>)	Other Federal Taxes (<i>\$1993 mil.</i>)	Federal Total (<i>\$1993 mil.</i>)
1993	636	\$ 10.0	\$ 3.8	\$ 6.8	\$ 20.6	\$ 13.6	\$ 0.6	\$ 14.2
0-79	520	\$ 8.2	\$ 3.1	\$ 5.6	\$ 16.9	\$ 11.1	\$ 0.5	\$ 11.6
80	478	\$ 7.5	\$ 2.8	\$ 5.1	\$ 15.4	\$ 10.2	\$ 0.4	\$ 10.6
90	440	\$ 6.9	\$ 2.6	\$ 4.7	\$ 14.2	\$ 9.4	\$ 0.4	\$ 9.8
100	405	\$ 6.4	\$ 2.4	\$ 4.3	\$ 13.1	\$ 8.7	\$ 0.4	\$ 9.1
110	372	\$ 5.8	\$ 2.2	\$ 4.0	\$ 12.0	\$ 7.9	\$ 0.3	\$ 8.2
120 - 200	363	\$ 5.7	\$ 2.2	\$ 3.9	\$ 11.8	\$ 7.8	\$ 0.3	\$ 8.1

The 1993 Lillooet TSA harvest of 636 000 m³ is estimated to have generated provincial government revenue of \$20.6 million. Approximately half of this is from stumpage and other timber related charges, a third is from personal income taxes, and the remainder includes other corporate income tax, provincial sales tax, property tax, electricity tax, logging tax, and corporation capital tax.

Under Scenario One, provincial government revenues would remain at \$21.0 million for three decades, then gradually decline until the long-term harvest level is reached. Annual government revenues would stabilize in Year 90 at \$11.8 million, about 43 percent less than the 1993 level.

Scenario Two would involve an immediate 18 percent reduction (\$3.7 million) in provincial government revenue, but no further declines would take place until Year 80.

5.4.2 Federal Government Revenues

Federal government revenues would be affected by Lillooet TSA harvest changes. The biggest impact would be on personal income taxes, but also affected would be corporate income taxes, and excise, sales, and withholding taxes. These impacts are also shown in Tables 5.7 and 5.8, and would follow the same harvest-related trends as provincial government revenues. Under both scenarios federal revenues would fall by a cumulative total of \$6.1 million (from estimated 1993 levels) by the time the LTHL is reached.

5.5 Non-Forestry Economic Impacts

5.5.1 Tourism and Recreation

As discussed in Section 2.4.2, it is estimated that the wilderness-based tourism sector generates approximately 50 PY of employment in the Lillooet TSA, including employment related to white water rafting, guide-outfitting and trail riding, fishing, snowmobiling and skiing. The basic sector

employment estimates shown in Table 2.4, which are based on a broader measure of tourism, indicates that 235 people were employed in the tourism sector, although this would include seasonal and part-time work and a large number of accommodation-related workers. While it is difficult to assess precisely how employment in the tourism sector would be affected by each scenario, several relevant factors are discussed below.

Tourism and recreation in the Lillooet TSA are based on the area's pristine wilderness attributes. However, because most visitors choose to camp and have limited needs for infrastructure, their spending in the region is limited and so are the related economic impacts.

Logging operations have mixed impacts on tourism and recreational activities in the Lillooet TSA. Guide outfitters generally access the alpine regions of the TSA by means of logging roads. However, they prefer that the industry maintain former logging roads rather than build new roads. Snowmobilers also tend to use logging roads to access remote areas of the TSA. Their concerns are over the deactivation of logging roads and the hazards this poses to snowmobilers (deactivated roads have large depressions, which are sometimes invisible because of snow coverage). The impact of either harvest forecast scenario on snowmobiling or guide outfitting is estimated to be small, as many of the access roads used will remain.

Certain summer activities, such as fishing, hiking and nature viewing, rely on a pleasing natural surrounding. Several tourism operations in the Lillooet TSA attribute a reduction in their tourism business to increased logging in their immediate surrounding area. Although alpine regions are above the tree line, the view from these alpine regions into other valleys incorporates logged areas, thereby diminishing the wilderness experience. Concern also exists regarding wildlife displacement due to logging.

The immediate reduction in harvest levels under Scenario Two could result in positive benefits to the tourism/recreation sector. Reduced logging, particularly in areas such as Spruce Lake, would result in less negative visual impact, thereby enhancing visitors' wilderness experiences. Under Scenario One, the lower harvest in later decades may have a similar effect. However, regarding relative employment impacts, the immediate 18 percent harvest reduction under Scenario Two would displace more workers in the TSA's forestry sector (an estimated 88 PY) than are estimated to be presently employed in wilderness-based tourism (50 PY). Moreover, while tourism is a large and growing sector in the TSA, tourism sector jobs are often part-time or seasonal, and are typically significantly lower paid than forest sector jobs.

5.5.2 Other Sectors

Agriculture

Agriculture in the Lillooet TSA would not be significantly affected directly by either harvest scenario. The ginseng operation, the largest agricultural employer, probably has a finite life at its present location regardless of the levels of timber harvest, and uses non-timber land for farming.

BC Rail and BC Hydro

Although BC Rail is a significant employer in Lillooet and the surrounding area, only about five percent of its jobs are directly attributable to the TSA's forest industry.³² (However, a much larger percentage of BC Rail's employment in Lillooet depends on the forest industry outside the TSA.) Accordingly, in the short-term, neither of the harvest scenarios would have a significant effect on BC Rail's operations.

The changes in harvest levels under Scenarios One and Two would likely have little or no impact on BC Hydro employment.

Mining

The two harvest scenarios would probably have little impact on the mining sector. The moratorium on mineral exploration in environmentally sensitive areas, such as the Middle Stein and Spruce Lake area, as well as the Protected Areas Strategy, are of greater concern to the mining industry than differing timber harvest levels.

This concludes the presentation of aggregate economic impacts. The following section discusses the potential community-level implications of Scenario One and Scenario Two.

³² Source: Morris Isackson, Terminal Supervisor, BC Rail, Lillooet.

6.0 Community Implications

6.1 Lillooet TSA Communities

The communities of Lillooet and Lytton have economies that are largely based on the forest industry, and would be significantly affected by lower timber harvests. The villages of Bralorne, Gold Bridge, and Spences Bridge are less likely to be affected.

As discussed in Section 5.1, under both scenarios, the employment loss in the Lillooet TSA would reach 207 direct PY and 68 indirect/induced PY once the long-term harvest level of 363 000 m³ is reached. Though the end result would be the same, under Scenario One job losses would be deferred for 30 years, providing a long lead time for community planning and adjustment. Scenario Two would involve an initial drop in employment of 88 direct PY and 29 indirect PY, which would immediately affect communities and individuals.³³ However, there would be no further reductions for 80 years, providing communities with considerable long-term stability.

Job impacts at the harvesting level are most likely to occur in proportion to timber harvest reductions. If the timber is not being harvested, there would no longer be the associated harvesting jobs. The initial 116 000 m³ (18 percent) harvest reduction under Scenario Two would therefore involve the loss of about 35 harvesting jobs.³⁴ If these losses were to be distributed in proportion to the licensees' AAC apportionments, about 80 percent of these would be in the Lillooet area, and 20 percent in the Lytton area.

The linkage between harvest volume reductions and processing jobs is less direct and more complex than at the harvesting levels because of the opportunities for fibre substitution. As discussed in Section 5.1, impacts may occur not in direct proportion to harvest changes, but in larger increments when certain minimum "threshold" levels of mill throughput become unattainable. The points at which thresholds may be reached would depend on mill operational factors and the availability of alternative supplies of wood, and it is beyond the scope of this report to make predictions in this regard. However, it is reasonable to assume that the larger the reduction in harvest, the greater the likelihood of threshold effects occurring. The assumption of processing job impacts occurring in proportion to harvest changes remains useful for providing estimates, although the timing and level of job loss may occur somewhat differently. On the basis of proportionality, Scenario Two would involve an immediate drop in processing employment of about 50 PY.³⁵ If this was spread among the TSA's mills in proportion to their 1992 employment levels, the incidence of impacts would be similar to those at the harvesting level: about 80 percent in the Lillooet area, and 20 percent in the Lytton area. Due to the limitations of using the

³³ These impacts are calculated based on a harvest reduction from 636 000 m³ to 520 000 m³ and an employment coefficient of 0.76 PY/1000 m³.

³⁴ Based on a harvest employment coefficient of 0.30 PY/1000 m³.

³⁵ Based on a processing employment coefficient of 0.45 PY/1000 m³. These PY reductions are from estimated 1993 processing employment levels, which are assumed to have increased by about 12 percent since 1992, in proportion to the higher harvest level (636 000 m³ in 1993, compared with 571 000 m³ in 1992).

proportionality assumptions, these estimates are intended only to provide a general idea of the types of impacts that could occur.

The immediate community-level impacts of Scenario Two, then, could be the loss of about 70 jobs in the Lillooet area and about 15 jobs in the Lytton area. These proportionally-estimated impacts do not consider possible threshold impacts at the local mills. When the local spin-off effect of reduced employee spending is allowed for, these impacts could be approximately a third higher. As discussed in Section 2, about 35 percent of the "basic sector" employment in Lillooet is related to forestry. In Lytton the proportion is 25 percent (in comparison, 45 percent is related to the public sector). With the economy of Lillooet being relatively more forestry-based than that of Lytton, and with the larger absolute level of potential job loss, impacts in the TSA would be felt most strongly in the Lillooet area. The communities of Lillooet and Lytton are seeking to diversify their economies through community-based initiatives.

Possibly offsetting lower forestry-related employment, there may be new employment opportunities within the next decade in a number of areas. These are discussed below.

