

**Dawson Creek Timber Supply Area  
Socio-Economic Analysis**

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## Executive Summary

### Introduction

- The Dawson Creek Timber Supply Area (TSA) is one of six TSAs in the Prince George Forest Region. The Dawson Creek TSA (2 278 000 ha) covers approximately 63 percent of the Dawson Creek Forest District (3 595 311 ha), with the remainder made up by TFL #48, parks and private land.
- This report focuses on the revised coniferous base harvest forecast from the *Dawson Creek Timber Supply Analysis Addendum* report included as an appendix in the discussion paper. It also focuses on the relevant parts of the original *Timber Supply Analysis* report, and on the current deciduous operations in the TSA.

### Methodology

- The socio-economic implications associated with coniferous and deciduous operations are identified in this report. The coniferous base harvest forecast and the deciduous operations are assessed within a “multiple-account” framework. Impacts of five accounts are reviewed within this framework, two accounts are quantitative in nature (employment and government revenues), while the other three (community, First Nations and environmental) are qualitative.

### Socio-Economic Profile

- The Dawson Creek TSA has a population of approximately 28 880 (1991), of which, 18 142 (63 percent) live in the communities of Dawson Creek, Tumbler Ridge and Chetwynd. Other communities in the TSA include Hudson’s Hope, Pouce Coupe, Kelly Lake and Moberly Lake.
- The TSA First Nations communities of Saulteau and West Moberly Lake are affiliated with the Treaty 8 Tribal Association. Kelly Lake is a Metis community in the process of becoming a member of the Treaty 8 Tribal Association.
- Mining is the largest single component of the area labour force, with forestry, agriculture, and oil and gas exploration being the other primary labour force components.

### Environmental Setting

- The biophysical components of the TSA include several ecosystems, important aquatic systems, and a variety of plant and wildlife. The TSA represents five ecosections and provides habitat for many extremely rare (S1 ranking) and rare (S2 ranking) plants and animals (see Table 3-1 and Table 3-2).
- The environmental setting also includes the TSA’s many recreational opportunities and parks. It is estimated that at least 394 844 recreation user-days (RUDs) are spent in the TSA annually.

### Current Forestry Operations

- Approximately 65 percent (1 478 839 ha) of the Dawson Creek TSA is managed by the Forest Service as productive forest. As indicated in the Analysis Addendum report, approximately 35 percent (791 675 ha) is considered to contribute to the long-term timber harvesting land base.
- The current aggregate allocated allowable annual cut (AAC) for the coniferous and deciduous

species in the TSA is 1 826 323 cubic metres.

- The allocated coniferous AAC is 691 323 cubic metres. There is an additional 150 000 cubic metres of coniferous AAC which has not been allocated and is therefore not being harvested.
- The deciduous AAC is 985 000 cubic metres and is apportioned to two pulpwood agreements and the Small Business Forest Enterprise Program. Since these agreements stipulate that holders must first purchase all available suitable fibre from other sources, the full apportionment is not expected to be harvested from Crown lands.

### **Coniferous Operations**

- Two major coniferous licensees, Canadian Forest Products Ltd. and West Fraser Timber Co. Ltd., operate processing facilities within the TSA. The TSA also has several smaller processors.
- Fibre flows in the Dawson Creek TSA are complicated. Crown land provides approximately 71 percent of the fibre required by the two major licensees' sawmills in Chetwynd. The remaining fibre is sourced from private lands and from out of the province.
- This report assesses the revised coniferous base harvest forecast as described in the *Dawson Creek TSA Timber Supply Analysis Addendum*. In this forecast, the coniferous harvest level increases immediately to approximately 972 000 cubic metres annually, and is sustained at that level indefinitely.
- Currently only 691 323 cubic metres of the coniferous AAC has been apportioned and is being harvested. Therefore, the revised coniferous base harvest forecast represents a 40.6 percent (280 677 cubic metre) increase in the annual harvest level.
- Approximately 75 percent, or 470 person years (PY) of the 629 PY of direct forestry employment derived from the current Dawson Creek TSA AAC accrues to Dawson Creek TSA residents.
- Under the revised base harvest forecast, increasing the harvest level to 972 000 cubic metres could create an additional 191 PY of TSA direct forestry employment. At the provincial level, direct forestry employment could increase by 256 PY.
- The addition of indirect and induced employment associated with the current harvest results in total provincial employment of approximately 1576 PY. The revised base harvest forecast supports total provincial employment of approximately 2217 PY.
- Harvesting at the revised base harvest level would increase annual TSA-level direct employment income by \$6.2 million, to \$21.4 million. Total provincial employment income would increase by approximately \$15.5 million to total \$56.8 million.
- The increase in the harvest level under the revised base harvest forecast would increase government revenues from approximately \$17.4 million, at a harvest of 691 323 cubic metres, to \$24.1 million at the 972 000 cubic metre harvest level.

### **Deciduous Operations**

- Louisiana-Pacific is a major U.S. forest products company with two processing facilities in the Dawson Creek TSA and three processing facilities elsewhere in Canada. Each of the Pulpwood Agreements (10 and 13) issued to Louisiana-Pacific authorize the harvest of 452 000 cubic metres per year. This represents 92 percent of the deciduous AAC.
- Louisiana-Pacific Canada Ltd. is the only deciduous processor in the TSA and relies on Crown and private sources to meet its processing volume requirements. Pulpwood Agreements 10 and 13 supplied 16.4 percent of Louisiana-Pacific's fibre in 1993. Other Crown lands supplied a further 20.1 percent, while the remainder came from private lands in B.C. and Alberta.
- Since the deciduous harvest from Crown land under pulpwood agreements is variable, only the economic levels associated with the current expected level (955 000 cubic metres) of processing are presented. Further, employment and employment income levels associated with all sources of timber (not just TSA) are presented.
- Dawson Creek TSA residents provide approximately 97 percent of the 764 PY of the direct forestry employment associated with the two deciduous processing facilities in the TSA. With the addition of indirect and induced employment, total provincial employment associated with deciduous processing is approximately 1910 PY.
- Annual government revenues associated with the harvesting and processing of 955 000 cubic metres of deciduous Crown timber are approximately \$11.9 million.
- The *Dawson Creek TSA Timber Supply Analysis Addendum*, included as an appendix in the discussion paper, reports a significant change in the aspen timber supply, compared to that in the original timber supply analysis report.

### **Social and Environmental Implications**

- The base harvest forecast would increase the AAC for the coniferous harvest. However, it is difficult to determine the implications of this scenario for TSA communities since it is not known who would harvest the timber and where it would be processed.
- The Treaty 8 Tribal Association has advised the Ministry of Forests that in the absence of a mutually acceptable consultation process, specific comments on the Timber Supply Review process or any particular scenario would be premature. The proposed rate of harvesting under the coniferous base harvest forecast and the expected deciduous level may lead to the realization of Kelly Lake community members desires to become more involved in harvesting, fire suppression and silviculture activities.
- Environmental concerns associated with forestry stem from road impacts, access, water quality, habitat alterations, and community concerns over recreation and visual quality.
- However, the most pressing environmental concern comes from the cumulative impacts of several sectors (*i.e.*, agriculture, mining, oil and gas exploration and development, and forestry).

<b>Table ES-1 Summary of Local and Provincial Economic Impacts: Current Coniferous Harvest, Base Harvest Forecast and Deciduous Processing</b>						
Impact Account  (By Decade)	Current Coniferous Harvest		Revised Base Harvest Forecast		Expected Deciduous Processing	
	TSA	Provincial	TSA	Provincial	Forest District	Provincial
<b>Employment and Employment Income Harvest Level (m<sup>3</sup>/year)</b>	691 323	691 323	972 000	972 000	955 000	955 000
Direct Employment (PY/year)	470	629	661	885	745	764
Total Employment (PY/year)	650	1576	914	2217	1098	1910
Direct After-Tax Income (\$1993 millions/year)	\$15.2	\$20.8	\$21.4	\$29.2	\$25.3	\$26.0
Total Income (\$1993 millions/year)	\$19.0	\$40.5	\$26.7	\$56.8	\$32.6	\$49.9
<b>Government Revenues: Decade One</b>						
Total Revenues (\$1993 millions/year)		\$17.4		\$24.1		\$11.9
<b>Summary of Social and Environmental Implications: Base Harvest Forecast and Expected Deciduous Processing</b>						
<b>Community</b>						
<ul style="list-style-type: none"> <li>The base harvest forecast would increase the rate of coniferous harvest; however, it is difficult to determine the implications of this scenario for specific communities in the TSA.</li> <li>Due to the uncertain nature of the deciduous fibre supply, there is concern that there could be a curtailment at deciduous processing facilities. Louisiana-Pacific management is concerned a lengthy closure could result in the loss of skilled tradesmen and other key staff.</li> </ul>						
<b>First Nations</b>						
<ul style="list-style-type: none"> <li>The Treaty 8 Tribal Association has advised the Ministry of Forests that, in the absence of a mutually acceptable consultation process, specific comments on the Timber Supply Review process or any particular scenario would be premature.</li> <li>In general however, three main areas of concern with respect to forestry activities are: economic and cultural impacts, environmental impacts and policy and administrative problems.</li> </ul>						
<b>Environmental Considerations and Impacts</b>						
<ul style="list-style-type: none"> <li>From an environmental perspective, the accumulated impacts from all industrial sectors (i.e., mining, oil and gas, agriculture and forestry) in the Dawson Creek TSA are of concern. Given this concern and others, the increase in harvest proposed under base harvest forecast will likely be perceived as a further burden on the local ecosystems in the TSA.</li> </ul>						

## **1.0 Introduction**

The B.C. Forest Service is conducting a provincial timber supply review to assist the Chief Forester in setting allowable annual cut (AAC) levels. The review examines the amount of timber available for harvest, under current forest management practices, throughout British Columbia.

Four documents are being prepared for each of the province's TSAs. Two technical documents, a timber supply analysis and a socio-economic analysis, provide information on timber supply, and the socio-economic and environmental implications of changing timber harvest levels. A discussion paper summarizes the technical information and provides a focus for public discussion of issues surrounding timber harvest levels. The fourth report describes the rationale behind the Chief Forester's AAC determination. In the case of the Dawson Creek TSA, a supplemental timber supply analysis was conducted, and the results were presented in an Addendum report included as an appendix in the Discussion Paper.

This report, the *Dawson Creek TSA Socio-Economic Analysis*, describes the economy, physical environment, and forest management operations and issues in the Dawson Creek TSA. The socio-economic and environmental implications of changing timber harvest levels are also examined. The analysis presented in this report does not promote or recommend any particular harvest level for the Dawson Creek TSA. The Chief Forester will determine the AAC after considering many factors in addition to the results contained in this report.

### **1.1 Approach**

This report organizes the effects of changing timber harvest levels into five categories or "accounts". Two of the categories are quantitative in nature (economic impacts), while the other three are qualitative (social, environmental and First Nations' implications). Table 1-1 presents a summary of the accounts used in this report.

Only those impacts identified as being directly attributable to changes in harvest levels in the Dawson Creek TSA have been examined in this analysis. In effect, this study assumes that all other variables (*e.g.*, the land base, technology, harvesting costs, timber values, etc.) remain constant.

<b>Table 1-1</b>	
<b>Summary of Accounts</b>	
<b>ECONOMIC IMPACTS</b>	
<b>Employment and Income</b>	<ul style="list-style-type: none"> <li>identifies direct and indirect/induced effects on TSA and provincial employment and employment income over the short and long-term.</li> </ul>
<b>Government Revenues</b>	<ul style="list-style-type: none"> <li>identifies impacts on government revenues derived from the TSA timber resource.</li> </ul>
<b>SOCIAL AND ENVIRONMENTAL IMPLICATIONS</b>	
<b>Community</b>	<ul style="list-style-type: none"> <li>discusses possible effects of employment loss on local residents/families and communities.</li> </ul>
<b>First Nations</b>	<ul style="list-style-type: none"> <li>discusses possible effects on local aboriginal communities, and identifies potential areas of concern related to aboriginal cultural values and political aspirations.</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>discusses possible implications for forest ecosystems.</li> </ul>