- **Cogeneration Plant (Lytton)** - Canyon Power, a Langley company, has proposed building a \$10 million cogeneration plant in Lytton that would provide the community with 20 PY of employment. Wood waste from the Lytton Lumber sawmill would provide 50 percent of the plant's fuel, with most of the rest being supplied by urban wood waste from the Fraser Valley and the Lower Mainland. The plant would therefore be dependent on the continued operation of the Lytton sawmill. The project is only a proposal, and may be contingent on financial assistance from the government.
- **Project Construction (Lytton)** - The construction and operation of the proposed mall expansion and health facility projects in Lytton would generate employment.
- **Melvin Creek Ski Resort (Lillooet area)** - According to Al Raine of NGR Consultants, the proposed Melvin Creek Ski Resort, just south of Lillooet, could provide substantial employment. However, it is uncertain whether the resort will go ahead.
- **Tourism and Outdoor Recreation** - Less logging could mean more wilderness and tourism opportunities. The Lillooet TSA is well situated for tourists, due to its proximity to the Lower Mainland and to Whistler. It is an easy destination for a weekend trip from Vancouver and offers tourists significant recreational opportunities. Accordingly, tourism operators are optimistic that there will be continued growth within this sector. Nevertheless, while the tourism sector may generate some employment growth in the next decade, it would likely replace only a small proportion of the jobs lost through timber harvest reductions under Scenario Two. Furthermore, tourism jobs are often seasonal and generally pay substantially less than forestry-related jobs.
- **Remanufacturing (Lillooet and Lytton)** - Additional employment could also be created by the expansion of the remanufacturing sector in the area. Representatives of both Lytton Lumber and Bridgeside Higa said they could expand their remanufacturing operations if they

could secure more fibre. Since secondary processing is more labour-intensive than primary processing, further development of these operations could potentially provide opportunities for displaced workers.

These potential sources of employment are presented to indicate that some areas of the TSA economy may grow, even if some forestry-related areas decline. It should be noted that, with the exception of opportunities related to tourism and outdoor recreation, it is possible that the above developments could proceed independently of TSA harvest reductions.

Although not considered in the job impacts in this report, mitigation could also occur through initiatives under the BC government's Forest Renewal Plan, which was announced in 1994. The Plan has among its goals the continued availability of forestry-related jobs and the long-term stability of communities that rely on the forests. The Plan is financed by an increase in stumpage revenues, and is being implemented by Forest Renewal BC, a provincial Crown corporation. Forest Renewal BC will direct funds to silviculture, assist in the start-up of value-added companies, and invest in value-added research and the development of new wood manufacturing technology, products, and markets. In addition, Forest Renewal BC will encourage community economic development planning and diversification, and skills training for forest sector workers.

Loss of employment, as would ultimately occur under both harvest scenarios, may create some instability and uncertainty at the community level and for unemployed individuals. The distinction between individual and family impacts and overall community impacts is an important one. Under Scenario Two, initial direct and indirect/induced job losses in the TSA in the first decade (as estimated in proportion to harvest level changes) would be unlikely to cause severe consequences in the TSA at the community level. However, individuals who lose their jobs, and their families, may experience great stress. Signs of stress related to job loss may 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 may be reflected in increased school drop out rates.³⁶ The degree to which these signs of stress could manifest themselves as the result of job losses in the Lillooet TSA is beyond the scope of this study to predict. However, if TSA communities are aware of the potential social problems related to the loss of forestry jobs, they may be better able to consider how to deal with the situation. Responses could include social service programs, worker re-employment and re-training programs, and community-level economic development planning.

6.2 Communities Outside the TSA

Elsewhere in BC, the effects of lower Lillooet TSA timber harvests would be more widely dispersed, and therefore most likely of somewhat less significance at the community level. The most direct impacts would be at the J.S Jones mill in Boston Bar and at Ainsworth's plywood plant in Savona. In the Boston Bar area, the forest sector, especially J.S. Jones, is a large source of employment. However, J.S. Jones' operations are primarily related to wood harvested in the

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.

Fraser TSA, and the short-term changes in the Lillooet TSA harvest considered in this report would be unlikely to cause significant difficulties for the community.³⁷ Savona is also a small, forestry-based community, and Ainsworth's plywood plant is an important part of the local economy. As the plywood plant is supplied by Ainsworth's Lillooet veneer plant, its operations could be affected by changes in the Lillooet TSA harvest. The extent of such impacts would depend on the amount of harvest reduction, the availability of alternative supplies, and Ainsworth's decisions regarding corporate fibre allocation.

³⁷ A discussion of the implications of the changes in the Fraser TSA timber harvest is provided in the Fraser TSA Socio-Economic Analysis, prepared by Crane Management Consultants for the Ministry of Forests, 1994.

7.0 First Nations Implications

The harvest changes under Scenario One and Two could affect First Nations communities in the TSA both positively and negatively.

Reduced harvest levels are consistent with First Nations' environmental and wildlife values. First Nations representatives that were interviewed felt that reduced logging would better preserve the cultural, heritage, and religious values of band members, because of their strong bond to the land. They preferred Scenario Two, as it immediately reduces the amount of harvesting, which they feel is desirable until such time as land claim issues are settled.

The First Nations community, however, could be negatively affected in economic terms by lowered timber harvest levels. Over 35 percent of mill employees in the area are First Nations people. Therefore, if a mill was to rationalize employment, First Nations employees could lose their jobs. Similarly, there would probably be job losses among the many First Nations people who are independent contractors and are involved in harvesting activities. These impacts could be particularly severe because unemployment among First Nations people is already very high. For example, two bands reported unemployment rates of over 65 percent.

In addition, several bands are currently seeking and developing opportunities to create forestry-related employment for their members. Six bands from the Nlaka'pamux Nation have jointly entered into a forest licence with J.S. Jones. The Lytton Indian Band has recently opened a school to instruct band members on renewable resource management. One of the main areas of instruction will relate to forest management.

The Forest Renewal Plan (discussed in Section 6) will include specific initiatives for First Nations.

8.0 Environmental Implications

This section identifies some of the potential environmental effects of current timber harvesting practices, and discusses how these effects may occur over the two timber harvest forecast scenarios. The discussion is based primarily on information and comment provided by BC Environment, Lands and Parks.³⁸ The discussion in this section is somewhat qualitative and tentative, due to the Timber Supply Review's focus on the aggregate TSA harvest level (rather than particular types of harvesting in specific areas), due to the assumption that current resource management practices would be in place over both harvest scenarios, and due to a lack of information about current wildlife populations, ecosystem processes and relationships, and the economic values of environmental attributes.

The impacts discussed in this section should be considered in light of the following considerations.

Timber Harvesting Land Base - The timber supply analysis reduced the total land base by 113 895 hectares (10 percent) to accommodate environmentally sensitive areas. These include areas that have moderate to high non-timber values, such as wildlife, watersheds, and recreational attributes, and areas that are prone to excessive site degradation if harvested, because of geological and topographical conditions. However, BC Environment officials believe that these area netdowns do not adequately accommodate all of the TSA's wildlife and fish resources.

Forest Management Practices - The timber supply analysis assumed some protection of community watersheds and visual landscapes. However, it did not incorporate the harvesting guidelines that were implemented in the Lillooet TSA in October, 1993, or the provisions of the new Forest Practices Code. The Forest Practices Code, in particular, could have a significant positive effect on environmental values.

Land Use Designations - The Protected Areas Strategy (PAS) is based on ecological principles. It is currently addressing the conservation of ecosystems at the landscape level and is increasing the amount of protected area in BC. As discussed in Section 4, PAS study areas include the Middle Stein and Spruce Lake areas, and a further 18 areas are under consideration. (These cover 24 percent of the TSA's landbase, and were not taken out of the land base in the timber supply analysis.) The Upper and Lower Stein Wilderness Areas are within the TSA and provide protection of local environmental attributes.

Comparisons Between Harvest Scenarios - Both scenarios have the same long-run harvest level and the same assumptions regarding resource and environmental management. The scenarios differ only in terms of how rapidly or slowly they move to the long-run harvest level, and that is the major basis for comparisons between them. This limits what can be concluded regarding many environmental values in terms of the relative impacts of the scenarios. However, it is still possible to discuss the general environmental implications of timber harvesting under both scenarios.

³⁸ Fish and Wildlife Section, Kamloops Region, Ministry of Environment, Lands and Parks.

With these points in mind, the following is a short discussion of the major environmental impacts of timber harvesting, the existing measures to deal with the impacts, and how the Forest Practices Code may change management practices.

8.1 Habitat

Old Growth Forest Habitat - Under both scenarios, over the first few decades most of the net operable old growth in the timber harvesting land base would be harvested and replaced by young forest. The existing forest's uneven age profile, with a large number of very young and very old stands, would be replaced by a distribution featuring mostly younger stands, thus reducing the amount of old growth habitat. Several species in the Lillooet TSA that are of management concern are dependent on old growth. (Appendix E identifies the species in the TSA that the Ministry of Environment, Lands and Parks considers to be of management concern.) Many of the most critical wildlife habitats are in the operable forest and can conflict with forest harvesting activities. More old growth habitat will likely be protected under the PAS and the Forest Practices Code. Functional attributes of old-growth, such as snags, wildlife trees and structural diversity, will likely become an increasingly important component of stand management strategies in immature forests.

Riparian Habitat - Riparian habitats are found in areas adjacent to streams and water bodies, and provide a variety of wildlife species with a rich diversity of food, as well as with water and cover. Consequently, wildlife tends to use these areas more intensively than any other habitat type. Riparian areas are very easily disturbed and detrimentally altered by timber harvesting and silvicultural practices. The Forest Practices Code will likely contain more restrictive prescriptions for riparian habitat management than those modelled in the timber supply scenarios.

Wetland Habitat: These habitats are sensitive and vulnerable to disturbance, not only from forest harvesting and roads, but also from other human activities. Harvesting of adjacent forest has the potential to alienate wetlands from use. Several species groups in the TSA use wetlands. Wetlands are usually mapped and protected from harvesting impacts during planning. It is anticipated that the Forest Practices Code will have some minor impact on current forestry practices for areas adjacent to wetlands.

Habitat Connectivity: The rugged terrain of the Lillooet TSA provides natural barriers to wildlife migration and habitat connectivity. Several wildlife species in the TSA require migration (or linkage) corridors between seasonal habitats. These migration corridors could be disrupted as forest harvesting activities continue. Habitat connectivity is required to maintain biodiversity across the landscape. As habitats become fragmented through development activities it becomes increasingly important that these fragmented habitats are connected by linkage corridors to ensure the maintenance of species diversity. Connectivity between habitats can be addressed by establishing Forest Ecosystem Networks.

8.2 Biodiversity, Wildlife, and Fish

Assessing the impacts on wildlife species is restricted by a lack of survey information, a lack of inventory data, a limited understanding of population dynamics and habitat requirements, and a limited understanding of predator/prey relationships. This section presents a brief summary of possible impacts based on the available information.

8.2.1 Biodiversity

The term "biodiversity" refers not only to the diversity of plant and animal species, but also to the genetic diversity of each species and the diversity of ecosystems that maintain this variety. The wide diversity of wildlife species in the Lillooet TSA is made possible by the diversity of habitats available. The ecology of natural forest stands is especially complex in early and late (old growth) stages of succession - in contrast to the simpler structure and composition of stands managed intensively for wood fibre production. Old growth forest has a high degree of biodiversity. Current timber harvesting and silviculture practices radically alter the ecosystems in which harvesting occurs, and lead to a general decline in biodiversity. It is therefore important that similar regional habitats be connected with one another by corridors to provide for genetic diversity within a species population.

8.2.2 Wildlife

Forest Bird Species (*cavity nesters, woodpeckers, secondary cavity users, raptors*): These species are largely dependent on late successional forest and old growth attributes such as large diameter trees, snags, and coarse woody debris. As harvesting reduces this habitat, populations of these species will probably decline. In general, the higher the rate of harvesting, the greater will be the degree of forest fragmentation and risk to species requiring mature forest. Forest fragmentation also favours generalist species, which compete with forest birds for available habitat.

Furbearers (*marten, fisher, wolverine and lynx*): The preferred habitat for marten, fisher and many furbearing species is riparian zones within or near mature and old growth habitat. The removal of mature forest cover and coarse woody debris in these areas through forest harvesting and silviculture activities diminishes the availability of this preferred habitat. Lynx are an early seral species, preying on species such as hare that inhabit regrowing areas. Silvicultural spacing reduces the number of trees and removes habitat for the prey species, which reduces lynx food supply. These factors could lead to declines in populations and distributions of furbearer species. (Populations of furbearers may also be under pressure in some areas due to trapping.)

Ungulates (*deer, elk, and moose*): Creation by timber harvesting of some spring forage sites close to winter range would likely encourage higher deer populations in the short-term. However, as second growth forests get older, the increase in spring forage is negated. Ungulate populations require the retention of winter range, which provides areas of shallower snowpacks and arboreal lichens and Douglas-fir needles, which are important food sources in winter. (Arboreal lichens are not found in the same quantity in second growth forests). As forest stand ages are gradually shifted towards second growth (particularly in deep snow packed zones), and

roads and access are expanded, populations are likely to be placed under stress and to decline. For example, increased road access can lead to more hunting and mechanized recreational activities, which disturb wildlife populations.

Ungulates (big horn sheep): The Lillooet TSA has two subspecies of bighorn sheep: California bighorn, which are indigenous, and Rocky Mountain bighorn that were introduced to the area. The primary impact is disruption of seasonal migration corridors by harvesting activities. Harvesting activities can disrupt migration by removing forested cover along migration corridors and also by creating noise disturbance through harvesting and hauling operations. This may result in bighorn sheep avoiding areas where these activities are taking place, with serious impacts on timing and location of migrations. The second type of impact on bighorn sheep populations is the creation of access roads into sensitive seasonal habitats. As the harvesting pattern moves from the valley bottoms to the more difficult terrain on hill sides and subalpine forest, there is more access into areas that were previously quite difficult to reach by motorized vehicles.

Ungulates (mountain goat): Goat winter range is not compatible with forestry operations (roads, harvesting, silviculture). Any activities within goat wintering areas would have an adverse impact on goat habitat. The protection of goat habitat is being addressed under the Forest Practices Code, but was not explicitly considered in the timber supply analysis.

Predators (grizzly and black bears, wolves): These species (except black bears) require extensive tracts of wilderness area, preferably unroaded and undisturbed, with a variety of habitat types. Older forests are used by grizzly bears for denning, day bedding, escape cover, and foraging for plants. Grizzlies are particularly seriously affected by road access into wilderness areas because they have low rates of reproduction and are incompatible with human activity. Any increase in access would lead to lower reproduction rates, increased culling, and perhaps increased poaching. In addition, grizzlies would be negatively affected by fire suppression, and silviculture practices that reduce the availability of understory forage species. As development moves into more remote areas and older forests are logged, the available habitat for predators is reduced, which would lead to population declines.

Reptiles (western racer, western rattlesnake, rubber boa, Great Basin gopher snake): The impact of logging on these species is primarily related to the loss of denning habitat and logging roads through migration corridors.

Given that much of the old growth in the TSA would be harvested under both scenarios, the real difference between the two is the rate at which this would occur. Both scenarios would have an ultimate overall impact on species and diversity due to the harvesting of large old growth patches. This would lead to a fragmentation of mature timber areas, a narrowing of the age class distribution of the forests, and a reduction of old growth habitats and ecological diversity in later decades. This conversion would cause changes in the distributions (both geographically and over time) and population levels of many wildlife species. Adaptable species that can use a wide range of habitat types, and species that use only young forests, would likely increase in numbers. Species dependent on mature and old growth forests would decline and possibly face local

extirpation. These impacts would occur earlier under Scenario One, due to the high harvest rates in the earlier decades. As Scenario Two involves an immediate reduction in the harvest level, larger old growth patches could be preserved over a longer period (however, Scenario Two would also maintain the harvest above the long-term level for a longer period than Scenario One).

It would appear to be a reasonable conclusion that the slower the rate of harvest, the better-accommodated would be the old growth requirements for wildlife. In addition, a slower rate of cut would have the environmental advantage of preserving options for future changes in land use designations. For these reasons, the immediately reduced harvesting levels of Scenario Two would be preferable to the more graduated reductions provided for under Scenario One. However, it should be noted that, as discussed above, timber harvesting frequently has mixed impacts on wildlife, being detrimental to some species and beneficial for others.

8.2.3 Fisheries

As discussed in Section 3.4, the Lillooet TSA contains a number of significant fisheries systems, including anadromous species such as steelhead and salmon. They support a freshwater sport fishery comprising steelhead, rainbow trout, sturgeon, and bull trout. In addition, saltwater sport and commercial fisheries are supported indirectly through spawning habitat and fresh water rearing habitat. These fisheries systems are also important from a gene pool and wild species survival point of view.

The long-term impacts on the fisheries resources associated with forest harvesting is not well understood, although some practices (such as clearcutting), have the potential to alter hydrological processes and reduce long-term large organic debris (LOD) recruitment.³⁹ Current harvesting methods, especially clearcutting, can result in increased water temperature, turbidity, and variability of flow rate in rivers and streams.⁴⁰ This can result in damage to fisheries habitat when logging is performed in sensitive areas.

Hydrological impacts would usually be most pronounced within the first 20 years of logging an area (depending on site characteristics), after which time the forest opening should become hydrologically recovered and mostly stabilized. Impacts from reduced LOD availability, however, would occur much later, since existing LOD would continue to function for some time after harvesting.

Some of these fisheries concerns are addressed in existing resource management guidelines applied across the TSA (and incorporated in Scenarios One and Two), and will be addressed further in additional guidelines under the Forest Practices Code (Biodiversity and Riparian Management Guidelines). Fisheries managers continue to stress the importance of adequate

³⁹ LOD (such as large tree trunks which sometimes fall into creeks) provides habitat complexity, maintains channel stability, provides escape cover and resting areas, and is an indirect source of fish food organisms.

⁴⁰ The extent and degree to which clear-cutting affects fish habitat and populations is dependent on a number of factors, including the proportion of the watershed harvested, the extent to which buffer strips are retained, and the quality and extent of roading (Keenan and Kimmins, 1993). The interaction of these factors, especially over the long term, is not well understood. These factors are addressed by the Lillooet TSA Timber Harvesting Guidelines and the Forest Practices Code.

habitat protection. Maintaining wild, indigenous fish populations or stocks is of the highest importance, regardless of whether or not they contribute to a sport or commercial fishery. It is most likely that the TSA's fisheries resource has high intrinsic, recreational, and probably commercial values.

It is difficult to conclusively determine the general superiority of one timber harvest scenario over another, as they both share the same management guidelines, and because fisheries and riparian habitat impacts tend to occur on a very site-specific basis. However, on the premise that a lower harvest rate would mean less logging in areas where fish habitat could be affected, Scenario Two would be preferred. Furthermore, the guidelines in effect, even if they are adequate, are less likely to be compromised under a lower harvest scenario. This general conclusion again should be qualified by the proviso that impacts on fish habitat are a function of how harvesting is conducted in specific areas.

8.3 Water

A watershed is a natural land drainage area, which may include several rivers, streams and lakes. Because most watersheds in BC are forested, forest management practices can affect both the quality and quantity of the water received by nearby communities. These practices can also affect the timing of peak flows and the water's flow rate. Generally, the smaller the watershed, the more significant are the effects.