## 1.2 Report Outline

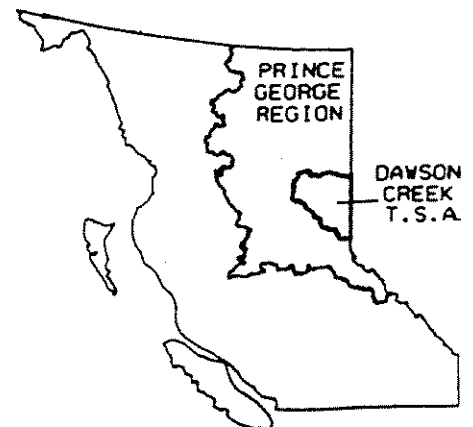
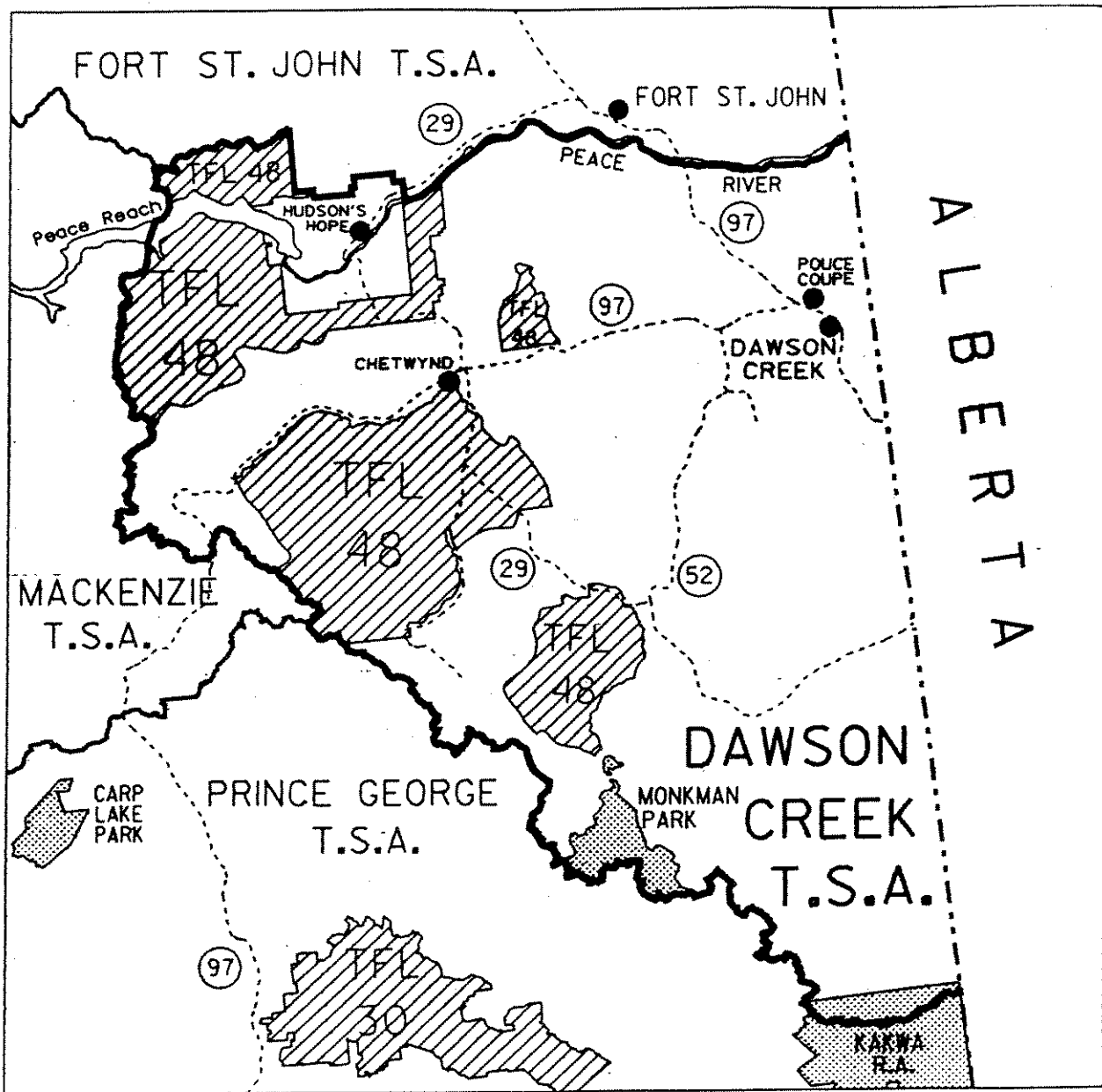
Following this Introduction, the report is organized as follows:

- Section 2.0 provides a socio-economic profile of the Dawson Creek TSA, including a description of the communities, social setting and First Nations activities and concerns. Section 2.0 also describes the structure of the labour force by industry and the major resource sectors in the TSA;
- Section 3.0 describes the environmental setting, and recreational areas and activities in the TSA;
- Section 4.0 describes current forestry operations with discussions on the timber harvesting land base, current management practices, historical AAC levels, and the current Dawson Creek TSA apportionment;
- Section 5.0 describes forestry activities related to the coniferous harvest in the TSA including a profile of coniferous licensees, coniferous fibre flow, and industry structure. This section also describes the revised coniferous base harvest forecast and economic impacts associated with the forecast;
- Section 6.0 describes forestry activities related to the deciduous harvest in the TSA including a profile of the deciduous licensee, deciduous fibre supply, and industry structure. The economic implications associated with the current level of deciduous processing are also outlined;
- Section 7.0 discusses the social and environmental implications of coniferous and deciduous harvesting activity in the TSA; and
- Section 8.0 provides a summary and conclusions. Appendices include a glossary, information on the methodology used in this study and a list of contacts.

### **1.3 Study Area**

The Dawson Creek Timber Supply Area (TSA) is one of six TSAs comprising the Prince George Forest Region. Located in the north-east interior of B.C., the TSA stretches from the Peace River in the north to the Kakwa Recreation Area in the south. It extends from the Alberta border in the east to the Rocky Mountains in the west and covers approximately 2 278 000 hectares. (Figure 1-1).

Figure 1-1  
Dawson Creek TSA



## 2.0 Socio-Economic Profile

This section provides a description of communities, and First Nation's activities and concerns in the Dawson Creek TSA. The profile also includes a description of the TSA labour force and other economic activities directly associated with the TSA land base.

### 2.1 Community and Social Setting

#### 2.1.1 Overview

The economy of the Dawson Creek TSA was historically based upon agriculture. During the 1950's and 1960's the area underwent rapid growth with the construction of the Pacific Great Eastern Railway (now the British Columbia Railway), and the construction of the Peace River hydro-electric project. It was during this period that forestry became a significant component of the local economy. Since 1981, with the development of coal deposits near Tumbler Ridge, mining has become the largest basic component of the TSA economy.

In 1991, the population of the Dawson Creek TSA was estimated at 28 880, of which 18 142 (63 percent) resided in the larger communities of Dawson Creek, Tumbler Ridge and Chetwynd. Between 1991 and 1995, the population increased by about 1.0 percent, reflecting a slower rate of growth than the provincial average of 13.8 percent. From 1993 to 2000, the TSA population is expected to increase by a further 5.7 percent.<sup>1</sup> Over the 1991 to 1995 period, the population of the some of the communities in the TSA increased disproportionately when compared to the TSA as a whole. Dawson Creek experienced a population increase of 2.6 percent and Chetwynd's population increased by 8.2 percent. Conversely, Tumbler Ridge's population decreased by over 20 percent.

Unemployment insurance claim levels in the TSA are slightly above the provincial average. From 1988 to 1992, the percentage of the workforce claiming unemployment insurance was between 7.2 and 9.2 percent annually, compared to provincial averages between 6.2 and 7.1 percent. During the same period, unemployment insurance claims for Dawson Creek were in the range of 7.7 to 9.5 percent. These rates were higher than those for Tumbler Ridge, which had unemployment insurance claims comprising 3.5 to 5.1 percent of the workforce.<sup>2</sup> Chetwynd had unemployment insurance claims fluctuating between 6.7 and 9.1 percent. In general, the community of Tumbler Ridge had unemployment claims below the provincial average while the communities of Dawson Creek and Chetwynd were above the provincial average.

Average incomes for TSA residents are lower than the provincial average. In 1991 the average TSA income was \$26 310, while the provincial average was \$27 620.<sup>3</sup>

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<sup>1</sup> B.C. Statistics, Ministry of Government Services. Based on average projected growth for the Peace River South Local Health Area between 1993 and 2000.

<sup>2</sup> B.C. Statistics, Ministry of Government Services.

<sup>3</sup> These income values include average earnings for both part-time and full-time earners.

### 2.1.2 Community Profiles

#### **Dawson Creek**

Dawson Creek is situated centrally in the Peace River area at the junction of Highways 97 (north and south), 2 and 49, and is located at mile zero of the Alaskan Highway. The British Columbia Railway runs through Dawson Creek connecting it with port facilities in Prince Rupert and Vancouver. Rail and highway links provide Dawson Creek with access to Alberta, the Yukon, Alaska and the rest of British Columbia.

In 1995, the population of Dawson Creek was estimated at 11 604 making it the largest community in the Dawson Creek TSA. Dawson Creek has a diverse economic base with agriculture, oil and gas, and the forest industry all contributing to the community's economy. Dawson Creek also serves as a regional service centre for surrounding communities. The major employers in the community include School District #59, the Dawson Creek and District Hospital, the City of Dawson Creek and Louisiana-Pacific Canada Inc. Louisiana-Pacific provides approximately 185 person-years (PY) of employment at its plant and woodlands office in Dawson Creek.

#### **Tumbler Ridge**

Tumbler Ridge is located south of Dawson Creek and Chetwynd, at the confluence of the Murray, Wolverine and Flatbed Rivers. Built between 1982 and 1985 to service the North East Coal Development project, Tumbler Ridge now has a population of 3797. The majority of employment in the community is associated with the Bullmoose Operating Corporation and the Quintette Operating Corporation, which together provide over 1400 PY of employment. Most of these employees reside in Tumbler Ridge, although some commute from Dawson Creek, Chetwynd and surrounding areas.

#### **Chetwynd**

In 1995, the population of Chetwynd was estimated at 3167. Chetwynd is located 103 kilometres west of Dawson Creek on a terrace above the flood plain of Centurion Creek. Highway 97 and 29 provide Chetwynd with road transportation connections to Alberta, Alaska, the Yukon and the rest of British Columbia.

Historically, Chetwynd has been a small agricultural-based community. The community benefited from the construction of the Peace River dams and the North East Coal Development project in the 1980s. Today, Chetwynd has a diverse economy with residents employed in forestry, mining, oil and gas, agriculture, tourism and the transportation industries. Major employers in Chetwynd include Canadian Forest Products Ltd., West Fraser Mills Ltd. Louisiana-Pacific Canada Ltd. and Westcoast Energy Ltd. Collectively, these companies provide approximately 600 PY of employment at sites in or near the community.

#### **Hudson's Hope**

Hudson's Hope was originally established as a fur post for the Hudson Bay Company. Hudson's Hope was located at the headwaters of the navigable portion of the Peace River. Once past the fourteen mile portage at Hudson's Hope, water transportation was possible almost all the way to Prince George.

Today, Hudson's Hope is situated 64 kilometres north of Chetwynd on Highway 24, and serves largely as the residential base for permanent employees at the two B.C. Hydro power plants located on the Peace River. In 1995, Hudson's Hope had a population of 1092. In addition to B.C. Hydro, major employers in the community include Alces River Farms and the District of Hudson's Hope.

### **Pouce Coupe**

Pouce Coupe was the original commercial centre in the TSA and was the site of B.C.'s first operating oil well in the 1920s. Since then the community of Pouce Coupe has declined in importance, with Dawson Creek, only 20 kilometres away, assuming the function of commercial centre. In 1995, the population of Pouce Coupe was estimated at 903. The major employers in the town include Peace River Haven and Nodes H.F. Construction Ltd.

### **Moberly Lake**

The Moberly Lake community is located at the west end of Moberly Lake, approximately 90 kilometres south-west of Fort St. John. The population is approximately 65. The community's labour force is involved in logging, back hoe contracting, and trapping. The community operates a band office and a community centre.

### **Saulteau**

The Saulteau community is located at the east end of Moberly Lake about 100 kilometres south-west of Fort St. John. The community's population is approximately 270 and has a labour force involved in silviculture, gravel excavation, cattle ranching and farming. As well, the community operates a band office, band hall and a healing centre.

### **Kelly Lake**

Kelly Lake is the only Metis community in British Columbia. In 1991, the community had a population of approximately 350. Kelly Lake is located 120 kilometres south-west of Dawson Creek and 50 kilometres west of Hythe, Alberta. The community maintains its native identity with several families having close ties to members of the Saulteau and Moberly Lake First Nations. Cree is the most commonly spoken language for people over the age of thirty. Forestry activities and the oil and gas industry provide seasonal employment opportunities. Five community members are also employed by the school and the Forgotten People Institute.

### **Smaller Communities**

Smaller communities within the Dawson Creek TSA include Arras, Progress, Willow Flats, East Pine, South Taylor, Farmington, Groundbirch and Jackfish Lake. These areas are characterized by collections of several family farms with small populations.

### 2.1.3 First Nations

The Saulteau and West Moberly Lake Indian Bands are located in the Dawson Creek TSA and are affiliated with the Treaty 8 Tribal Association. The Kelly Lake Metis community is in the process of becoming a member of the Treaty 8 Tribal Association. The Halfway River Band at Wonowon is not located in the TSA, but the community maintains economic and cultural ties to the TSA.

#### Land Claims

On December 15, 1993 the B.C. Treaty Commission began accepting statements of intent from First Nations as a first step to commencing treaty negotiations. In the Dawson Creek TSA, the Treaty 8 Tribal Association has several outstanding issues they wish resolved with respect to the existing treaty. A portion of the TSA falls within the comprehensive land claims of the Carrier-Sekani and the Lheit-Lit'En Nations who reside outside the Dawson Creek TSA.

#### Treaty 8 Forestry Issues<sup>4</sup>

The Treaty 8 First Nations in the TSA (Saulteau Band and West Moberly Lake Band) have identified three main areas of concern related to forestry activities: economic and cultural impacts, environmental impacts, and policy and administrative problems.

Treaty 8 First Nations people are concerned that there is excessive logging pressure on traplines and that forestry activities are reducing the economic viability of trapping. There is also concern that forestry activities are negatively impacting important Treaty 8 First Nations cultural sites.

First Nations people feel that local moose populations are being stressed by being dislocated from preferred calving areas as a result of logging. It is felt that this type of resource value should receive more thorough consideration prior to logging. First Nations people are also concerned that second growth forests do not provide the same forest values as old growth forests. In general, it is felt that greater effort must be made to protect all resource values in the TSA and to ensure that logged areas are properly reforested.

Treaty 8 First Nations people have expressed frustration with the lack of consultation by the Ministry of Forests regarding traditional, cultural and economic impacts associated with timber harvesting in the TSA. They feel that it takes too long to get changes implemented through the proper channels and as an alternative would like to see a co-management arrangement developed which allows for the consideration of alternative plans. Currently, the First Nations have stated that they do not have the resources to participate at this level. However, they would like to have more community meetings to discuss their concerns.

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<sup>4</sup> No mutually acceptable consultation practice exists between the Treaty 8 Tribal Council and the Ministry of Forests. Therefore, the Treaty 8 Tribal Council declined invitations to provide specific comments on the Timber Supply Review process. Information in this section has been obtained from C. Shearer, Aboriginal Forestry Advisor, Ministry of Forests, Dawson Creek and summary notes from First Nation's Information Sessions in Fort St. John, February 18, 1994.

### **Kelly Lake Forestry Issues<sup>5</sup>**

Residents of Kelly Lake are active in the forest industry and would like to foster a more co-operative relationship with the Ministry of Forests. The community feels that this could be achieved through more community meetings and greater involvement with Ministry of Forests staff in planning issues in the Kelly Lake area. The community desires greater recognition of traditional land and resource uses, greater accommodation of local environmental concerns, and increased employment opportunities in forestry for community residents.

Kelly Lake has been consulted by the Ministry of Forests on one cutblock in the area. Other cutblocks in the area have been harvested without community consultation. Of current concern are cutblocks along the shore of Kelly Lake. This area is important for big game hunting and trapping. The community is also concerned that herbicide residues from silvicultural treatments may be consumed by game, potentially contaminating an important food source.