The hydrologic impacts of forestry activities in the Lillooet TSA are varied, and can include:

- *Changes in stream flow:* The largest flow-related impact of logging is the increase in spring run-off from melting snowpacks in clearcut areas. This is especially true of harvesting which occurs at higher elevations (which diminishes the benefits of tree height and canopy closure in reducing snow accumulation and melt). Over the long term, higher peak flows can have a variety of detrimental effects, such as changing channel creek equilibrium, scouring sediment out of channels, and triggering landslides. Greater volumes of runoff can also create water storage problems, such as reservoir overflows. Generally, changes to streamflow increase with the percentage of alteration of a given watershed.
- *Landslides:* Poor harvesting and road construction in a watershed may lead to landslides, the effects of which can range from minor water quality degradation to the initiation of a major debris torrent.
- *Surface Erosion:* Poor road construction practices can be major causes of surface erosion and soil disturbance and can lead to potentially damaging sediment deposits in streams and stream bottoms. Severe sedimentation can have serious effects on the productivity of fish-bearing streams. Visible turbidity is aesthetically undesirable and can be associated with higher bacteria concentrations. Moreover, suspended sediment can be deposited in and reduce the capacity of irrigation ditches, storage ponds, and water tanks. Turbidity may also be caused by natural occurrences and agriculture.
- *Channel Change:* The removal of stream-side vegetation reduces the natural erosion protection provided by plant root systems. The exposed soil is easily eroded by high

water flows. In addition to eroding land and threatening structures, unstable channels can adversely affect water quality and degrade fish habitat.

- *Water Yield Losses:* The loss of forest cover can reduce overall water yield (especially in late summer) in watersheds over time.

In general, all of the above hydrological impacts can have negative impacts on fish, fish habitat, associated aquatic life, and the quality and quantity of water used for human consumption. However, the precise relationships between some hydrological impacts and forestry development is not well understood. Where it is agreed that forestry activities are having a major detrimental impact, blame is often laid on the road networks that accompany timber harvesting (including skid trails, landings, drainage, and culverts). Recent slides in BC's southern interior have increased the concern regarding roads (in particular that the annual increase in new road networks is not being offset by the deactivation of unused roads).

Maintaining a supply of high quality water is a high priority for all municipalities in the region. In recognition of this priority, the timber supply analysis classified 6200 hectares as the *Community Watershed Zone*, which includes community watersheds for Lytton (Lytton Creek), Lillooet (Town Creek), Spences Bridge (Murray Creek), and Gold Bridge (Ferguson Creek). More restrictive forest management requirements apply within the Community Watershed Zone. The rate of cut, for example, should be slower than in other watersheds, and cutblocks should be smaller and narrower (to maximize shading). Under the Lillooet TSA Timber Harvesting Guidelines, the Water Management Zone has a maximum cutblock size of 20 hectares and a maximum harvest level of 20 percent. Watershed protection will be addressed in the Forest Practices Code.

For the reasons discussed in previous sub-sections, Scenario Two would be preferred on the grounds of lower likelihood of hydrological impact, with the proviso again that actual impacts would have to be ascertained on a site-specific basis.

8.4 Terrain Stability

Timber harvesting, particularly clear-cutting, and road building can increase the risk of landslides and other forms of mass-wasting on unstable terrain. In addition, poor timber harvesting and road construction, maintenance and deactivation practices can destabilize otherwise stable terrain. The timber supply analysis incorporated reductions to the land base (under "Environmentally Sensitive Areas") for areas prone to excessive site degradation if harvested, due to geological and topographical conditions (including sensitive soils). At an operational level, the intent of the Forest Service is to not permit logging or road building in high-risk areas. This is addressed through the requirements for detailed Terrain Hazard Assessments, as well as through the review of road permits and Pre-Harvest Silvicultural Prescriptions (PHSPs). However, some forestry operations do occur in sensitive areas of the TSA due to the lack of detailed terrain mapping, which has been carried out only in some portions of the TSA. Such mapping will be a requirement under the FPC, which will assist in the protection of terrain stability.

Scenario Two would probably involve a lower likelihood of problems related to terrain stability.

8.5 Road Access

Timber harvesting activity generally requires the construction of roads. The provision of access into areas of the TSA can cause dramatic changes, one of the most obvious being in the type of recreational experience that any given area provides. Road access often increases the number of recreation users, such as snowmobilers, which can disturb wildlife habitat and populations, and can change an area from being a wilderness setting to that where there is increased evidence of the presence of humans. In addition, increased road access can lead to more hunting (and perhaps poaching) in an area, putting additional pressure on wildlife populations. This may require increased regulation and enforcement, to keep the impacts on wildlife to within acceptable limits.

Roads themselves can impose considerable environmental hazards, particularly when they are not constructed, maintained or deactivated to appropriate standards. Poor roads can lead to increased mass wasting, surface erosion, sedimentation of fish creeks and higher rates of water delivery to streams. This can lead to reduced forest productivity, destruction of fish and wildlife habitat, and degraded visual landscapes. Over the last several years there has been a Forest Service initiative to ensure that roads are built, maintained and constructed to appropriate standards. This initiative appears to have been largely successful, and increased emphasis is being placed on identifying problems with old roads. With the Forest Renewal Plan in place, lack of funding has become less of an impediment to dealing with the environmental liability of poor roads. (A recent phenomenon is the increased concern expressed by recreational and mining industry users of roads deactivated to prevent or mitigate environmental impacts.)

Because of the relatively lower level of road construction probably associated with Scenario Two, it would again be preferred on these grounds over Scenario One. This conclusion is subject to the qualification that lower harvest levels do not necessarily imply fewer roads, as the extent of road construction would depend on factors such as the topography of specific operating areas and specific cut-block patterns.

8.6 Visual Quality

To many viewers, the impacts of timber harvesting, in particular clearcutting, are unsightly until there is visually effective green up. In the Lillooet TSA, this issue is managed through the establishment of visual quality objectives that limit the degree of alteration within sensitive viewsapes as well as designing cutblock shape to conform with predominant lines of form. In visually sensitive areas, more stringent green-up requirements have been imposed, which will restrict the volumes of timber that can be harvested from those designated areas. Forest cover requirements for visual quality apply to 7756 hectares in the TSA. As these requirements would apply under both scenarios, there may be little difference between them over the long term. However, the lower harvest rate under Scenario Two would mean that less of the landscape would be affected visually in the first five decades.

As discussed in Section 2.0, there is significant outdoor recreation in the Lillooet TSA. The major interface with forestry activities occurs in terms of the visual aesthetics of the surrounding landscape. Scenario Two would probably be associated with less intrusive impacts on the views of interest to the outdoor recreation sector.

8.7 Summary of Environmental Implications

In summary, Scenario Two, with its more immediate harvest netdown, would be preferred on the grounds of lower environmental risk to wildlife and fish habitat and populations, watersheds, terrain, and visual landscapes, and of preserving more flexibility for future resource management and land use initiatives. This conclusion is qualified by the fact that both scenarios share the same resource management assumptions, and that actual environmental impacts would depend mainly on where and how harvesting would occur. It should also be noted that under Scenario One harvesting would be lower after Year 50 than under Scenario Two, and the long-term level would be reached four decades earlier.

The ultimate reduction in timber harvesting over the later decades under both scenarios would stabilize wildlife population changes, soil erosion, stream sedimentation, and landscape disturbances, but changes in genetic and species diversity would have already occurred.

9.0 Summary and Conclusions

9.1 Report Context

The Lillooet TSA Timber Supply Analysis report indicated that the current AAC of 650 000 m³ was not indefinitely sustainable, and that at some point there would be a transition to the long-term harvest level of 363 000 m³. The timber supply analysis did not consider factors such as removals from the operable land base for new protected areas or the impact of the resource management provisions of the new Forest Practices Code. Any timber volume reductions arising as a result of those processes would be additional to the estimated reduction currently required to achieve long-term harvest sustainability.

This socio-economic assessment report has examined some of the major economic, social, and environmental implications that may be associated with two of the harvest forecast scenarios from the timber supply analysis. These scenarios were chosen to illustrate a range of impacts, and should not be viewed as ones to which the Ministry is predisposed. The following discussion summarizes the implications of lower TSA harvest levels and draws a number of conclusions.

9.2 Summary of Implications

9.2.1 Employment

Significant levels of job loss could occur under both scenarios as the harvest is reduced from the 1993 level of 636 000 m³. These would start immediately under Scenario Two, and after 30 years in Scenario One. While tied to specific scenarios for the purpose of this report, the job impact estimates presented can be extrapolated to a wider range of harvest scenarios.

Direct Employment - Direct employment impacts were estimated based on the profile of direct employment currently supported by timber harvested from the Lillooet TSA. A province-wide total of 986 PY of direct employment was estimated as currently being supported by the 1993 harvest level. Of the total, about 50 percent (483 PY) were estimated to be held by residents of the Lillooet TSA and 50 percent by non-residents. About 40 percent of the TSA-based jobs (197 PY) were in harvesting or silviculture, and about 60 percent (286 PY) were in the processing sector. Of the jobs held by non-TSA residents, about 80 percent (420 PY) were in the wood processing (primarily sawmilling and plywood) and the pulp and paper sectors.

Employment impacts were estimated in proportion to harvest reductions. Employment under Scenario One would remain constant for 30 years, before commencing a gradual decline until the LTHL is reached in Year 90. Under Scenario Two, an immediate annual harvest reduction of 116 000 m³ (18 percent) would result in a direct job loss of 88 TSA-based PY and 180 PY province-wide (including those in the TSA). This would be followed by 80 years of stability. At the LTHL in Year 120, the cumulative harvest reduction of 273 000 m³ (43 percent) would result in the loss of about 200 PY in the TSA and about 420 PY province-wide.

Indirect and Induced Employment - In the TSA, in 1993 there were an estimated 159 PY of indirect/induced employment supported by the Lillooet TSA harvest (mainly in the Lillooet and Lytton areas), and 1476 indirect/induced PY province-wide (including those in the TSA). Scenario One would involve no changes in employment for 30 years. Under Scenario Two, the initial harvest reduction of 116 000 m³ would involve indirect/induced employment losses of about 30 PY in the TSA and 270 PY province-wide. The cumulative reduction of 273 000 m³ (to the LTHL) could produce employment losses of about 70 PY in the TSA and 630 PY province-wide.

Thus, the job loss implications of moving towards the LTHL for the Lillooet TSA could be significant, and the level and timing of harvest reductions are clearly important considerations. Some mitigation could occur through the Forest Renewal Plan, short-term income support measures such as Unemployment Insurance, or through the adjustment strategies of workers and businesses. Employment opportunities may arise related to growth in other sectors, such as tourism and outdoor recreation. It should be noted that forestry employment losses are not a certain outcome, and may be delayed or mitigated, depending on factors such as the availability of alternative sources of wood, the possibilities for increased value-added production, the use of more labour-intensive harvesting techniques, and general conditions in the regional economy. However, many of these areas of employment growth may occur independently of harvest level reductions, and could still represent net losses relative to otherwise higher employment levels.

9.2.2 Communities

Employment losses associated with lower timber harvesting levels would occur mostly in Lillooet and to some extent in Lytton. Under Scenario One, job losses would not occur for thirty years, providing a long lead time for community planning and adjustment. Scenario Two could involve the immediate loss of about 70 jobs in the Lillooet area and about 15 jobs in the Lytton area. These are proportionally estimated impacts, and do not consider possible threshold impacts at local mills. When the local spinoff effect of reduced employee spending is allowed for, these impacts could be approximately a third higher. These estimates are benchmarks only, and actual job impacts would depend on the response of the area's forestry employers. Impacts in the TSA would be greatest in the Lillooet area, as its economy is more forestry-based than that of Lytton.

Elsewhere in BC, the effects of lower Lillooet TSA timber harvests would be more widely dispersed, and therefore most likely of less significance at the community level. The most direct impacts would be related to the J.S Jones mill in Boston Bar and Ainsworth's plywood plant in Savona.

9.2.3 First Nations

The reduced harvest levels under either scenario are consistent with First Nations environmental and wildlife values. First Nations representatives preferred Scenario Two because it immediately reduces the amount of harvesting, which they believe is desirable until land claim issues are settled.

The First Nations community would be negatively affected in economic terms by lower timber harvest levels. Over 35 percent of mill employees in the TSA are members of First Nations, as are several independent contractors involved in harvesting and silviculture activities. Furthermore, several bands are currently seeking and developing forestry -related opportunities to create employment for their members.

9.2.4 Environment

Both scenarios would ultimately involve the harvesting of much of the old growth in the TSA. This would probably lead to a loss of biodiversity and declines in the populations and distributions of wildlife species dependent on old growth, but may be beneficial for relatively adaptable species and species that thrive in early successional forests. Logging roads may lead to greater recreational access, placing pressure on wildlife populations and habitat. Disturbance of the forest floor and lower levels of forest cover could lead to terrain instability and water-related impacts, such as the release of sediment, possibly impairing fish habitats and affecting community water users. Harvesting may also detract from the visual landscape. Many of these impacts would be mitigated by timber harvesting guidelines in place in the TSA and by the Forest Practices Code (which was not incorporated into the timber supply analysis).

Scenario Two, with its immediate harvest netdown, would probably involve lower environmental risk to wildlife and fish habitat and populations, watersheds, terrain, and visual landscapes, and would preserve more flexibility for future resource management and land use initiatives. This conclusion is qualified by the fact that both scenarios share the same resource management assumptions, and that actual environmental impacts would depend mainly on where and how harvesting would occur. It should also be noted that under Scenario One harvesting would be lower after Year 50 than under Scenario Two, and the long-term level would be reached four decades earlier.

9.3 Concluding Remarks

The economies of Lillooet and Lytton depend significantly on the forest industry and would be affected by reductions in TSA harvest levels. Both of the harvest forecast scenarios examined in this report would involve significant employment and income losses in the long-term. Under Scenario One, impacts would be delayed for thirty years, allowing a considerable lead time to plan for adjustment. Under Scenario Two, there would be an immediate harvest reduction followed by a long period of stability. The Forest Renewal Plan, announced in April, 1994 was considered only in a general way in this report, but may assist in offsetting some of these impacts. While the negative economic impacts on the forest sector were quantifiable, the positive impacts of lower

harvesting on the environment were not similarly measurable, and were therefore discussed in a qualitative way.

This analysis has assumed that factors such as the land base, resource management, harvesting and processing technology, and timber prices remain constant. A change in any of these variables - increasingly likely with time - would require a re-examination of the impacts.

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GLOSSARY OF TERMS

Allowable Annual Cut (AAC)	The volume of timber which may be cut from a forest management unit (such as a Timber Supply Area), 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.
Clear-Cutting	A type of silviculture system in which the crop is cleared from an area at one time and an even-aged, replacement stand is established. Clear-cutting is designed so that most of the opening has full light exposure and is not dominated by the canopy of adjacent trees. The minimum size of a clear-cut opening is generally considered to be one hectare.
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, silviculture, and milling).
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.
Forest Practices Code	A package of legislation, regulations, and standards that govern forest practices in British Columbia.
Green-Up Period	The time needed for a stand of trees to reach a desired condition (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.
Hydrology	The science that describes and analyzes the occurrence of water in nature, and its circulation near the surface of the earth.
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.
Multiplier	Ratio of total income or employment impacts relative to direct impacts. Multipliers are greater than 1.0, since 1.0 represents the direct component.

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Not Satisfactorily Restocked (NSR)	Productive forest land that has been denuded and has failed, partially or completely, to regenerate by natural or artificial means.
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 measure of employment representing one full-time job for one year. The length of a work year will depend on the type of job and working conditions that prevail in the area. In this report a PY represents between nine and twelve months of full-time employment. A PY takes into account part-time or seasonal full-time work. For example, if an employee works full-time for six months (half a year), he or she accounts for 0.50 PY of employment. Using person-years allows employment of different duration to be compared on a similar basis. The number of PY will not necessarily equal the number of people working full-time and part-time in an area. In this report, forest sector PY generally equal the number of people employed, with the exception of silvicultural employment, which has a large seasonal and part-time component.
Protected Areas Strategy (PAS)	A process initiated by the government of British Columbia aimed at protecting representative examples of the major ecosystems across the province's ecosections, as well as, special natural, cultural and recreational features. Under the PAS, the provincial government is committed to developing and expanding a protected areas system that will comprise 12 percent of British Columbia. The 12 percent target is applied at the biogeoclimatic level within each ecosection.
Riparian Zone	The land adjacent to the normal high water line in a stream, river, lake, or pond and extending to the portion of land that is influenced by the presence of the adjacent ponded or channelled water. Riparian areas typically exhibit a rich and diverse vegetative mosaic, reflecting the influence of available surface water.
Seral Stage	The series of changes occurring in the ecological succession of a plant community.
Small Business Forest Enterprise Program (SBFEP)	This program permits the Forest Service to sell Crown timber competitively to individuals and corporations who are registered in the SBFEP. Approximately 10 percent of the province's timber allocation is directed towards this program.

APPENDIX A

Snag	A standing dead tree or part of a dead tree from which at least the smaller branches have fallen.
Stand	A community of trees sufficiently uniform in species composition, age, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity.
Tree Farm Licence (TFL)	A stewardship agreement between an individual forest company and the Forest Service that allows the company to occupy and continuously manage the forests of a specified area. The licence includes the right to harvest timber according to plans approved by the Forest Service, and the obligation to carry out all phases of forest management.
Timber Licence (TL)	A type of forest tenure issued in the early 1900s. It includes a right to harvest timber according to plans approved by the Forest Service, and an obligation to reforest. After harvesting, the area is rolled back into either a TSA or TFL.
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.
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.

ECONOMIC IMPACT METHODOLOGY

This appendix provides a detailed explanation of the methods used to estimate the direct, indirect, and induced economic impacts associated with the Lillooet TSA AAC. Both TSA-level and province-wide impacts are discussed.

B.1 Direct Employment and Income Estimates

Estimates of forestry employment and employment income generated by the Lillooet TSA timber harvest are based on information collected from area forest products companies, area contractors, and the Forest Service office in Lillooet, and relate to jobs attributable to the Lillooet TSA harvest volume and not to employment associated with non-TSA wood. The following employment estimates are based on the 1992 TSA harvest volume of approximately 571 000 m³. This information was used to calculate employment coefficients, or measures of jobs per 1000 m³ of timber harvested. These coefficients were used to estimate the employment impacts associated with different timber harvest levels, starting with the 1993 harvest level of 636 000 m³, which is the base year for the tables presented in Section 5 of the report. This approach assumes that changes in harvest levels lead to directly proportional changes in forestry employment. A number of cautionary points related to the interpretation and use of employment coefficients are noted in Section 5. Coefficients for the different categories of direct employment are presented in Tables B.1, B.2, and B.3. The province-wide employment coefficients in Table B.3 are obtained by adding those for the Lillooet TSA and those for outside the TSA.