The Kelly Lake community would like to have the opportunity to harvest timber from Crown lands in the area immediately around Kelly Lake. They have also expressed a desire to become more involved in Ministry of Forests fire suppression activities and silviculture programs.

## **2.2 Economic Profile**

For the purposes of this analysis, the Dawson Creek TSA economy is divided into two parts, the basic and non-basic sectors. The basic sector is defined as the component of the economy that results in the in-flow of dollars from outside the local area. Examples of income sources considered to be part of the basic sector of the economy include sawmills and mining operations. Conversely, the non-basic sector workers earn income by selling goods and services to individuals living in the local area. A pharmacist or barber are two examples. The basic sector is assumed to be the driver of the local economy, in that employment and income generated in the non-basic sector ultimately depends on the spending of those employed in the basic sector.

A diversity index, developed by the Ministry of Finance and Corporate Relations, can be used to measure a community's relative dependency on various sectors of the economy.<sup>6</sup> The Dawson Creek area has a diversity index of 74. In relation to other areas of the province, the Dawson Creek TSA has a diversified economic base with mining, the public sector, and forestry representing the major sectors.<sup>7</sup> Figures 2-1 and 2-2 illustrate the employment and income dependencies in the Dawson Creek Forest District.<sup>8</sup>

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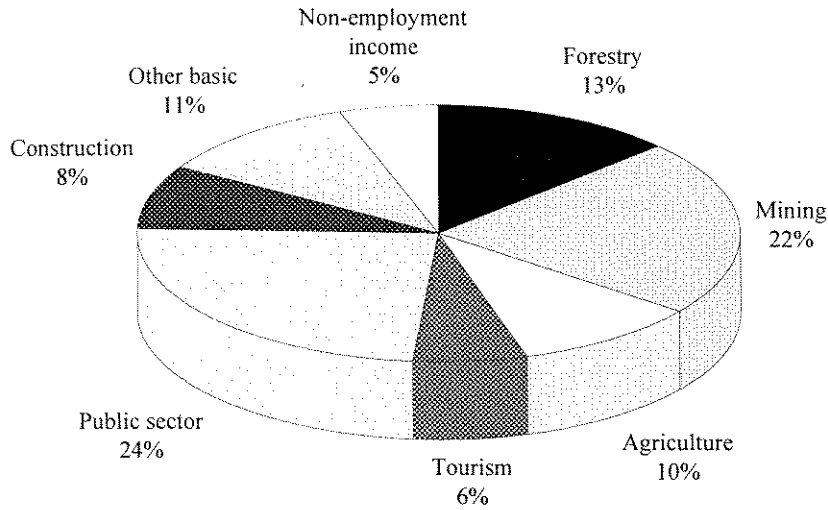
<sup>5</sup> Concerns as expressed by C. Gauthier, Chief, Kelly Lake, September 28, 1994.

<sup>6</sup> Horne, G., and Powell, C. (1995), *British Columbia Local Area Economic Dependencies and Impact Ratios*, Analysis and Evaluation Branch, Treasury Board Staff, Ministry of Finance and Corporate Relations. The diversity index ranges between zero (if the local area were entirely dependent on one sector) to 100 (if the local area were equally dependent on each of the defined sectors).

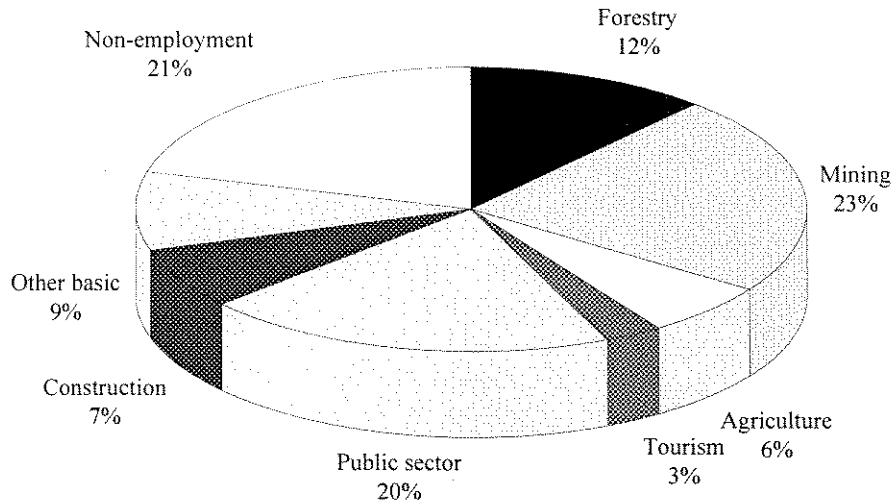
<sup>7</sup> It should be noted that the Dawson Creek TSA represents a diversified region, yet within any single community there may be a heavy dependence upon one sector (eg., Tumbler Ridge is dependent on coal mining).

<sup>8</sup> Horne, G., and Powell, C. *The Forest District Tables*, Ministry of Finance and Corporate Relations, March, 1995.

**Figure 2-1 Dawson Creek Forest District Employment Dependencies<sup>9</sup>**



**Figure 2-2 Dawson Creek Forest District Income Dependencies<sup>10</sup>**



<sup>9</sup> Horne, G., and Powell, C. *The Forest District Tables*, Ministry of Finance and Corporate Relations, March, 1995. Refer to Appendix B, Tables B-3 and B-4 for a complete breakdown of total employment and income estimates.

<sup>10</sup> Horne, G., and Powell, C. *The Forest District Tables*, Ministry of Finance and Corporate Relations, March, 1995. Non-employment income includes pensions, investments, unemployment insurance, transfers and social assistance.

### 2.3 Mining and Energy Resources

Mining activity in the Dawson Creek TSA is associated primarily with coal mining, and oil and natural gas exploration and production.

#### Coal

The TSA encompasses much of the Peace River coal field which occurs within the inner foothills of the Rocky Mountains, north of the Peace River and extending south to the Alberta-B.C. Border. While coal had been mined and used for home heating for many decades, it was not until the North East Coal Development project near Tumbler Ridge that coal mining became a major component of the regional economy.

High quality coals, low in sulphur content and representing an excellent metallurgical grade coal, are mined at the Bullmoose and Quintette deposits. In 1993, the Quintette operation produced 5.0 million tonnes of coal and provided an estimated 1079 PY of direct employment. During the same year, the Bullmoose operation produced 1.8 million tonnes and provided 353 PY of direct employment.<sup>11</sup>

#### Oil and Gas

Exploration and production activity related to oil and natural gas are significant in the Dawson Creek TSA. Wells in the TSA account for approximately 10.0 percent of provincial natural gas production and 3.0 percent of provincial oil production.<sup>12</sup> Currently 16 of B.C.'s 731 producing oil wells are in the TSA, while an estimated 150 of B.C.'s 922 producing gas wells are in the TSA.

The oil and gas industry has shown strong activity in the last few years. Demand has resulted in record sales of oil and natural gas from the Peace and Liard areas: \$143.0 million in 1993 and \$121.2 million in the first six months of 1994.<sup>13</sup> Exploration (*i.e.*, drilling and seismic exploration) has also increased significantly. In addition, expansion of natural gas projects in the Peace and Liard areas, announced recently by Westcoast Energy, could total \$1.1 billion in expenditures.

The majority of employment generated in the oil and gas industry is through exploration. Currently, it is estimated that about half of all exploration activity in the province is occurring in the Dawson Creek TSA.<sup>14</sup>

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<sup>11</sup> Price Waterhouse (1993), *The Mining Industry in British Columbia*, p. 6.

<sup>12</sup> Ministry of Energy, Mines and Petroleum Resources (1994), *Accumulated Well Production Report*.

<sup>13</sup> Government of Canada (1994), *Labour Market Review Jan-Aug 1994 Peace/Liard*, p. 7

<sup>14</sup> D. Werle, Geophysical Technician, Ministry of Energy, Mines and Petroleum Resources.

## 2.4 Agriculture

Commercial agriculture has a long history in the TSA and has played an important role in the development of the Peace River region. Agriculture continues to be a significant contributor to the area's economy and important to area communities. Most farming activity occurs in the north-eastern corner of the TSA, extending eastward from Chetwynd.

Grain farms and cattle ranching dominate the industry, but other types of enterprises are also represented. Cattle ranches are located primarily on the margins of the main farming areas. Forage crop farming is a relatively recent development and a large amount of land is now devoted to the production of alfalfa. Dairying is concentrated near Tupper, while potatoes and other vegetables are grown mostly on the Peace River flats, south of Taylor and near Pouce Coupe. Pigs and sheep are raised in quantity for outside markets and poultry production supplies local demand. Recent trends include a decline in significance of crops and an expansion into beef and speciality livestock.<sup>15</sup> Also of importance to the industry is the diversification into forage seeds and speciality crops.

In 1991, there were approximately 868 farms encompassing a total area of 397 093 hectares in the TSA.<sup>16</sup> Of the total farm area, 121 252 hectares were in crops, the most important crops being canola and hay. The TSA had 53 254 head of cattle and 4320 pigs. Total farm capital was estimated at \$314.0 million and gross farm receipts at \$44.0 million.

An increasingly significant component of farm revenues in the TSA is derived from the sale of deciduous (aspen and cottonwood) forest products harvested from private farm land. In the Peace River area these sales have increased three-fold over the period 1986 to 1991 and were estimated at over \$1.0 million in 1991. Since 1991, sales have increased dramatically. Agricultural activity creates an estimated 186 PY of paid employment in the TSA in addition to employment attributed to owner-operators.<sup>17</sup>

## 2.5 Tourism

Currently, most of the tourism activity in the TSA is associated with drive-through tourists on their way to Alaska. As a result, most tourism related expenditures occur at recreational vehicle campgrounds. The majority of tourists passing through the TSA are from the United States (62 percent), while Albertans represent the next largest segment (18 percent).<sup>18</sup>

The Dawson Creek TSA has the potential to develop tourism related to the area's hunting and fishing opportunities, and exceptional parks along the Rocky Mountains. As winter tourism is undeveloped, the majority of the tourism activity occurs in the summer season. Initiatives are being undertaken to

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<sup>15</sup> G. Gleeson, Dawson Creek Forest District. Crown rangelands provide an estimated 58 000 animal unit months of forage to ranchers in the TSA. Currently, the TSA is the only region in the province where additional Crown rangeland is available.

<sup>16</sup> Statistics Canada, *1991 Census of Agriculture*. Figures are for Census Subdivision C of the Peace River-Liard Census Division and are assumed to represent the Dawson Creek TSA.

<sup>17</sup> Of this employment approximately half is year round and the remainder is seasonal or temporary.

<sup>18</sup> Ministry of Small Business, Tourism and Culture (1990), *Visitor '89 Survey*. These percentages are for the entire Northeast Region of B.C., of which the Dawson Creek TSA is a portion.

develop the destination-oriented component of tourism in the area<sup>19</sup>, with a focus on snowmobiling and skiing.

## 2.6 Hunting and Trapping

The Dawson Creek TSA provides an abundance of hunting opportunities, especially for deer, moose, elk and to a lesser degree, black bears. In 1993, it is estimated that residents of B.C. engaged in 57 348 days of hunting in the TSA. Most of this hunting effort was for deer and moose, which account for 81 percent of the total effort.<sup>20</sup> There are also a variety of game birds in the TSA, including sharp-tailed grouse and ducks. These game birds provide recreational hunting opportunities for resident hunters.

In addition to resident hunting activity during 1993, non-resident hunters are estimated to have spent 2437 days hunting in the TSA. Deer, moose, black bear and wolf accounted for most of the non-resident hunting effort. There are seven guide-outfitters operating in the TSA most of whom are dependent upon non-resident hunting activity as a source of income.

Trappers in the TSA consider their activity a lifestyle choice that provides supplementary income during the winter. The TSA is located within the Boreal White and Black Spruce biogeoclimatic zone which supports a fur harvest that is among the largest in the province.<sup>21</sup> Over the period 1990 to 1993, the most popular species trapped in the TSA were marten, squirrel, beaver, coyote and weasel. During this period, there was an average annual harvest of 1613 martens, 1280 squirrels, 492 beavers, 231 coyotes and 207 weasels. This harvest had a value of \$126 924.<sup>22</sup> Based on the 1990-1993 average, it is estimated that 120 licensed and 11 non-licensed trappers operate within the TSA.

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<sup>19</sup> E. Fraser, Peace River Highway Tourism Association.

<sup>20</sup> Ministry of Environment, Lands and Parks (1993), *Wildlife Branch Summary Statistics Data Base, Hunter Harvest and Effort*, for the year 1993. Management Units 719, 720, 721, 722, 731, 732, 733 have been used as the boundaries to reflect Dawson Creek TSA.

<sup>21</sup> Ministry of Forests (1991), *Ecosystems of British Columbia*, p. 249.

<sup>22</sup> Ministry of Environment, Lands and Parks (1993), Annual Report 1991-1992. The value of furs has been depressed in recent years, however, it is expected to recover.



### **3.0 Environmental Setting**

This section consists of a brief overview of the TSA's biophysical assets and associated outdoor recreation values.

#### **3.1 Biophysical Setting**

The biophysical components of the area include several ecosystems, important aquatic systems and a variety of plants and wildlife.

##### **3.1.1 Ecosystems**

Ecological areas can be described using the Biogeoclimatic Ecosystem Classification System which delineates climatic zones having specific soils, plant and animal communities and aquatic systems<sup>23</sup>. There are three biogeoclimatic zones within the Dawson Creek TSA.

##### **Boreal White and Black Spruce**

Most of the Boreal White and Black Spruce zone occurs as an extension of the Great Plains of the prairie provinces and exists in the north-eastern corner of B.C. This zone is the largest and most widespread in Canada and is characterized by a severe climate with long cold winters and a short growing season. White spruce, trembling aspen, lodgepole pine, black spruce, balsam poplar, larch (tamarack), subalpine fir, common paper birch and Alaska paper birch are the major tree species in the forests of this zone.

Forests predominate in the better-drained plateau, foothill, and cordilleran sections of the zone, where mixed trembling aspen - white spruce forests dominate the landscape.

##### **Engelmann Spruce-Subalpine Fir**

The Engelmann Spruce-Subalpine Fir zone occurs at higher elevations through much of the British Columbia interior. In the Dawson Creek TSA it occurs in the westernmost portion along the Rocky Mountains. The climate is severe, with a short cool growing season and long cold winters. The landscape at upper elevations is open park land, with clumped trees interspersed with meadow, heath and grassland. Engelmann spruce, subalpine fir and lodgepole pine are the dominant tree species. In areas of this zone, extensive lodgepole pine and whitebark forests are common.

##### **Sub-boreal Spruce**

The Sub-boreal Spruce zone occurs in the central interior of B.C., primarily on gently rolling plateaus. In the Dawson Creek TSA, this zone occurs to the west along the Rocky Mountains. The zone is intermediate between the interior Douglas fir forests to the south and the boreal white and black spruce forests to the north. Forest productivity in this zone is moderate, and although the climate is severe, the winters are shorter and the growing season longer than in boreal areas.

Hybrid Engelmann-white spruce and subalpine fir are the dominant trees. In addition, extensive stands of lodgepole pine occur in the drier portions of the zone due to past forest fires. Wetlands are abundant in this area, dotting the landscape in poorly drained areas. Engelmann spruce is most productive on moist, nutrient rich soils within cool temperate climates.

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<sup>23</sup> Ministry of Forests (1991), *Ecosystems of British Columbia*.

### 3.1.2 Aquatic Ecosystems

The Dawson Creek TSA has several rivers located within its boundary. The Peace River drainage represents the largest system in the TSA and forms its northern boundary. The Pine River is one of the major tributaries to the Peace River and flows entirely within the TSA boundaries. The Pine River extends from the mountain foothills where the river is characterized by high gradients with cold water habitat suitable for bull trout, Arctic grayling, mountain whitefish and rainbow trout. As the Pine River enters the plateau region, gradients become lower and the river is characterized by a different substrate, warmer water and habitat better suited for fish species such as pike and walleye. This river serves as the domestic water supply for the community of Chetwynd. The major tributaries of the Pine River are the Sukunka and Murray Rivers.

The other major tributary to the Peace River from within the TSA is the Kiskatinaw River. The Kiskatinaw River originates in the east-central region of the TSA at Bearhole Lake and drains a significant part of the Alberta plateau region of the TSA. The Kiskatinaw River is a lower gradient, warmer system with some salmonoid species at the upper reaches, and pike and walleye at the lower end. The Kiskatinaw River also contains some regionally significant populations of non-sport fish. This river serves as the domestic water supply for the community of Dawson Creek.

In the south, the Redwillow and Wapiti rivers drain into Alberta, eventually joining the Smoky River system. The Redwillow is a lower gradient drainage that begins in the Yoho Mountain area. The Wapiti River begins at Wapiti Lake and drains the southern foothills area of the TSA before crossing into Alberta. The TSA also has a number of small lakes fed by ground water and replenished by runoff. A relatively small number of the lakes contain native fish stocks, while most contain stocked fish. The lakes containing native fish are of particular importance because of the low numbers, the sensitivity to disturbances and the potential impacts of increased access.

Besides the fish species, the aquatic habitat also supports a moderate abundance of waterfowl as compared to the Prairie pothole region<sup>24</sup>. Waterfowl are particularly dependent on the numerous marsh areas in the TSA. Twenty-six species of ducks, three species of geese, and two species of swan are found in the TSA. A variety of other bird species depend on the aquatic habitat for nesting sites or resting areas.

### 3.1.3 Riparian Areas

Located between aquatic and terrestrial ecosystems, riparian areas are highly productive habitat that provide important food and shelter integral to fish and wildlife species. For example, white spruce-poplar riparian areas provide spring habitat for grizzly bears.

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<sup>24</sup> Ministry of Environment, Lands and Parks (1988), *Wildlife Management Plan: Peace Subregion*

### 3.1.4 Ecoregions and Wildlife<sup>25</sup>

The Dawson Creek TSA is a large region representing several distinct ecoregions. These ecoregions each represent specific habitat, creating different management concerns for a variety of wildlife.

#### **Peace Lowlands Ecoregion**

Within the Dawson Creek TSA, the Peace Lowland Ecoregion has the mildest climate with lowest snowfall, and supports the greatest abundance and diversity of wildlife in the TSA. The habitat in this ecoregion supports, among other wildlife, moose, elk, deer, game birds and non-game birds including red-listed wood warblers and blue-listed trumpeter swans<sup>26</sup>. Habitat concerns for moose, elk and deer include summer and winter feeding habitat, escape terrain and adequate calving areas. Cavity nesting sites for fishers, boreal owls, kestrels and mountain bluebirds, and peregrine falcon eyries are also of management concern.

#### **Hart Foothills Ecoregion**

The Hart Foothills Ecoregion lies between the Hart Ranges and the Alberta Plateau. Moose are the most abundant big game species in this ecoregion. Winter ranges are limited, resulting in many moose migrating into adjoining ecoregions which have less snow pack. Elk are limited as a result of the lack of available winter habitat. Caribou, mountain goat, bighorn sheep and stone sheep all rely on this ecoregion for part of their habitat requirements. The ecoregion also has populations of grizzly bears.

#### **Hart Ranges and Front Ranges Ecoregions**

These ecoregions represent a narrow belt of mountains that form the south-western boundary of the TSA. These ecoregions have the highest grizzly bear density in the TSA. Alpine and subalpine Engelmann spruce habitat are particularly important to the grizzly bears. Both caribou and mountain goat summer in alpine areas in these ecoregions. A few bighorn sheep and stone sheep also summer in the alpine areas of these ecoregions. Escape terrain and migration corridors to winter ranges are of management concern in these areas of the TSA.

#### **Kitskatinaw Plateau Ecoregion**

This ecoregion lies between the Hart Foothills to the west, the Alberta border to the east and the Peace Lowlands to the north. Moose are abundant in this ecoregion, with stands of white spruce and trembling aspen providing important habitat. Elk are limited as a result of limitations to winter range habitat. Caribou rely on the Kitskatinaw Plateau Ecoregion for winter habitat while trumpeter swans are common in marshes and lakes in the area.

#### **Peace Foothills Ecoregion**

There is a portion of this ecoregion within the TSA. The Butler Ridge area supports populations of caribou, stone sheep, elk and moose.

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<sup>25</sup> Ministry of Environment, Lands and Parks (1988), *Wildlife Management Plan: Peace Subregion*.

<sup>26</sup> Red Listed (R): Candidates for designation as endangered or threatened species or subspecies (taxa), and taxa which have either very small populations or biological characteristics that make them imperiled.

Blue Listed (B): Sensitive or vulnerable taxa that could become candidates for the Red List in the foreseeable future.

### 3.1.5 Biodiversity

Biodiversity, or biological diversity refers to the full range of life in an area. Biodiversity includes genetic diversity, species diversity and ecosystem diversity. When managing forest ecosystems for biodiversity it is important to maintain broad landscape features (e.g., species composition, seral age-class distributions, and disturbance regimes), as well as specific stand level attributes (e.g., snags and coarse woody debris). At the landscape level, the maintenance of corridors between wildlife habitat areas helps to ensure that biodiversity is maintained in the long-run. Managing forest lands to maintain the habitat of "umbrella" species such as grizzly bears and large ungulates also help to maintain the habitat of other species including non-game birds, non-game mammals, amphibians and reptiles.

While management for umbrella species also benefits other species, it is important to consider species such as non-game birds, non-game mammals, amphibians and reptiles. These species are widely distributed throughout the TSA and contribute to the area's biodiversity. Many of these species also act as indicator species, representing the most sensitive animals to alterations in their local habitat or ecological niche.

The Peace sub-region hosts 232 species of non-game birds (all birds species except waterfowl and upland game birds) most of which are also found within the TSA. Approximately 23 species of non-game mammals inhabit the TSA, including a variety of bats, shrews, rabbits, hares and rodents. The TSA also has five species of amphibians and two species of garter snake. Among the amphibians are four frog species and one salamander species.

### 3.1.6 Rare or Uncommon Plants and Animals

The area supports a number of plant and animal species that require special consideration due to their rarity or restricted ranges. As shown in Table 3-1 and Table 3-2, several species of plants and animals in the Dawson Creek TSA are considered "extremely rare" or "rare". These species are potentially vulnerable to extirpation (extinction within part of their historical range). Other species in the TSA are considered to be "uncommon" and are susceptible to large-scale disturbances within the province. In addition, species that are either red-listed or blue-listed are indicated with a R or B (respectively) after the species name.

<b>Table 3-1</b>		
<b>Rare or Uncommon Plant Species in the Dawson Creek TSA<sup>27</sup></b>		
<b>Extremely Rare Plants<sup>28</sup></b>	<b>Rare Plants<sup>29</sup></b>	<b>Uncommon Plants<sup>29</sup></b>
Canada Anemone	Slender Sedge	Smith's Melic
Least Moonwort	Dry-Land Sedge	Mountain Sandwort
Plains Reedgrass	Austrian Draba or	Northern Sandwort
Pointed Broom Sedge	Witlow Grass	Birdfoot Buttercup
Alpine Draba or Rock Cress	Milky Draba or	Meadow Willow
Three Lobed Daisy	Whitlow Grass	Autumn Willow
Nuttal's Sunflower	Small Flowered	Sprangle-Top
Seneca Root	Willowherb	Arctic Eyebright
Heart-Leaved Buttercup	Tufted Fleabane	Spike Oat
Arkansas Rose	Sheathed Cotton-Grass	
Common Pitcher Plant		
Tall Butterweed		
Prairie Wedgegrass		
Edible Valerian		

<b>Table 3-2</b>		
<b>Rare or Uncommon Wildlife Species in the Dawson Creek TSA<sup>30</sup></b>		
<b>Extremely Rare &amp; Rare Wildlife</b>	<b>Uncommon Wildlife</b>	
Upland Sandpiper - <b>R</b>	Short-eared Owl - <b>B</b>	Pearl Dace
Cape May Warbler - <b>R</b>	American Bittern - <b>B</b>	Bull Trout
American Peregrine Falcon - <b>R</b>	Palm Warbler - <b>B</b>	Wolverine - <b>B</b>
Connecticut Warbler - <b>R</b>	Black-throated Green	Fisher - <b>B</b>
North Redbelly Dace	Warbler- <b>B</b>	Northern Long-eared Myotis - <b>B</b>
	Yellow Bellied FlyCatcher	Rocky Mountain Bighorn
	- <b>B</b>	Sheep - <b>B</b>
	Bald Eagle - <b>B</b>	Woodland Caribou - <b>B</b>
	Philadelphia Vireo - <b>B</b>	Grizzly Bear - <b>B</b>
	Canada Warbler - <b>B</b>	

<sup>27</sup> Information for Dawson Creek Forest District, B.C. Conservation Data Centre, Victoria, B.C. Ministry of Environment, Lands and Parks.

<sup>28</sup> Scientific Names for plants: *Anemone canadensis*, *Botrychium simplex*, *Calamagrostis montanensis*, *Carex scoparia*, *Draba alpina*, *Erigeron trifidus*, *Helianthus nuttallii* var *nuttallii*, *Polygala senega*, *Ranunculus cardiophyllus*, *Rosa arkansana*, *Sarracenia purpurea* SSP *purpurea*, *Senecio serra*, *Sphenopholis obtusata* var *major*, *Valeriana edulis* SSP *edulis*.

<sup>29</sup> Scientific names for plants: *Carex tenera*, *Carex xerantica*, *Draba fladnizensis*, *Draba lactea*, *Epilobium leptocarpum*, *Erigeron leptocarpum*, *Eriophorum vaninatum* SSP *spissum*, *Euphrasia arctica* var *disjuncta*, *Helictotrichon hookeri*, *Melica smithi*, *Minuartia biflora*, *Minuartia elegans*, *Ranunculus petafidus*, *Salix petiolaris*, *Salix serissima*, *Scolochloa festucacea*.

<sup>30</sup> Information for Dawson Creek Forest District, B.C. Conservation Data Centre, Victoria, B.C. Ministry of Environment, Lands and Parks.

### 3.1.7 Protected Areas

Under the Protected Area Strategy (PAS), the provincial government is committed to doubling the system of protected areas from six to 12 percent of the provincial land base by the year 2000<sup>31</sup>. One of the key criteria is to protect representative ecosystems in B.C. as defined by ecosections and biogeoclimatic units. At the time of writing this report, the government had not made decisions on adding to the amount of protected area in the Dawson Creek TSA portion of the Dawson Creek Forest District. Therefore, PAS was not considered in the current timber supply analysis. However, decisions under PAS will be considered in future timber supply analysis. The information outlined below identifies the scope of the PAS work in the Dawson Creek TSA.

Six of the Prince George Forest Region's ecosections are fully or partially represented within the boundaries of the Dawson Creek Forest District. Collectively these ecosections currently have 1.39 percent of their area fully protected and an additional 0.02 percent partially protected.<sup>32</sup>

#### Areas of Interest (AOIs)

Study areas are established under the PAS and are subject to Interim Management Guidelines designed to protect resource values while areas await review and possible designation as protected areas. Within the Dawson Creek Forest District, study areas which have been considered under the PAS include Butler Ridge, Peace River-Boudreau Lake, Pine Pass/Mt. Lemoray, Elephant Ridge, Bearhole-Chain lakes, Wapiti-Onion Lake and Kakwa addition north.

Several small areas (*i.e.*, areas of interest less than 30 square kilometres) are being considered along the Peace River, within the Peace Lowland ecosection. These sites represent approximately 14.0 square kilometres, with some sites located in the Fort St. John Forest District. Many of these sites have high ratings for PAS values and are being reviewed by the Dawson Creek Land and Resource Management Planning process (LRMP) and the Regional Protected Areas Team (RPAT). Currently, the Dawson Creek Forest District has 6.50 percent of area being targeted for protection, resulting in a 5.11 percent increase above present full and partial protection.

### 3.2 Recreational Use

It is estimated that approximately 394 844 recreational user-days (RUDs) are spent in the TSA annually. This includes 274 844 RUDs in provincial parks and recreation areas, and a further 40 000 RUDs at recreation sites managed by the Ministry of Forests. The remaining 80 000 RUDs occur on other Crown lands within the TSA.