Incomes shown include cash benefits, such as vacation pay and overtime, but exclude non-cash benefits, such as employer contributions to pension and extended health plans. Before-tax incomes were generally reduced by approximately 15 percent to account for non-cash benefits. In addition, income impacts are calculated and presented on an after-tax basis (government income tax revenues are discussed in Section B.3, below). Non-cash benefits and income taxes were removed in order to provide a measure of the disposable income which is available to circulate in the local economy and which is therefore consistent with the estimation of indirect and induced employment impacts using the multipliers discussed in Section B.2, below. Incomes are presented in \$1993, and have been rounded slightly.

Table B.1 Lillooet TSA - Employment and Income

Sector	TSA Employment Coefficient (PY/000 m ³)	TSA Employment (PY)	TSA Average Income (before-tax \$)	Tax Rate	TSA Average Income (after-tax \$)
Harvesting	0.30	171	\$ 50 000	29%	\$ 35 500
Silviculture	0.01	5	\$ 33 000	23%	\$ 25 400
Processing	0.45	256	\$ 38 000	25%	\$ 28 500
Total	0.76	432	\$ 42 700	27%	\$ 31 200

Table B.2 Outside Lillooet TSA - Employment and Income

Sector	Outside TSA Employment Coefficient (PY/000 m ³)	Outside TSA Employment (PY)	Outside TSA Average Income (before-tax \$)	Tax Rate	Outside TSA Average Income (after-tax \$)
Harvesting	0.05	29	\$ 50 000	29%	\$ 35 500
Silviculture	0.08	46	\$ 33 000	23%	\$ 25 400
Wood Processing	0.49	280	\$ 44 800	28%	\$ 32 300
Pulp and Paper	0.17	97	\$ 45 600	28%	\$ 32 800

Table B.3 Provincial Employment and Employment Income

Sector	Provincial Employment Coefficient (PY/000 m ³)	Provincial Employment (PY)	Provincial Average Income (before-tax \$)	Tax Rate	Provincial Average Income (after-tax \$)
Harvesting	0.35	200	\$ 50 000	29%	\$ 35 500
Silviculture	0.09	51	\$ 33 000	23%	\$ 25 400
Wood Processing	0.94	536	\$ 41 500	27%	\$ 30 300
Pulp and Paper	0.17	97	\$ 45 600	28%	\$ 32 800
Total	1.55	884	\$ 43 400	27%	\$ 31 700

Harvesting

Harvesting includes logging, log hauling, road building and maintenance contractors, and company woodlands personnel. Most of the contractors for TSA's mills were residents of Lillooet or Lytton. Harvesting contractors to J. S. Jones generally reside outside the TSA. A pre-tax annual income of \$50 000 was used, based on information provided by licensees and contractors.

Silviculture

Silviculture includes forestry services, field assessments, site preparation, planting, stand tending and improvement activities. On the basis of discussions with the licensees, most silvicultural employees reside outside the TSA. The average pre-tax silviculture wage of \$33 000 was obtained from Statistics Canada sources and verified through discussions with silviculture companies and the BC Forest Service.

Wood Processing

The TSA's wood processing sector includes Ainsworth's lumber mill and veneer plant (Lillooet), Bridgeside Higa's remanufacturing operation (Lillooet), and Lytton Lumber's mill (Lytton). The Lillooet TSA-related employment of 256 PY was estimated by multiplying each mill's total employment by the proportion of its 1992 input provided by Lillooet TSA. The average pre-tax processing income of \$38 000 was based on information obtained from company representatives.

The Lillooet TSA harvest also supported approximately 280 PY of wood processing employment outside the TSA in 1992. This included employment at the J.S. Jones Ltd. lumber mill in Boston Bar, Ainsworth's plywood plant at Savona, and other plywood and wood processing facilities in BC. The average before-tax income of \$44 800 was obtained by taking an employment-weighted average of the incomes reported by J.S. Jones and (for other processing facilities) Price Waterhouse (*The Forest Industry in British Columbia - 1993*).

Pulp and Paper

Lillooet TSA timber supports employment at pulp and paper mills which use chips made from the TSA's wood. Based on chip production of 42.8 MBDU at Ainsworth's Lillooet plant, 10.0 MBDU at Lytton Lumber, and 12.9 MBDU at J. S. Jones (the prorated Lillooet TSA share), and an average coastal pulp and paper employment coefficient of 1.3 PY per MBDU, 85 PY of employment would be supported at BC pulp and paper mills. A further 12 PY were estimated to be attributable to TSA harvest volumes not specifically tracked, for a total of 97 PY.

A pre-tax income of \$45 600 was used. This was obtained from the BC average gross annual income for pulp and paper reported in the Price Waterhouse report *The Forest Industry in British Columbia - 1993* (reduced by an assumed 20 percent non-cash benefits margin).

BC Forest Service

There is additional forestry-related employment of approximately 46 PY at the Lillooet Forest District office. In addition, there are 10 PY at the Kamloops Forest Region office related to the Lillooet TSA (estimated by multiplying the Kamloops Forest Region's total of about 125 PY by the approximately eight percent Lillooet TSA share of the Kamloops Region's total harvest volume).

Forest Service employment was presented for profiling purposes only. Due to the broad management and stewardship role of the Forest Service, no direct relationship can reasonably be established with harvest levels. For example, the Forest Service has an increasing workload related to planning and the balancing of timber and non-timber resource values. For this reason, Forest Service employment is not included in the impact analysis presented in this report.

B.2 Indirect and Induced Impacts

In addition to the direct forest sector employment associated with the Lillooet TSA harvest, there is also indirect and induced employment that was estimated using employment ratios, or multipliers. Indirect employment is generated by forest company spending on goods and services. Induced employment is generated through the spending of direct and indirect employment income, for example in local retail outlets. The estimation of indirect and induced employment in the Lillooet TSA, and in the province as a whole, is discussed below.

B.2.1 Lillooet TSA

For the Lillooet TSA, indirect and induced employment and income were calculated using employment ratios developed by the Ministry of Finance and Corporate Relations.⁴¹ The indirect component was also estimated by Price Waterhouse through surveys of the local transportation and forest industry supply sectors. These survey-based estimates correspond closely to the estimates arrived at below using the employment ratios. (The survey of suppliers is discussed in Appendix C.)

The indirect/induced employment ratios developed by the Ministry of Finance and Corporate Relations for the Lillooet TSA are shown in Table B.4.

Table B.4 Lillooet TSA Employment Ratios

	No Migration	Migration
Logging and Silviculture	1.27	1.41
Wood Processing	1.16	1.28

These ratios show the potential impact of the gain or loss of one job in local forestry sector. Two types of ratios were developed. In the *No Migration (With Safety Net)* case, when jobs are lost it is assumed that everyone who becomes unemployed stays in the area (that is, they do not migrate) and receives unemployment insurance benefits (the "safety net"). This is most appropriate for looking at immediate and short-term impacts, since unemployment insurance benefits can currently be claimed for a maximum of 50 weeks in the Lillooet area.

The ratios in the *Migration (No Safety Net)* case assume that all those who have lost their jobs leave the area - they migrate and do not use the local safety net. It is reasonable to assume that as time goes by there would be a tendency for the cumulative effects of a drop in local employment to move towards the *Migration* case. However, long-run impacts could in fact be underestimated even under this scenario if alternative sources of income do not occur and if public sector activity in the region is reduced due to emigration and reduced government revenue.

This SEA uses the *Migration (No Safety Net)* employment ratios because the impact analysis covers a period of decades. This will tend to overstate the impacts in the first two years following the loss of jobs, due to the availability of unemployment insurance and social assistance programs. These would provide some income to those who lose their jobs, as well as maintaining some level of re-spending and induced employment in the community. These employment ratios indicate, for example, that the loss of one direct logging (harvesting) job in the Lillooet TSA would also involve the loss of an estimated 0.41 local indirect/induced jobs.

The steps in arriving at TSA level indirect/induced employment and employment income associated with the 1992 harvest level of 571 000 m³ are shown below.

⁴¹ From Horne, Garry and Charlotte Powell, The Forest District Tables, Analysis and Evaluation Branch, BC Ministry of Finance and Corporate Relations, March, 1995.

APPENDIX B

Step 1 The information in the following table is the Lillooet TSA forest industry survey data collected for this study.

Sector	TSA Employment Coefficient (PYs/000 m ³)	TSA Employment (PYs)	TSA Average Income (before-tax \$)	Tax Rate	TSA Average Income (after-tax \$)
Harvesting (Logging)	0.30	171	\$ 50 000	29%	\$ 35 500
Silviculture	0.01	5	\$ 33 000	23%	\$ 25 400
Wood Processing	0.45	256	\$ 38 000	25%	\$ 28 500
Total	0.76	432	\$ 42 700	27%	\$ 31 200

Step 2 Use the *Migration (No Safety Net)* employment ratios to calculate indirect/induced employment of 144 PY.

Sector	Direct Employment (PY)	Indirect/Induced Employment Ratio	Indir/Induced Employment (PY)	Indir/Induced Income (before-tax \$)	Indir/Induced Income (after-tax \$)
Logging and Silviculture	176	0.41	72		
Wood Processing	256	0.28	72		
Total	432	0.33	144	\$ 23 700	\$ 19 200

Step 3 Calculate after-tax employment income by multiplying the number of PY in each category by the appropriate after-tax income level. For example, direct income for wood processing (\$7 296 000) is calculated by multiplying 256 PY by the after-tax income level of \$28 500. The indirect/induced income levels are based on information provided by the Ministry of Finance and Corporate Relations.

Sector	Direct Income (after-tax \$)
Harvesting	\$ 6 070 500
Silviculture	\$ 127 000
Wood Processing	\$ 7 296 000
Direct Income	\$ 13 493 500
Indirect/Induced Income	\$ 2 764 800
Total Employment Income	\$ 16 258 300

Step 4 This employment and income information is then used to develop harvest-related coefficients for estimating employment and income levels associated with the Lillooet TSA timber harvest forecasts. These coefficients indicate employment and income levels per 1 000 m³ of timber harvested. For example, the direct employment coefficient (0.76 PY per 1 000 m³) is determined by dividing direct employment (432 PY) by the 1992 harvest level (571 000 m³). The income coefficients shown below have been slightly rounded.