Residents of this region spend an average of two days more per resident enjoying recreational opportunities than the provincial average (15.4 days per resident)<sup>33</sup>. As well, average recreation expenditures of \$48.95 per day (household) in the Prince George Forest Region were slightly higher than the provincial average of \$46.55 per day.

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<sup>31</sup> Province of British Columbia (1993), *A Protected Area Strategy for British Columbia*.

<sup>32</sup> Ministry of Forests (1995) *Omineca-Peace Protected Areas Strategy Report*.

<sup>33</sup> Ministry of Forests (1991), *Outdoor Recreation Survey 1989/90*.

Among the more popular recreation sites are Heart Lake, Carbon Lake, Moose Lake, Stoney Lake, Wapiti River, Quintette Mountain and several snowmobile trails. Some of the more intensively used provincial parks include Swan Lake, Moberly Lake, Kiskatinaw and East Pine. Table 3-3 summarizes park use in the Dawson Creek Forest District.

Swan Lake Provincial Park is located 35 kilometres south-east of Dawson Creek off of Highway #2. The park has been a popular recreation site with local residents for decades. Moberly Lake Provincial Park, situated between Hudson's Hope and Chetwynd, occupies 98 hectares of land on the south shore of Moberly Lake. The park remains one of the most popular day and over-night recreation sites in the Dawson Creek Forest District.

Kiskatinaw Provincial Park is located north of Dawson Creek on Mile 28 of the Alaska Highway. This park is a popular destination for campers. East Pine Provincial Park is located near the junction of the East Pine and Murray Rivers. These parks offer good fishing, boating and canoeing. With the recent completion of road access from Tumbler Ridge, the spectacular Kinuseo Falls will likely become a more popular recreation destination.

Park	Class <sup>35</sup>	Area (ha)	Campgrounds (sites)	Total Use (RUDs)
Dunlevy	RA	110	0	13 171
East Pine	A	14	0	18 036
Gwillim Lake	A	9 199	40	20 276
Kiskatinaw	A	58	28	30 683
Moberly Lake	A	98	115	40 410
Monkman	A	40 170	42	18 517
One Island Lake	A	61	85	16 088
Sudeten	A	5	15	15 232
Sukunka Falls	A	360	0	0
Swan Lake	A	67	42	87 208
Taylor Landing	A	2	0	15 225
<b>Total</b>		<b>50 144</b>	<b>367</b>	<b>274 846</b>

<sup>34</sup> Ministry of Environment, Lands and Parks (1994), *Park Data Handbook 1993*.

<sup>35</sup> Designation class of the park. Classes include A, B, C, Recreation Area (RA) and Wilderness Conservancy (WC).



## 4.0 Current Forestry Operations

This section provides an overview of the timber harvesting land base, current management practices and the history and apportionment of the allowable annual cut (AAC) in the Dawson Creek TSA.

### 4.1 Timber Harvesting Land Base

The Dawson Creek TSA covers a total land area of 2 277 753 hectares of which 1 478 839 hectares (64.9 percent) are managed by the Forest Service as productive forest. Current forest management activities determine how much of the productive land base is available for timber harvesting. The following areas are excluded from the timber harvesting land base:

- Areas not managed directly by the Forest Service (*i.e.*, parks and recreation areas);
- Forest land not administered as part of the TSA (*i.e.*, woodlot licences and TFLs);
- Non-forest areas and non-commercial cover areas;
- Inoperable areas (*i.e.*, areas classified as unavailable for harvest for terrain-related or economic reasons);
- Areas with sensitive soils, important wildlife values and non-merchantable forest types (*i.e.*, areas occupied by timber stands of low volume or non-merchantable species);
- Existing roads, trails, seismic lines, landings, and right of ways;
- Future roads, trails, seismic lines, and landings.

Table 4-1 summarizes the timber harvesting land base for the Dawson Creek TSA.<sup>36</sup>

<b>Table 4-1</b>		
<b>Dawson Creek TSA Timber Harvesting Land Base</b>		
<b>Classification</b>	<b>Area (ha)</b>	<b>Proportion of area (%)</b>
<b>Total Area</b>	<b>2 277 753</b>	<b>100.0</b>
Productive Forest	1 478 839	64.9
Current Reductions to Crown Forest	(702 205)	31.0
Additions to Crown Forest	35 028	1.5
<b>Current Timber Harvesting Land Base</b>	<b>811 662</b>	<b>35.6</b>
Future Reductions for Roads	(19 987)	0.9
<b>Long-Term Timber Harvesting Land Base</b>	<b>791 675</b>	<b>34.7</b>
Long-Term Timber Harvesting <b>Coniferous Land Base</b>	526 481	23.1
Long-Term Timber Harvesting <b>Deciduous Land Base</b>	265 194	11.6

<sup>36</sup> A more detailed outline is available in the *Dawson Creek TSA Timber Supply Analysis Addendum* report included as an appendix in the Discussion Paper.

## 4.2 Current Management Practices

Timber supply is related to forest inventory, forest site productivity, and forest management activity. The *Dawson Creek TSA Timber Supply Analysis* describes the timber supply subject to the main forest cover objectives: cutblock adjacency, green-up and visual quality. Other management practices outlined in the timber supply analysis include basic silviculture levels, forest health and unsalvaged losses, utilization standards, and minimum harvestable ages.

Timber harvesting is usually delayed in adjacent areas to prevent harvesting from becoming overly concentrated. This is achieved by prescribing minimum distances (e.g., 400 m) between cutblocks. Regenerating stands are typically required to reach a height of three metres in a harvested area before an adjacent site may be harvested. The time required for the regenerated trees to grow to this height is referred to as the "green-up" period. In general, no more than 33 percent of an area being developed for timber harvesting may be occupied by stands that have not achieved the minimum height requirement.

Four visual quality objectives (VQOs), namely preservation, retention, partial retention, and modification, define the maximum allowable limits of harvest disturbance in visually sensitive areas. Furthermore, in visually sensitive areas, the green-up requirement for minimum tree height is approximately five metres. The proportion of visually sensitive areas that are subject to the five metre height restriction depends on the specific VQOs for the area. About 25 percent of the timber harvesting land base in the TSA is being managed to meet specific VQOs.

The *Timber Supply Analysis* also considers several other management practices. Among these is basic silviculture, which is the requirement to establish free-growing stands of acceptable tree species following harvesting. As well, losses of merchantable timber due to insect, fire and wind damage are incorporated. Notably, losses due to diseases, particularly tomentosus root disease, have not been explicitly considered although it may be captured, in part, under windthrow losses. Management practices also require that stands reach a certain minimum age before harvest. The minimum age established for the Dawson Creek timber supply analysis varies by leading species type, and is based upon the earliest age at which stands are within five percent of their maximum average growth. The timber supply analysis could not incorporate all of the practices being developed in the new Forest Practices Code, as the data and assumptions for analysis were completed one year before the Code came into effect.

### 4.3 Historical AAC Levels<sup>37</sup>

In 1987, the Dawson Creek TSA AAC was set at 1 250 000 cubic metres. The apportionment of this AAC consisted of 570 000 cubic metres of deciduous and 680 000 cubic metres of coniferous volume. In 1989, the AAC was reassessed and raised to 1 710 173 cubic metres, consisting of 710 173 cubic metres of coniferous and 1 000 000 cubic metres of deciduous volume. In 1990, the AAC was increased to 1 860 173 cubic metres (860 173 cubic metres coniferous and 1 000 000 cubic metres deciduous)<sup>38</sup>. The 150 000 cubic metre increase in coniferous volumes represented the addition of height class 2 pine stands. This volume was not allocated pending an update of inventory information.

### 4.4 Current Apportionment

The current apportionment of the Dawson Creek TSA AAC is outlined in Table 4-2. The coniferous AAC is 841 323 cubic metres and the deciduous AAC is 985 000 cubic metres. However as mentioned, 150 000 cubic metres of the coniferous AAC has not been allocated and as a result the current harvest level is better reflected by an AAC of 691 323 cubic metres for the purposes of this report.

Licensee	Coniferous (m <sup>3</sup> )	Deciduous (m <sup>3</sup> )	Total (m <sup>3</sup> )
<b>1. Forest Licences, Replaceable</b> Canadian Forest Products Ltd. West Fraser Mills Ltd.	87 046 409 567		496 613
<b>2. Small Business Forest Enterprise Program (SBFEP)</b> Any Category (sec. 16) Category 1 (sec. 16) Category 2 (sec. 16) Bid Proposal TSL (major) less than 10 000 m <sup>3</sup>	124 650 10 000 44 490 72	81 000	260 212
<b>3. Forest Service Reserve</b>	15 498		15 498
<b>4. Temporary Licences (<i>currently not allocated</i>)</b>	150 000		150 000
<b>5. Pulpwood Agreement, TSL</b> Louisiana-Pacific PA 10 Louisiana-Pacific PA 13		452 000 452 000	904 000
<b>Total</b>	<b>841 323</b>	<b>985 000</b>	<b>1 826 323</b>

<sup>37</sup> The timber volumes discussed in this section includes volumes associated with woodlots. Woodlots are not considered in the timber supply analysis.

<sup>38</sup> The timber supply analysis excludes AAC available in Woodlot Licences. In the Dawson Creek TSA approximately 18 850 cubic metres are allocated under coniferous Woodlot Licences and 15 000 under deciduous Woodlot Licences.

The analysis of the coniferous harvest forecast (contained in Section 5.0) assumes that as the AAC increases, there will be changes in harvesting, manufacturing and silviculture activities, and related economic returns, proportional to that supported by the current AAC. However, the *Forest Act* would first require that an increase in AAC be apportioned to various tenure types in an apportionment plan approved by the Minister. Since this timber could actually support a significantly different mix of activities than is currently in place there is some risk associated with this assumption.

It is also important to note that forest licences held by coniferous licensees do not require them to harvest their entire AAC allocation in any one year. The licensee's actual harvest rate may deviate by plus or minus 50 percent in any one year and, in the case of a small AAC allocation, the licensee may harvest for only one or two years in the five-year period. However, over the five-year period each licensee's total harvest must be within plus or minus 10 percent of its total AAC allocation.

The deciduous AAC under the SBFEP is managed in a manner similar to that of the coniferous AAC. However, the deciduous AAC allocated under Louisiana-Pacific's Pulpwood Agreements (PA's) 10 and 13 does not follow the cut control requirements of a forest licence. The PA's specifically require Louisiana-Pacific to make a "best effort" to obtain deciduous timber volumes from alternative sources before utilizing volumes from the pulpwood areas. Timber from Crown lands may then be used to supplement deciduous timber short falls below the 452 000 cubic metre level outlined for each PA. For example, in 1993, PA 10 supplied the Louisiana-Pacific OSB plant with 92 032 cubic metres of deciduous timber.<sup>39</sup>

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<sup>39</sup> For the socio-economic assessment the "typical" deciduous processing for Louisiana-Pacific is used (See Section 6.4).



## **5.0 Coniferous Operations**

This section provides an overview of the forest companies in the TSA, presenting information on; fibre supply, industry structure, the coniferous harvest forecast, and associated economic implications.

### **5.1 Major Licensee Company Profiles**

Two major coniferous licensees, Canadian Forest Products Ltd. (Canfor) and West Fraser Timber Co. Ltd. (West Fraser), operate processing facilities within the Dawson Creek TSA. The TSA also has several smaller processing operations.

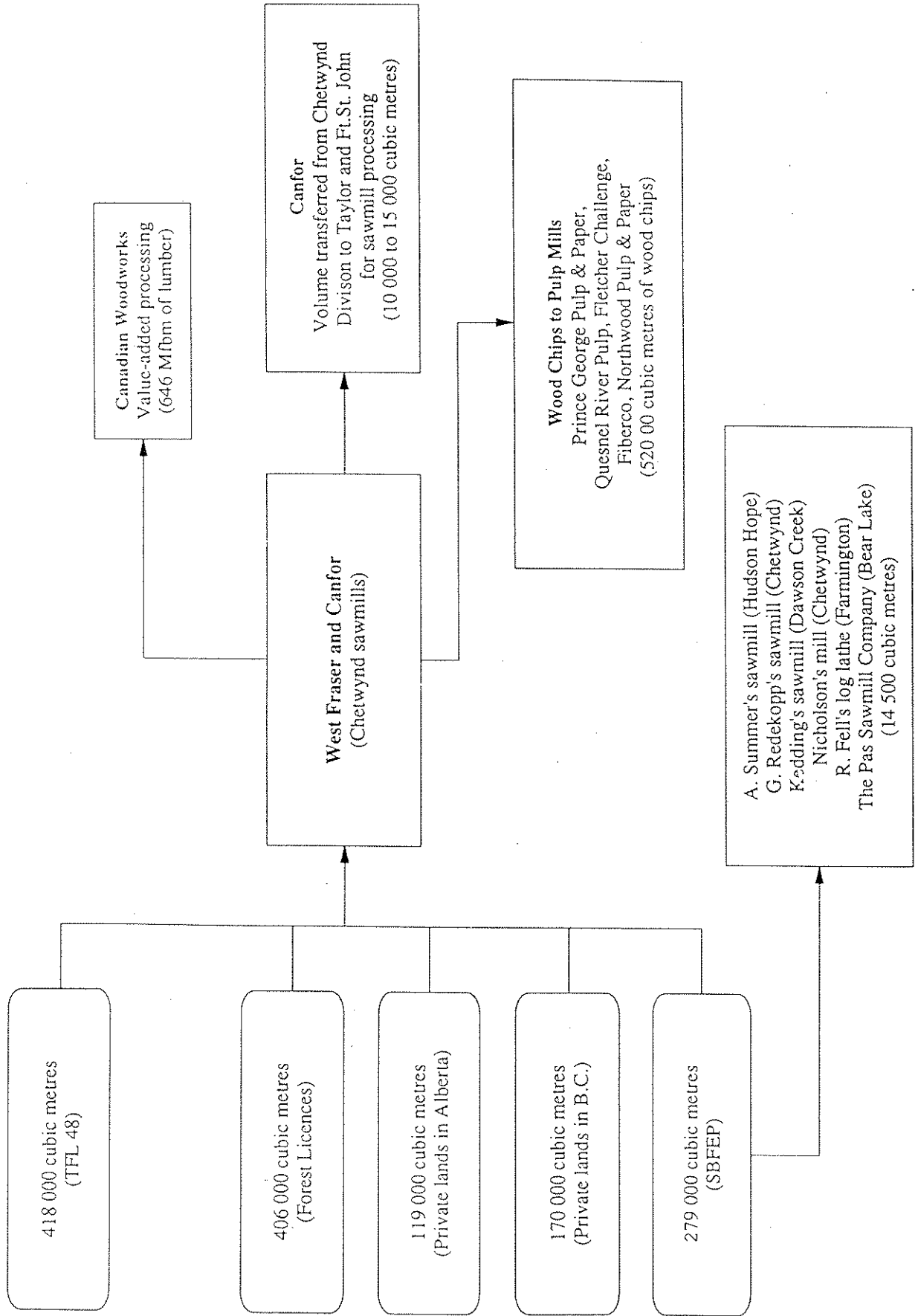
Canfor, a major Canadian integrated forest products company based in Vancouver, has extensive forest operations and modern manufacturing facilities on the south coast and in the northern interior of B.C., in northern Alberta, and in the north-western United States. Canfor has been operating in the Chetwynd area for the past 30 years producing dimension lumber and pulp chips. The mill at Chetwynd was purchased in 1964 from the Ft. St. John Lumber Company. Since then, the mill has undergone several upgrades; currently there are plans to put in a new planer and to replace the beehive burner.

West Fraser is a Canadian forest products company with forest and manufacturing operations in British Columbia and Alberta. The company was founded in 1955 and has grown to include 3600 employees at seven wholly-owned sawmills, two joint-venture sawmills, a joint-venture pulp mill, a linerboard and kraft paper mill, a joint-venture newsprint mill and a chain of home-improvement stores. In the Dawson Creek TSA, West Fraser operates a sawmill at Chetwynd which produces dimension lumber and pulp chips.

### **5.2 Coniferous Fibre Flows**

The coniferous fibre supply for the two large sawmills and the smaller and non-TSA processors is shown in Figure 5-1. This figure illustrates area processors' 1993 dependence on fibre from the tree farm licence (TFL #48), forest licences, the small business forest enterprise program (SBFEP) and private land both inside and outside the TSA. Based on the information supplied by Canfor and West Fraser, the coniferous Crown timber volumes from the Dawson Creek TSA tenures provided approximately 41.0 percent of their total 1993 requirements. As well, some of the smaller processors and two mills outside the district regularly obtain a portion of their volume from within the TSA.

Figure 5-1  
 Coniferous Fibre Flows in the Dawson Creek TSA: 1993



### 5.3 Industry Structure

This section discusses the employment coefficients estimated for the coniferous AAC in the Dawson Creek TSA. Table 5-3 summarizes the employment coefficients derived for each employment category related to the TSA harvest.

#### 5.3.1 Harvesting

##### Site Employment

All timber volumes in the Dawson Creek TSA are generally harvested by independent contractors, either through contract directly from the major licensees or through contracts awarded under the SBFEP. Harvesting contractors typically fall into one of three categories: equipment-intensive contractors, mixed-conventional contractors, and horse-loggers.

Equipment-intensive contractors supply the largest proportion of timber volume to TSA mills typically utilizing machinery such as cable systems, fellerbunchers, delimiters, loaders and skidders.<sup>40</sup> These contractors are the most labour efficient harvesters in the TSA, having the capability to remove large volumes of timber in a short period of time (which is often a site- and weather-related requirement).

Mixed-conventional contractors are collectively the second largest harvester of timber supplying the area mills. Although there is no clear distinction between the equipment-intensive category and the mixed-conventional category, increased employment requirements are associated with the latter as the contractors are less dependent on mechanized equipment. They typically conduct a larger portion of their operations manually (*i.e.*, delimiting and bucking), or with less efficient, older equipment. In general, some form of mechanical felling system would be used on most harvest sites, however hand-felling techniques are still commonly used in mixed coniferous and deciduous stands.

The third category of contractors, horse-loggers, provided the smallest component of the TSA harvest. Horse logging operations, well suited for operations in some sensitive harvesting areas, usually involve several horse teams working on coniferous or mixed coniferous/deciduous harvest sites. Horse logging is labour intensive with the only conventional heavy equipment being a loader or self-loading logging trucks at roadside landings.

A variety of site factors influence the employment requirements at a particular harvest site including the terrain, soil type, time of year, weather conditions and experience of the harvesting crew.

##### Log Hauling

Log hauling, similar to harvesting, is performed by independent contractors. In fact, many contractors in the TSA are engaged in both log hauling and harvesting. Employment in log hauling varies, depending on the distance that timber is transported. TSA harvest sites range from only a few kilometres to 250 km from a mill. In other cases, timber may be transported from the harvest site to as far away as Prince George. Though not considered in the Dawson Creek TSA employment coefficients, some private wood (both coniferous and deciduous) is transported into TSA processing facilities from the Yukon and Alberta.

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<sup>40</sup> Although not used on every site, other equipment such as soft track skidders/crawler tractors, and forwarders are used in the TSA. Also, cable logging systems are being utilized in steep and sensitive sites.

**Road Building and Maintenance**

Harvesting activities require the construction, maintenance and upgrading of logging roads. Forestry road crews perform a variety of tasks including sub-grade construction, reconstruction, grading, culvert installation, gravelling, bridge construction, sanding and salting, snow removal, blasting, snag falling, dust control, brush control, landing construction, land rehabilitation, grass seeding, environmental audit, hazard abatement, installation of erosion bars, and full deactivation. Roads built for horse logging tend to be narrower with shorter distances required and often depend on existing road structures.

**5.3.2 Processing****Mill Site**

The major TSA licensees, Canfor and West Fraser, have sawmills in Chetwynd which process the majority of the TSA coniferous volumes. The TSA is also a source of timber for several small, independent processing facilities in the TSA: G. Redekopp's sawmill in Chetwynd; Nicholson's mill in Chetwynd; A. Summer's sawmill near Hudson's Hope; Kedding's sawmill near Dawson Creek.; and R. Fell's log lathe in Farmington. Emporium Investments operates a wood stock remanufacturing facility producing pallet material near Pouce Coupe.

Several companies located outside the TSA process Dawson Creek TSA timber. Canadian Woodworks value-added facility located near Prince George, receives rough lumber from West Fraser's Chetwynd sawmill. The Pas Lumber Company's sawmill, also near Prince George has also regularly received log volumes in recent years.<sup>41</sup> To best utilize the specific dimensions of the timber profile, Canfor's Chetwynd Division sends approximately 10 000 to 15 000 cubic metres annually to its mills in Taylor and Ft. St. John. Beginning in 1994, timber was also hauled to Dunkley Lumber Ltd. in Strathnaver (near Prince George) and to Plateau Forest Products in Vanderhoof.

Canfor's Chetwynd sawmill utilized approximately 715 000 cubic metres of coniferous volume in 1993. This plant employs 174 hourly staff and 34 salaried staff. Canfor's sawmill produces approximately 273 000 cubic metres of wood chips, all of which are supplied to Prince George Pulp and Paper. In 1993, West Fraser's sawmill utilized approximately 688 000 cubic metres. The staffing at this mill consisted of 175 hourly and 34 salaried staff (approximately half the salaried staff are associated with administration). West Fraser's sawmill contributed approximately 254 000 cubic metres of wood chips to Quesnel River Pulp, Prince George Pulp and Paper, Cariboo Pulp and Paper, Fletcher-Challenge, Fiberco and Northwood Pulp and Paper.

**Administration**

Licensees maintain supervisory and administrative staff who oversee operations in their woodlands operations, processing plants and local and head offices. West Fraser's administrative staff representing approximately 32 employees, consists of general office, sales, and corporate staff at the Chetwynd sawmill and industry staff at the head office. Canfor has approximately 26 employees

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<sup>41</sup> According to I. Hanson, The Pas Lumber Company has received some timber from the Dawson Creek TSA over the past few years but likely will not receive any in 1994.

associated with administration at the Chetwynd sawmill and with its head office operations.<sup>42</sup>

### 5.3.3 Forestry Services

#### Silviculture

Silviculture activities include site preparation, planting, brushing, aerial and ground herbicide application, girdling, fertilization and spacing. The Ministry of Forests is responsible for funding silviculture in all areas harvested prior to 1987 and in areas harvested under the SBFEP after 1987. Licensees are responsible for all basic silviculture activities in areas they harvested after 1987. The silviculture activity completed under the SBFEP and corresponding employment at the licensees' recently harvested sites, are used to derive the silviculture employment coefficient for the Dawson Creek TSA.

#### Other

This category of forestry-service employment includes employment associated with licensees' expenditures on labour contracted to perform a variety of tasks related to the harvest sites. These tasks typically include engineering, reconnaissance, bark beetle probes, mapping, cruising, layout, waste surveys and landing reclamation (subsoiling).

Activity	TSA Employment Coefficient (PY/1000 m <sup>3</sup> )	Provincial Employment Coefficient (PY/1000 m <sup>3</sup> )
<b>Harvesting</b>		
Site Employment	0.20	0.21
Log Hauling	0.07	0.07
Road Building and Maintenance	0.05	0.05
<b>Total Harvesting</b>	<b>0.32</b>	<b>0.33</b>
<b>Forestry Services</b>		
Silviculture	0.03	0.05
Other	0.01	0.02
<b>Total Forestry Services</b>	<b>0.04</b>	<b>0.07</b>
<b>Processing</b>		
Mill Site	0.28	0.45
Administration	0.04	0.06
<b>Total Processing</b>	<b>0.32</b>	<b>0.51</b>
<b>Total</b>	<b>0.68</b>	<b>0.91</b>

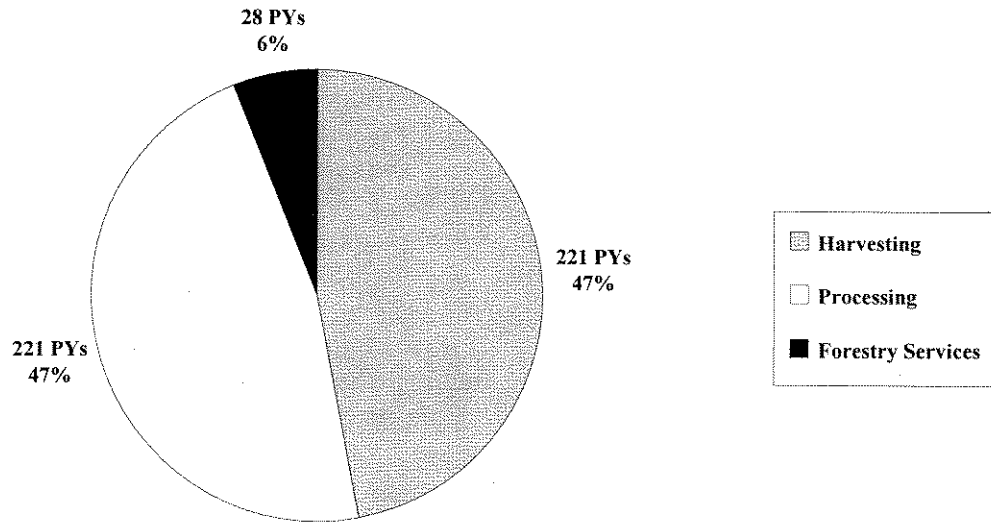
<sup>42</sup> Head office employment has been identified by the licensees and represents a portion of head office employment prorated by the companies' total harvest level.

#### **5.3.4 Current Direct (Forestry) Employment**

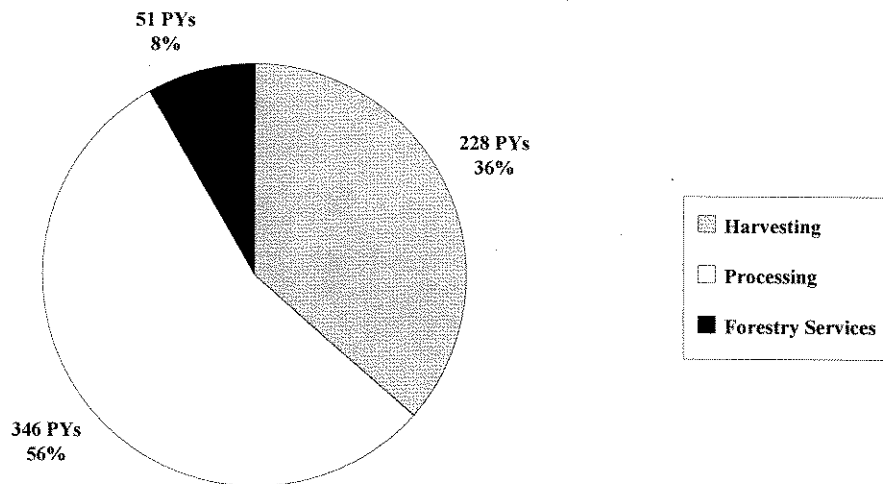
The provincial direct forestry employment level (TSA and provincial residents) associated with the current coniferous harvest level of 691 323 cubic metres is approximately 629 PY. At the TSA-level, Dawson Creek TSA timber supports approximately 470 PY of local direct employment. Figure 5-2 illustrates the distribution of direct employment among the various job categories.

**Figure 5-2**  
**Current Direct (Forestry) Employment Associated with the Dawson Creek TSA AAC**  
(Current Coniferous Harvest: 691 323 cubic metres)

**Dawson Creek Current Direct (Forestry) Employment (470 PY)**



**Provincial Current Direct (Forestry) Employment (629 PY)**  
(Including Dawson Creek TSA Employment)



#### 5.4 Harvest Forecast

The revised base coniferous harvest forecast is described in the *Dawson Creek TSA Timber Supply Analysis Addendum*. The Addendum confirms an average timber availability of 164 000 cubic metres of small pine (annually), over the planning horizon. The forecast involves an immediate 15.5 percent increase in the current Dawson Creek TSA coniferous AAC, from 841 323 cubic metres to 972 000 cubic metres annually. The non-declining harvest level of 972 000 cubic metres could be maintained over time and represents the long-term harvest level (LTHL).

The increase in the coniferous timber supply is possible due to the inclusion of forest types such as small pine stands previously not considered harvestable, and expansion of the landbase resulting from changed deciduous assumptions. Small pine stands are defined as mature pine stands which have not reached 19.5 metres in height (Height Class 2). It has also been assumed that timber yields from regenerated stands will be higher than original projections.