Information for calculating TSA employment and income impacts for Lillooet TSA harvest forecasts	
TSA direct employment coefficient (PY/000 m ³)	0.76
TSA indirect/induced employment coefficient (PY/000 m ³)	0.25
TSA direct after-tax income coefficient (\$/000 m ³)	\$ 23 600
TSA indirect/induced after-tax income coefficient (\$/000 m ³)	\$ 4 840

These coefficients were applied to the 1993 harvest level and to the Scenario One and Scenario Two harvest forecasts to calculate the impacts shown in Section 5. It should be noted that these coefficients could be applied to a wider range of harvest scenarios, such as those presented in the Timber Supply Analysis report (and the addendum).

B.2.2 Provincial Impacts

The procedure for estimating provincial impacts is outlined below. These include impacts occurring in the TSA.

Step 1 The information in the following table is forest industry survey data collected for this study. The province-wide information is obtained by combining the information for the TSA and non-TSA areas.

Table B.3 Provincial Employment and Employment Income

Sector	Provincial Employment Coefficient (PY/000 m ³)	Provincial Employment (PY)	Provincial Average Income (before-tax \$)	Tax Rate	Provincial Average Income (after-tax \$)
Harvesting	0.35	200	\$ 50 000	29%	\$ 35 500
Silviculture	0.09	51	\$ 33 000	23%	\$ 25 400
Wood Processing	0.94	536	\$ 41 500	27%	\$ 30 300
Pulp and Paper	0.17	97	\$ 45 600	28%	\$ 32 800
Total	1.55	884	\$ 43 400	27%	\$ 31 700

Step 2 Estimate total provincial employment and employment income. Determining indirect and induced impacts at the provincial level involves the application of a provincial employment multiplier of 2.5, which implies that each direct job in the forest sector is associated with 1.5 indirect and induced jobs. This multiplier is used by the Ministry of Forests and is based on a review of studies outlining the impacts of the forest sector on the BC economy.

Indirect/induced employment at the provincial level (1326 PY) is calculated by multiplying direct employment (884 PY) by 1.5, which is the indirect/induced component of the multiplier. The indirect/induced before-tax income level of \$28 600 is an employment-weighted average of the \$23 700 used for the TSA and \$29 178, which is based on 1993 BC average before-tax weekly earnings (Source: Statistics Canada, Catalogue No. 72 -002), used for non-TSA indirect/induced employment. Provincial income is calculated by multiplying employment in each sector by the appropriate income level. For example, after-tax direct income (\$28 022 800) is estimated by multiplying direct employment (884 PY) by after-tax direct income (\$31 700).

Current After-Tax Incomes			
Sector	Income (before-tax \$)	Tax Rate	Income (after-tax \$)
Direct	\$ 43 400	0.27	\$ 31 700
Indirect/Induced	\$ 28 600	0.21	\$ 22 600

Employment (PY)	
Direct	884
Indirect/Induced	1326
Total	2 210
Income (After-Tax \$)	
Direct	\$ 28 022 800
Indirect/Induced	\$ 29 967 600
Total	\$ 57 990 400

Step 3 The figures presented above are the estimated provincial employment and income levels associated with the 1992 Lillooet TSA timber harvest (571 000 m³). This information is used to develop coefficients for estimating employment and income levels associated with the Lillooet TSA harvest forecasts. The coefficients indicate employment and income levels per 1000 m³ of timber harvested. For example, the direct employment coefficient (1.55 PY per 1000 m³) is determined by dividing direct employment (884 PY) by the 1992 harvest level (571 000 m³).

Information for calculating provincial employment and income impacts for Lillooet TSA harvest forecasts	
Provincial direct employment coefficient (PY/000 m ³)	1.55
Provincial indirect/induced employment coefficient (PY/000 m ³)	2.32
Provincial direct after-tax income coefficient (\$/000 m ³)	\$ 49 080
Provincial indirect/induced after-tax income coefficient (\$/000 m ³)	\$ 52 480

Applying these coefficients to the 1993 harvest level of 636 000 m³ and to the forecast timber harvest levels results in the estimates presented in Section 5 of the report. As at the TSA level, these coefficients could also be applied to a wider range of timber harvest forecasts than those examined in this report.

B.3 Government Revenue Impacts

The report estimates the impacts of timber harvest changes on BC and federal government revenues. These impacts are made up of the following components.

Personal Income Tax: The BC government receives about a third of the personal income tax revenues collected in BC, with about two-thirds going to the federal government. Impacts on personal income tax revenues were calculated by taking the difference between the before-tax and after-tax incomes for each category of employment and multiplying this by the number of PY in each category. Harvest-related coefficients for BC and federal personal income tax were calculated by dividing estimated revenues by the 1992 harvest level of 571 000 m³.

Stumpage, Rent, and Fees: Annual stumpage was calculated at a rate \$15.14/m³ (Source: Valuation Branch, Ministry of Forests). This is a weighted average of 1994 stumpage rates on licensee and SBFEP wood for the Lillooet Forest District (discounted to \$1993 using the 1994 BC Consumer Price Index of 2.0 percent). Provincial rent and other fees comprised an additional \$0.57/m³, for a total of \$15.71/m³ (Source: *The Economic Impacts of Timber Harvesting in British Columbia*, Economics and Trade Branch, Ministry of Forests, 1994).

Other Taxes: Other provincial taxes, including taxes on corporations, logging, property, sales, and electricity, were calculated using an estimate of \$5.94/m³. Other federal taxes, such as corporate income tax, sales and excise taxes, and withholding taxes, were estimated at \$0.91/m³. (Source: *The Economic Impacts of Timber Harvesting in British Columbia*).

This information, summarized in the following table, was used in Section 5 to estimate BC and federal government revenues.

Information for calculating government revenue impacts for Lillooet TSA harvest forecasts	
BC Personal Income Tax coefficient (\$/000 m ³)	\$ 10 680
BC Stumpage, Rent and Fees coefficient (\$/000 m ³)	\$ 15 710
Other BC Forest Sector Taxes coefficient (\$/000 m ³)	\$ 5 940
Federal Personal Income Tax coefficient (\$/000 m ³)	\$ 21 360
Other Federal Taxes coefficient (\$/000 m ³)	\$ 910

As with the employment and income coefficients, these may be applied to harvest scenarios other than those examined in this report.

RESULTS OF SUPPLIERS ANALYSIS FOR THE LILLOOET TSA

Price Waterhouse contacted various large suppliers in the area to determine the extent to which their revenue and employment were directly linked to the Lillooet TSA forest industry.

The following table of results is based on successful contacts with 21 suppliers.

Table C.1 Lillooet TSA Forestry Supply Sector Employment

Total Number of Person Years (PY) of Employment	110
Total Number of Part-Time Employees	10
Total Person Year Equivalent Employment ⁽¹⁾	113
Percentage of Revenue Directly Attributable to the Forest Industry	35%
Total Number of PY Related to the Forest Industry ⁽²⁾	39

Notes:

- (1) Total employment was calculated by adding total full-time employment to one-third of the total part-time employment. Therefore, three part-time positions were considered to be equivalent to one full-time position. This 3:1 ratio was an arbitrary decision.
- (2) The number of PY is an aggregation of the number of PY-equivalent positions for each company multiplied by the proportion of its revenue directly attributable to the Lillooet TSA forest industry.

List of 21 Suppliers based in the Lillooet TSA

Alpine Contracting	Hotel Victoria
Auto Marine Electric	Kal Tire
Big O Tire	Kipper's Towing
Capitol Tractors	Lillooet Glass & Tire
Cariboo Plumbing	Lytton Hotel
DDM Transport Services	Lytton Junction Restaurant
Direct Electric	Lytton Supplies
4 Pines Motel	Multi-Line Cleaners
Garibaldi Building Supplies	Tri-B Concrete
Gold Bridge Hotel	Week's Contracting (Dump Truck Hauling)
Guy's Contracting	

LILLOOET TSA AND PROVINCIAL INCREMENTAL ECONOMIC IMPACTS

This appendix presents the incremental changes in employment, income, and government revenues that would occur under Scenario One and Scenario Two. The incremental change shown for each time period represents the change from the previous period. For example, incremental changes shown for Year 0 under Scenario One represent changes from 1993 levels. Provincial impacts include those in the Lillooet TSA.