The long-term harvest level is the harvest rate at which the total growing stock remains at a constant level over time. A constant stock is maintained when the annual growth volume is equal to the annual harvest volume. However, the long-term harvest level of 972 000 cubic metres per year is less than the maximum sustainable harvest level, largely because of reductions for non-timber values. Non-timber values important in the Dawson Creek TSA include visual quality objectives (VQO), wildlife values and recreation values.

Though the base harvest forecast represents an 15.5 percent increase in the current coniferous AAC, harvesting at a rate of 972 000 cubic meters per year would represent a 40.6 percent increase in the TSA harvest level. The discrepancy between the AAC and the harvest level is attributable to the 150 000 cubic metre increase in the AAC that occurred in 1990. This increase, the result of the projected availability of 150 000 cubic metres of harvestable small pine stands, was never apportioned nor harvested.

As well, coniferous AAC apportionment does not reflect harvesting activity associated with log grades 3, 5 and 6<sup>43</sup>. These log grades represent decadent, non-suitable and under-sized timber volumes removed from operable harvest sites in addition to volumes harvested as part of the AAC. In the TSA, log grades 3, 5 and 6 represent approximately 3.0 percent of the timber volume harvested<sup>44</sup>.

#### 5.5 Coniferous Economic Implications

In this section, the employment, employment income and government revenue impacts associated with the revised base harvest forecast are reviewed. Employment and employment income impacts for residents of the Dawson Creek TSA are analyzed in Section 5.5.1. In Section 5.5.2, the provincial employment, employment income and government revenue impacts are assessed.

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<sup>43</sup> See Appendix A for definition of wood classes.

<sup>44</sup> C. Jahn, R.O. Planning, Ministry of Forests, Dawson Creek Forest District.

### 5.5.1 Dawson Creek TSA Impacts

#### Employment and Income<sup>45</sup>

The analysis identifies three types of employment that would be affected by changes in Dawson Creek harvest levels: direct, indirect and induced employment. Direct employment includes forest sector jobs associated with harvesting, processing, and forestry services on TSA forest lands. Indirect employment is generated by industries that support the forest sector, such as mill and equipment suppliers<sup>46</sup>. Induced employment is generated through the re-spending of employment income, for example at local retail outlets. The methodology applied to estimate employment impacts relies on assumptions and is subject to limitations as outlined in Appendix B.

Forestry activities in the Dawson Creek TSA provide significant employment benefits for area residents. For example, approximately 75 percent of the total direct employment created by the Dawson Creek TSA harvest accrues to TSA residents. Estimates of current and projected direct, indirect and induced employment and employment income levels associated with the harvesting and processing of the Dawson Creek TSA coniferous harvest are shown in Table 5-2.<sup>47</sup>

Under the revised coniferous base harvest forecast, the harvest level increases from 691 323 to 972 000 cubic metres. This 40.6 percent (280 677 cubic metre) increase would increase direct employment by approximately 191 PY to a total of 661 PY per year. Associated with this increase in direct employment would be a \$6.2 million increase in direct employment income resulting in a total of \$21.4 million per year. Since 972 000 cubic metres represents the non-declining harvest level, no future changes in direct employment levels would occur.

The 40.6 percent increase in harvest would also lead to a 73 PY increase in the indirect and induced employment category levels. An employment increase of this magnitude would result in a corresponding employment income increase of \$1.5 million per year. Total employment (direct, indirect and induced) supported by the base harvest level is about 914 PY, with associated annual employment income of approximately \$26.7 million.

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<sup>45</sup> Annual employment income is presented after-tax in millions of 1993 dollars .

<sup>46</sup> Employment associated with log hauling and roadbuilding and maintenance were included in the direct category. See Appendix B for an explanation of the impact methodology employed.

<sup>47</sup> The estimates of future employment and employment income levels are based on the assumption that future harvest levels will be the same as the revised base harvest forecast volume (40.6 % higher than the current harvest level) . See Appendix E for estimates of employment and employment income associated with alternative harvest levels in the range suggested by the *Analysis Addendum* report.

Decades	Harvest (m <sup>3</sup> /year)	Employment (PY/year)			Employment Income (after-tax \$1993 millions/year)		
		Direct <sup>48</sup>	Indirect/ Induced	Total	Direct <sup>49</sup>	Indirect/ Induced	Total
Current Harvest	691 323	470	180	650	\$15.2	\$3.8	\$19.0
1-25	972 000	661	253	914	\$21.4	\$5.3	\$26.7

### 5.5.2 Provincial Impacts

#### Employment and Income

Employment supported by fibre from the Dawson Creek TSA harvest, but accruing to workers residing outside the TSA is captured at the provincial level. Most of this non-TSA employment is the result of processing at six pulp mills which receive wood chips from the TSA harvest.<sup>50</sup> Canadian Woodworks Ltd., near Prince George, and The Pas Lumber Company, at Bear Lake, have also generated processing employment associated with the Dawson Creek TSA in recent years.<sup>51</sup> The remaining non-TSA employment occurs mostly in the areas of harvesting, silviculture, administration and engineering.

The current harvest level (691 323 cubic metres), supports an estimated 629 PY of direct forestry employment and contributes \$20.8 million in annual direct employment income. This level of harvest also provides 947 PY of combined indirect and induced employment, generating \$19.7 million in related employment income.

Increasing the rate of harvest to the revised base harvest level (972 000 cubic metres), would lead to a 256 PY increase in provincial direct employment to 885 PY. In turn, annual direct employment income would increase by \$8.4 million to \$29.2 million. Additionally, indirect and induced employment levels would increase by 385 PY to 1332 PY. This increase would be accompanied by a \$7.9 million rise in annual provincial indirect and induced employment income.

Total (direct, indirect and induced) provincial employment attributable to the revised base harvest level would be approximately 2217 PY per year. Associated with this 641 PY increase is a corresponding increase in employment income of \$16.3 million to a total of \$56.8 million per year.

<sup>48</sup> Includes harvesting, log hauling, road building, processing, silviculture, and administrative employment. Based on information obtained from individual licensees and area contractors. (See Appendix B.)

<sup>49</sup> Direct income is based on payroll information from the licensees, contractors and from Statistics Canada's 1991 Census. (See Appendix B.)

<sup>50</sup> Quesnel River Pulp Co., Prince George Pulp and Paper Div., Cariboo Pulp and Paper Co. Ltd., Fletcher-Challenge Canada Ltd., Fiberco Pulp Inc. and Northwood Pulp and Paper Co.

<sup>51</sup> Although The Pas Lumber was unsuccessful in obtaining TSA timber in 1994, other Prince George area mills benefited from the Dawson Creek TSA harvest.

At the 972 000 cubic metre level, non-TSA residents would represent approximately 224 PY of the direct forestry employment total.

Decade	Harvest (m <sup>3</sup> /year)	Employment (PY/year)			Employment Income (after-tax \$1993 millions/year)		
		Direct <sup>52</sup>	Indirect/ Induced	Total <sup>53</sup>	Direct	Indirect/ Induced	Total
Current Harvest	691 323	629	947	1576	\$20.8	\$19.7	\$40.5
1-25	972 000	885	1332	2217	\$29.2	\$27.6	\$56.8

### Government Revenues

Forestry activities generate significant annual government revenues for federal, provincial and local governments. Estimates of provincial and regional government revenues associated with the current coniferous harvest and the base harvest forecast are summarized in Table 5-4.<sup>54</sup>

Government revenues are separated into variable and fixed revenues. Variable government revenues change proportionally as the harvest level changes, while fixed government revenues depend on other variables. Local government revenues are assumed to be dependent on the existence of the processing facility rather than on the amount of timber processed in it. Currently, the harvest volume of 691 323 cubic metres generates approximately \$16.7 million in variable government revenue. The potential increase in the coniferous harvest under the revised base harvest forecast (to 972 000 cubic metres) would increase annual government revenues to approximately \$23.4 million.

Variable annual provincial government revenues associated with the base harvest forecast are derived from the following: stumpage and rent of \$13.1 million; personal income taxes of \$5.9 million; scaling, residue and waste fees of \$0.5 million; and other provincial sources of \$3.9 million. Fixed annual government revenues consist of local taxes for the two coniferous processing facilities and total approximately \$0.7 million.

<sup>52</sup> Includes harvesting, log hauling, road building, processing, silviculture and administrative employment. Based on employment information obtained from individual licensees and contractors. (See Appendix B.)

<sup>53</sup> Based on provincial forest industry employment multiplier of 2.5. Economics and Trade Branch, MOF. (See Appendix B.)

<sup>54</sup> Federal personal income taxes are estimated to be an additional \$8.0 million at the 691 323 cubic metre harvest level and \$10.9 million at the 938 000 cubic metre level (see Appendix C).

<b>Table 5-4</b>		
<b>Revised Coniferous Base Harvest Forecast: Government Revenue</b>		
<b>Category</b>	<b>Current Harvest Level -</b> (691 323 m <sup>3</sup> )	<b>Base Forecast Harvest Level</b> Revised (972 000 m <sup>3</sup> )
	(\$1993 millions/year)	
<b>Variable Provincial:</b>		
Stumpage and Rent <sup>55</sup>	\$9.3	\$13.1
Personal Income Tax	4.2	5.9
Scaling, Waste and Residue Fees	0.4	0.5
Other Taxes	2.8	3.9
<b>Fixed Local:</b>		
Local Revenues	0.7	0.7
<b>Total Revenues</b>	<b>\$17.4</b>	<b>\$24.1</b>

<sup>55</sup> 1994 stumpage rates were applied to the last four years of a three-year average (1991, 1992, and 1993) is used to determine a stumpage rate of \$8210 per 1000 cubic metres. In 1994, the stumpage rate for coniferous harvest from the Dawson Creek TSA was \$15 180 per 1000 cubic metres.

## 6.0 Deciduous Operations

In this section, levels of economic activity associated with the harvesting and processing of deciduous timber located within the Dawson Creek Forest District are reviewed. Forest district and provincial level employment and employment income levels related to the deciduous harvest are assessed in Sections 6.3.1 and 6.3.2.<sup>56</sup>

### 6.1 Major Licensee Company Profile

Louisiana-Pacific Corporation, a major U.S. forest products company based in Oregon, directly employs 13 000 people at 129 operations located throughout the U.S., Mexico and Canada. Louisiana-Pacific has stewardship of over one million hectares of timber land producing: oriented strand board (OSB) structural panels, siding, engineered LVL-joists, laminated veneer lumber, medium density fibreboard, wallboard and construction panels, residential insulation, plywood, and windows and doors. Three of its mills also produce chlorine-free pulp, used to make paper, and dissolving pulp, the raw material for rayon and several other products.

Louisiana-Pacific Canada Ltd. began operations in the Dawson Creek TSA in 1987, with the construction of an OSB mill in Dawson Creek. The company later built a zero-effluent kraft pulp mill near Chetwynd. Elsewhere in Canada, Louisiana-Pacific operates a FiberBond plant in Port Hawkesbury, NS, and is currently building an OSB plant near Swan River, MB.

### 6.2 Deciduous Fibre Flows

The Dawson Creek TSA deciduous apportionment represents only a portion of Louisiana-Pacific's total fibre supply. Additional fibre is sourced from private stands located both inside and outside the forest district. Further complicating the fibre supply picture are the requirements Louisiana-Pacific must fulfil for its deciduous AAC associated with Pulpwood Agreements (PA's) 10 and 13. The administration of the PA's result in deciduous timber volumes from Crown land being managed differently than Crown coniferous timber volumes. These PA's require that Louisiana-Pacific maximize the amount of deciduous timber from alternative sources (*i.e.*, private lands) prior to accessing Crown timber supplies. In effect, Crown lands are used to supplement deciduous timber short-falls, below the 452 000 cubic metre level outlined for each PA. Therefore, depending on the available private land volume, the Dawson Creek TSA AAC contribution to Louisiana Pacific's fibre requirements are highly variable. Deciduous timber volumes associated with the SBFEP are harvested in a manner similar to that for the coniferous AAC.

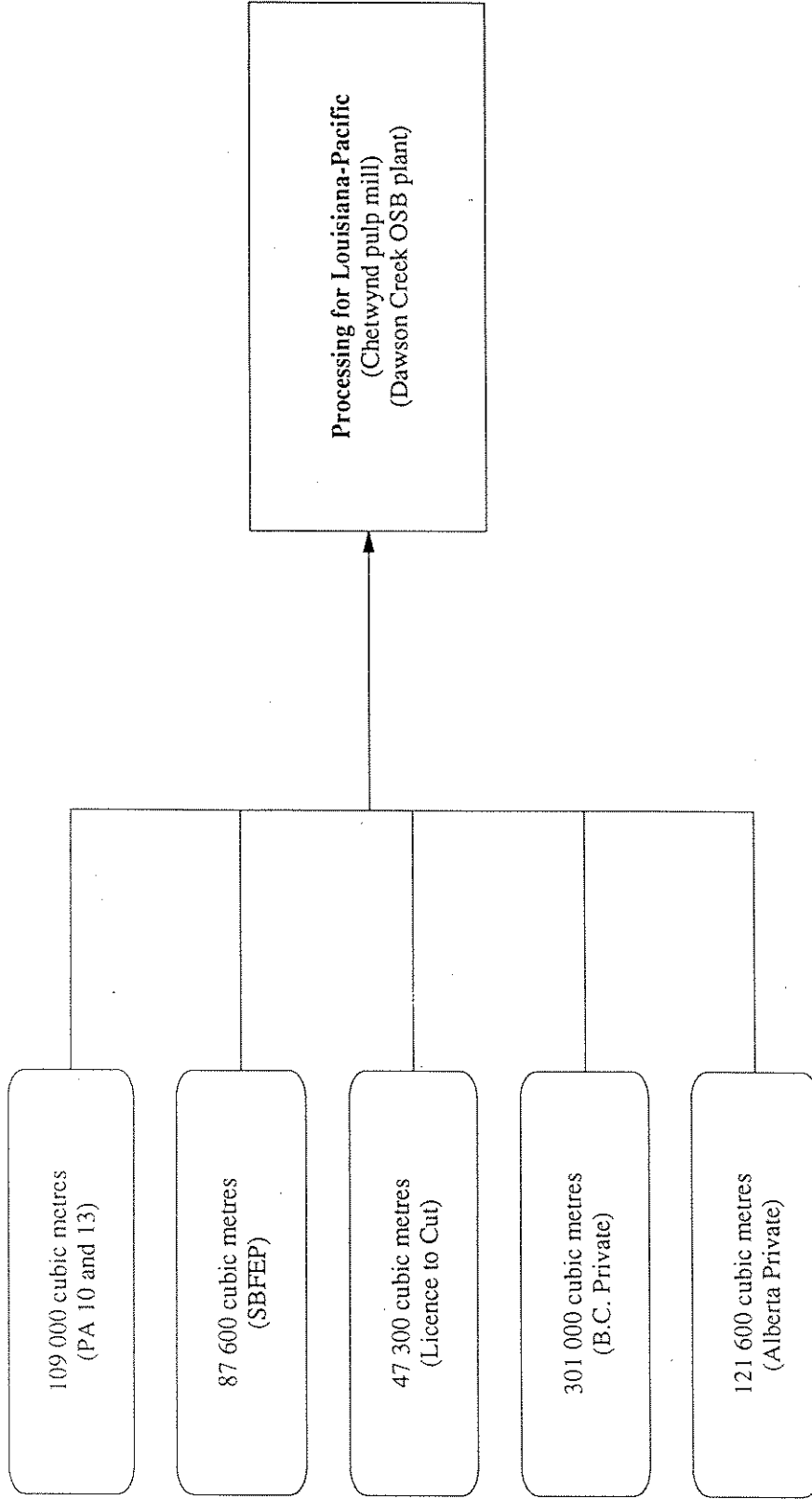
Louisiana-Pacific's fibre supply from all sources is illustrated in Figure 6-1. In 1993, PA's 10 and 13 supplied approximately 16.4 percent of the deciduous timber volume utilized by Louisiana-Pacific's two processing facilities in the TSA. An additional 20.1 percent came from other Crown lands. It should be noted that Louisiana-Pacific's pulp mill operated far below capacity during 1993 utilizing only 56 650 cubic metres. As a result, the deciduous fibre flow in 1993 was substantially lower than would be experienced in a "typical" year. In 1994, the Louisiana-Pacific pulp mill was expected to