D.1 Lillooet TSA Incremental Economic Impacts

Table D.1 Scenario One: Lillooet TSA Incremental Impacts

Year	Harvest (<i>'000 m³/year</i>)	Employment			Income		
		Direct (<i>PY</i>)	Indirect/ Induced (<i>PY</i>)	Total (<i>PY</i>)	Direct (<i>\$1993 mil.</i>)	Indirect/ Induced (<i>\$1993 mil.</i>)	Total (<i>\$1993 mil.</i>)
1993	636	483	159	642	\$ 15.0	\$ 3.1	\$ 18.1
0	14	11	4	15	\$ 0.3	\$ 0.0	\$ 0.3
10 - 29	0	0	0	0	\$ 0.0	\$ 0.0	\$ 0.0
30	-52	-40	-13	-53	-\$ 1.2	-\$ 0.2	-\$ 1.4
40	-48	-36	-12	-48	-\$ 1.1	-\$ 0.2	-\$ 1.3
50	-44	-33	-11	-44	-\$ 1.1	-\$ 0.3	-\$ 1.4
60	-40	-31	-10	-41	-\$ 0.9	-\$ 0.1	-\$ 1.0
70	-38	-29	-10	-39	-\$ 0.9	-\$ 0.2	-\$ 1.1
80	-34	-26	-8	-34	-\$ 0.8	-\$ 0.2	-\$ 1.0
90 - 200	-31	-23	-8	-31	-\$ 0.7	-\$ 0.1	-\$ 0.8

Table D.2 Scenario Two: Lillooet TSA Incremental Impacts

Year	Harvest (<i>'000 m³/year</i>)	Employment			Income		
		Direct (<i>PY</i>)	Indirect/ Induced (<i>PY</i>)	Total (<i>PY</i>)	Direct (<i>\$1993 mil.</i>)	Indirect/ Induced (<i>\$1993 mil.</i>)	Total (<i>\$1993 mil.</i>)
1993	636	483	159	642	\$ 15.0	\$ 3.1	\$ 18.1
0	-116	-88	-29	-117	-\$ 2.7	-\$ 0.6	-\$ 3.3
10 - 79	0	0	0	0	\$ 0.0	\$ 0.0	\$ 0.0
80	-42	-32	-10	-42	-\$ 1.0	-\$ 0.2	-\$ 1.2
90	-38	-29	-10	-39	-\$ 0.9	-\$ 0.2	-\$ 1.1
100	-35	-26	-9	-35	-\$ 0.8	-\$ 0.1	-\$ 0.9
110	-33	-25	-8	-33	-\$ 0.8	-\$ 0.2	-\$ 1.0
120 - 200	-9	-7	-2	-9	-\$ 0.2	\$ 0.0	-\$ 0.2

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D.2 Provincial Incremental Economic Impacts

Table D.3 Scenario One: Provincial Incremental Impacts

Year	Harvest (<i>'000 m³/year</i>)	Employment			Income		
		Direct (PY)	Indirect/ Induced (PY)	Total (PY)	Direct (\$1993 mil.)	Indirect/ Induced (\$1993 mil.)	Total (\$1993 mil.)
1993	636	986	1476	2462	\$ 31.2	\$ 33.4	\$ 64.6
0	14	22	32	54	\$ 0.7	\$ 0.7	\$ 1.4
10 -29	0	0	0	0	\$ 0.0	\$ 0.0	\$ 0.0
30	-52	-81	-121	-202	-\$ 2.6	-\$ 2.7	-\$ 5.3
40	-48	-74	-111	-185	-\$ 2.3	-\$ 2.5	-\$ 4.8
50	-44	-69	-102	-171	-\$ 2.2	-\$ 2.3	-\$ 4.5
60	-40	-62	-93	-155	-\$ 1.9	-\$ 2.1	-\$ 4.0
70	-38	-59	-88	-147	-\$ 1.9	-\$ 2.0	-\$ 3.9
80	-34	-52	-79	-131	-\$ 1.7	-\$ 1.8	-\$ 3.5
90 - 200	-31	-48	-72	-120	-\$ 1.5	-\$ 1.6	-\$ 3.1

Table D.4 Scenario Two: Provincial Incremental Impacts

Year	Harvest (<i>'000 m³/year</i>)	Employment			Income		
		Direct (PY)	Indirect/ Induced (PY)	Total (PY)	Direct (\$1993 mil.)	Indirect/ Induced (\$1993 mil.)	Total (\$1993 mil.)
1993	636	986	1476	2462	\$ 31.2	\$ 33.4	\$ 64.6
0	-116	-180	-270	-450	-\$ 5.7	-\$ 6.1	-\$ 11.8
10-79	0	0	0	0	\$ 0.0	\$ 0.0	\$ 0.0
80	-42	-65	-97	-162	-\$ 2.0	-\$ 2.2	-\$ 4.2
90	-38	-59	-88	-147	-\$ 1.9	-\$ 2.0	-\$ 3.9
100	-35	-54	-81	-135	-\$ 1.7	-\$ 1.8	-\$ 3.5
110	-33	-50	-75	-125	-\$ 1.6	-\$ 1.7	-\$ 3.3
120 - 200	-9	-15	-23	-38	-\$ 0.5	-\$ 0.5	-\$ 1.0

D.3 Government Revenues - Incremental Impacts

Table D.5 Scenario One: Incremental Government Revenue Impacts

Year	Harvest	BC Government Revenues				Federal Government Revenues		
		Stumpage, Rent & Fees	Other Forestry Taxes	Personal Income Tax	BC Total	Personal Income Tax	Other Federal Taxes	Federal Total
	(<i>'000 m³/year</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)
1993	636	\$ 10.0	\$ 3.8	\$ 6.8	\$ 20.6	\$ 13.6	\$ 0.6	\$ 14.2
0	14	\$ 0.2	\$ 0.1	\$ 0.1	\$ 0.4	\$ 0.3	\$ 0.0	\$ 0.3
10 - 29	0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0
30	-52	-\$ 0.8	-\$ 0.3	-\$ 0.5	-\$ 1.6	-\$ 1.1	-\$ 0.1	-\$ 1.2
40	-48	-\$ 0.8	-\$ 0.3	-\$ 0.5	-\$ 1.6	-\$ 1.1	\$ 0.0	-\$ 1.1
50	-44	-\$ 0.7	-\$ 0.3	-\$ 0.5	-\$ 1.5	-\$ 0.9	\$ 0.0	-\$ 0.9
60	-40	-\$ 0.6	-\$ 0.2	-\$ 0.4	-\$ 1.2	-\$ 0.8	-\$ 0.1	-\$ 0.9
70	-38	-\$ 0.6	-\$ 0.3	-\$ 0.4	-\$ 1.3	-\$ 0.9	\$ 0.0	-\$ 0.9
80	-34	-\$ 0.5	-\$ 0.2	-\$ 0.4	-\$ 1.1	-\$ 0.7	\$ 0.0	-\$ 0.7
90 - 200	-31	-\$ 0.5	-\$ 0.1	-\$ 0.3	-\$ 0.9	-\$ 0.6	-\$ 0.1	-\$ 0.7

Table D.6 Scenario Two: Incremental Government Revenue Impacts

	Harvest	BC Government Revenues				Federal Government Revenues		
		Stumpage, Rent & Fees	Other Forestry Taxes	Personal Income Tax	BC Total	Personal Income Tax	Other Federal Taxes	Federal Total
	(<i>'000 m³/year</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)	(<i>\$1993 mil.</i>)
1993	636	\$ 10.0	\$ 3.8	\$ 6.8	\$ 20.6	\$ 13.6	\$ 0.6	\$ 14.2
0	-116	-\$ 1.8	-\$ 0.7	-\$ 1.2	-\$ 3.7	-\$ 2.5	-\$ 0.1	-\$ 2.6
10 - 79	0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0	\$ 0.0
80	-42	-\$ 0.7	-\$ 0.3	-\$ 0.5	-\$ 1.5	-\$ 0.9	-\$ 0.1	-\$ 1.0
90	-38	-\$ 0.6	-\$ 0.2	-\$ 0.4	-\$ 1.2	-\$ 0.8	\$ 0.0	-\$ 0.8
100	-35	-\$ 0.5	-\$ 0.2	-\$ 0.4	-\$ 1.1	-\$ 0.7	\$ 0.0	-\$ 0.7
110	-33	-\$ 0.6	-\$ 0.2	-\$ 0.3	-\$ 1.1	-\$ 0.8	-\$ 0.1	-\$ 0.9
120 - 200	-9	-\$ 0.1	\$ 0.0	-\$ 0.1	-\$ 0.2	-\$ 0.1	\$ 0.0	-\$ 0.1

RED AND BLUE LISTED SPECIES IN THE LILLOOET TSA

The BC Ministry of Environment, Lands and Parks (MELP) has distinguished two groups of wildlife species that it considers "at risk" in BC. *Red list* species are considered to be currently or potentially endangered or at risk of extirpation in BC. *Blue list* species are at less risk, but are still considered to be vulnerable. The following tables indicate the Red and Blue list wildlife species found in the Lillooet TSA, as compiled by MELP's Conservation Data Centre.

Red Listed Species (1994) for the Lillooet TSA

AMPHIBIANS

(none)

BIRDS

prairie falcon
spotted owl

REPTILES

(none)

FISH

(none)

MAMMALS

pallid bat

Blue Listed Species (1994) for the Lillooet TSA

AMPHIBIANS

(none)

BIRDS

white-throated swift
great blue heron
short-eared owl
American bittern
Swainson's hawk
turkey vulture
bald eagle
Lewis' woodpecker
long-billed curlew
flamulated owl
Williamson's sapsucker, thyroideus subspecies

REPTILES

rubber boa
western rattlesnake
Great Basin gopher snake

FISH

(none)

MAMMALS

spotted bat
wolverine, luscus subspecies
fisher
western small-footed myotis
fringed myotis
California bighorn sheep
Rocky Mountain bighorn sheep
badger
grizzly bear

LIST OF CONTACTS

Gus Abel, Owner/Operator
Tyax Mountain Lake Resort,
Tyaughton Lake, BC

Arnold Adolph, Regional Economic
Development Officer (Ashcroft)
Ministry of Small Business, Tourism and Culture
Ashcroft, BC

Keith Blom, Operation Manager, Harvesting
Lillooet Forest District
Ministry of Forests
Lillooet, BC

Kevan Bracewell
Chilcotin Holidays
Gold Bridge, BC

Larry Casper
Natural Resources Development Coordinator
(formerly Economic Development Officer)
Lillooet Tribal Council
Lillooet, BC

Pat Corbett
Cariboo Tourist Association
108 Mile Ranch, BC

Joe Chute
Mayor of Lytton
Lytton, BC

Rino Elverhoy, Economic Development Officer
Thompson-Nicola Regional District
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Richard Enns, Manager
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Ron Friesen, Woodlands Manager,
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APPENDIX F

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