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<sup>56</sup> Due to the complications introduced by the administration of the pulpwood agreements, local deciduous employment is not TSA-level employment as is the case in other socio-economic analyses completed for the Timber Supply Review. Rather, employment relating to harvesting and processing all deciduous timber in the Dawson Creek Forest District (including private land and the TFL) is considered local.

utilize approximately 400 000 cubic metres. Using the projected requirements for Louisiana-Pacific's pulp mill and the actual processing at Louisiana-Pacific's OSB plant in 1993, the expected combined processing volume would be approximately 955 000 cubic metres of timber annually. It is important to note however, that in any one year the TSA's deciduous AAC will only need to support a portion of this total processing volume.

**Figure 6-1**  
**Deciduous Fibre Flows in the Dawson Creek TSA**



### **6.3 Industry Structure**

This section discusses the employment coefficients associated with the harvesting and processing of 955 000 cubic metres of deciduous timber within the Dawson Creek TSA. Table 6-3 summarizes the coefficients (PY per 1000 cubic metres) derived for each employment category of the deciduous harvest.

#### **6.3.1 Harvesting**

##### **Site Employment**

Similar to coniferous harvesting, deciduous harvesting contractors typically fall into one of three categories: equipment-intensive contractors, mixed-conventional contractors and horse-loggers. There is little difference in the types of employment for harvesting associated with deciduous, coniferous and mixed harvest sites. The only distinction is the requirement that deciduous volumes destined for Louisiana-Pacific must be cut into 2.5 metre lengths (see Section 5.3.1 for a complete discussion regarding site employment).

##### **Log Hauling**

Log hauling is similar to harvesting in that it is performed by independent contractors. Many contractors in the TSA are engaged in both log hauling and harvesting. Deciduous log hauling is similar to coniferous log hauling discussed in Section 5.3.1.

##### **Road Building and Maintenance**

Harvesting activities require the construction of new logging roads each year. As well, existing logging roads require regular maintenance and upgrading. Deciduous harvesting is assumed to require the same amount of road construction and maintenance labour as coniferous harvesting.

#### **6.3.2 Processing**

##### **Mill Site**

Louisiana-Pacific's OSB plant located in Dawson Creek has an annual capacity of approximately 600 000 cubic metres. In 1993, it processed approximately 502 600 cubic metres employing 120 hourly employees, 30 casual employees and 27 salaried staff.<sup>57</sup> The Louisiana-Pacific pulp mill located near Chetwynd has an annual capacity of approximately 452 000 cubic metres. However, due to technical problems in 1993, the mill processed only 56 000 cubic metres. In a more representative year, (processing level of approximately 452 000 cubic metres) the pulp mill would employ 145 hourly employees, 13 casual employees and 29 salaried staff. Since Louisiana-Pacific's processing facilities utilize all fibre on-site there are no hog-fuel or wood chip by-products shipped to other processing facilities.

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<sup>57</sup> In 1994, hourly staff worked an additional 10% in overtime.

### **Administration**

Louisiana-Pacific has administrative staff associated with the two processing facilities and the woodlands office in Dawson Creek. In total, administration provides approximately 42 PY of employment to TSA residents. Louisiana-Pacific also employs three PY of employment outside the TSA in the form of sales staff and managerial staff related to TSA processing.

### **6.3.3 Forestry Services**

#### **Silviculture**

Deciduous silviculture primarily relies on natural regeneration. There is some fill-in planting and thinning activity required on deciduous sites, but not as much as is required on coniferous sites. For example, aspen trees regenerate through a vegetative regeneration process by root suckering, with young aspen stems or shoots coming up from disturbed root systems (root suckering is stimulated by removing the existing overstory).<sup>58</sup> Cottonwood regenerates by coppicing from roots or stumps (*i.e.*, using roots or stumps as nursery trees), by natural seeding or through re-planting techniques similar to those used for coniferous species.

#### **Other**

This category captures employment associated with licensees expenditures on a variety of contract labour tasks on harvest sites. These tasks typically include engineering, reconnaissance, mapping, cruising, block layout, waste surveys and landing reclamation.

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<sup>58</sup> L. Ollenberger, R.O. Silviculture, Ministry of Forests, Dawson Creek.

<sup>58</sup> M. Byl, Woodlands Divison, Lousiana-Pacific.

Activity	TSA Employment Coefficient (PY/1000 m <sup>3</sup> )	Provincial Employment Coefficient (PY/1000 m <sup>3</sup> )
<b>Harvesting</b>		
Site Employment	0.20	0.21
Log Hauling	0.07	0.07
Road Building and Maintenance	0.05	0.05
<b>Total Harvesting</b>	<b>0.32</b>	<b>0.33</b>
<b>Forestry Services</b>		
Silviculture	0.01	0.01
Other	0.01	0.01
<b>Total Forestry Services</b>	<b>0.02</b>	<b>0.02</b>
<b>Processing</b>		
Mill Site	0.38	0.38
Administration	0.06	0.07
<b>Total Processing</b>	<b>0.44</b>	<b>0.45</b>
<b>Total</b>	<b>0.78</b>	<b>0.80</b>

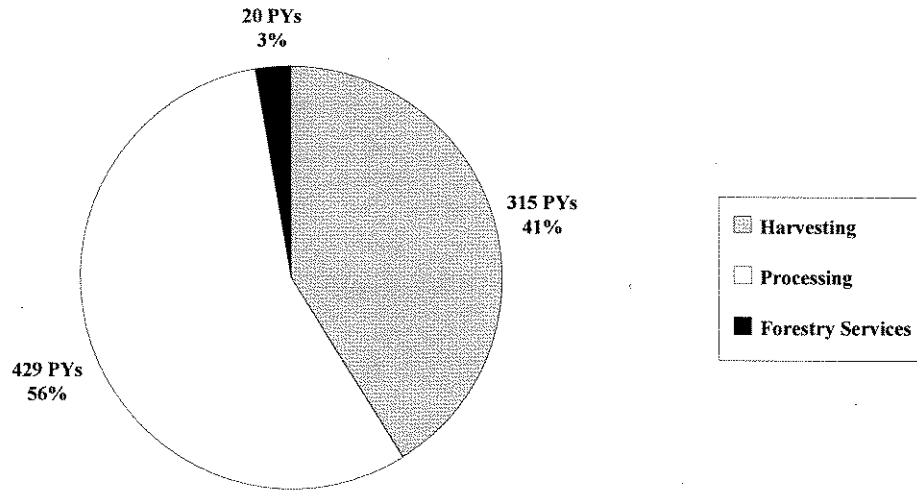
#### 6.3.4 Direct (Forestry) Employment

Provincial direct employment (including forest district and non-forest district residents) associated with the 955 000 cubic metre deciduous volume is approximately 764 PY.<sup>59</sup> In the Dawson Creek Forest District, approximately 745 PY of direct forestry employment is supported. Figure 6-2 illustrates the total direct employment and the distribution of employment among the direct employment categories.

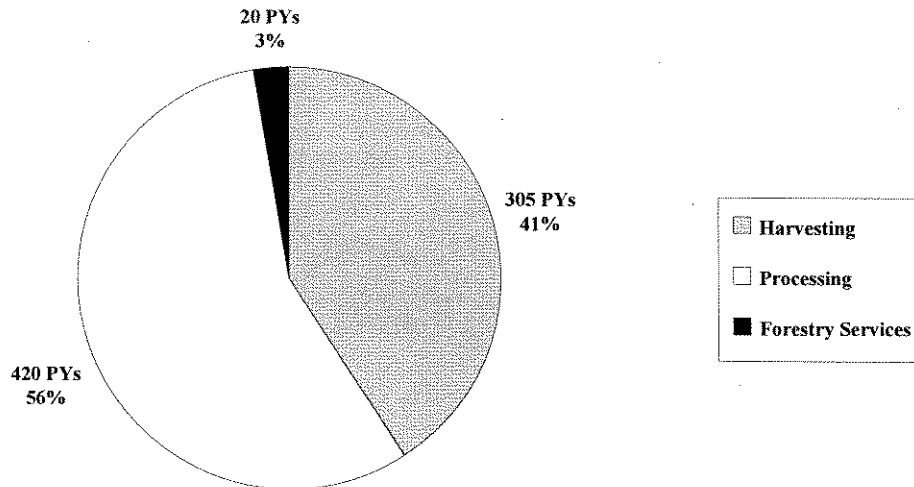
<sup>59</sup> Due to Louisiana-Pacific's relatively low waste and breakage factor (five to eight percent), the harvest level and processing volume are assumed to be the same (955 000 cubic metres).

**Figure 6-2**  
**Deciduous Direct (Forestry) Employment**  
(955 000 cubic metres)

**Provincial Direct (Forestry) Employment (764 PY)**  
(Including Dawson Creek TSA Employment)



**Dawson Creek Forest District Direct (Forestry) Employment (745 PY)**



#### **6.4 Economic Implications**

As discussed in Section 6.2, PA's 10 and 13 make up a large portion of the deciduous AAC, and there is a significant level of uncertainty surrounding the annual harvest of deciduous timber required from Crown land in the TSA. Louisiana-Pacific's processing facilities are dependent on a mix of timber from Crown (TSA), private B.C. and Alberta lands. Therefore, a more appropriate approach in assessing the employment and employment income resulting from the processing at Louisiana Pacific's two TSA facilities would be to assess the expected level of deciduous timber required to support processing at these facilities regardless of the source of fibre. Using the projected requirements for Louisiana-Pacific's pulp mill and the actual processing at Louisiana-Pacific's OSB plant in 1993, the "typical" processing volume would be approximately 955 000 cubic metres of timber annually. It is important to note however, that in any one year the TSA's deciduous AAC would likely only support a portion of the total volume processed. Due to this uncertain linkage between the AAC and deciduous harvests from Crown land, future employment impacts associated with potential deciduous AAC changes are not estimated.

##### **6.4.1 Dawson Creek Forest District Employment and Income<sup>60</sup>**

The analysis identifies three types of employment that result from Dawson Creek deciduous volume: direct, indirect and induced employment. Direct employment includes forest sector jobs associated with harvesting, processing and re-forestry deciduous timber. Indirect employment is generated by industries that support the forest sector, such as mill suppliers. Induced employment is generated through the re-spending of employment income, for example at local retail outlets. The methodology applied to estimate employment levels relies on certain assumptions and is subject to limitations as outlined in Appendix B.

The harvesting and processing of deciduous timber in the Dawson Creek Forest District provides significant economic benefits to the local economy. A deciduous volume of 955 000 cubic metres would support approximately 745 PY of direct employment for Dawson Creek Forest District residents. This employment level represents approximately 97 percent of the total labour force requirements, reflecting the proportion of harvesting and processing undertaken locally. Direct income associated with this level of direct employment is approximately \$25.3 million. Table 6-2 summarizes local employment and employment income associated with this deciduous processing volume.

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<sup>60</sup> Annual employment income estimates are presented after-tax in millions of 1993 dollars.

Volume (m <sup>3</sup> /year)	Employment (PY/year)			Employment Income (after-tax \$1993 millions/year)		
Processed	Direct <sup>61</sup>	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total <sup>62</sup>
955 000	745	353	1098	\$25.3	\$7.3	\$32.6

The indirect and induced employment level of 353 PY is estimated to generate approximately \$7.3 million dollars in employment income. Associated with the total (direct, indirect and induced) local employment level of 1098 PY, is annual employment income of approximately \$32.6 million.

#### 6.4.2 Provincial Employment and Income

At the provincial level, additional direct employment accrues to residents outside the Dawson Creek Forest District. Most of this employment is in the harvesting category, and is related to SBFEP bids won by contractors from outside the Dawson Creek Forest District or the delivery of fibre to area mills by outside suppliers. Provincial direct employment (including district and non-district residents) is estimated at approximately 764 PY for the 955 000 cubic metre deciduous volume.<sup>63</sup>

The harvesting and processing of deciduous Dawson Creek Forest District timber would also support provincial indirect and induced employment totalling approximately 1146 PY. Hence, total (direct, indirect and induced) provincial employment is estimated at 1910 PY. Table 6-3 summarizes provincial employment and employment income associated with the typical deciduous volume.

Volume (m <sup>3</sup> )	Employment (PY/year)			Employment Income (after-tax \$1993 millions/year)		
Processed	Direct <sup>64</sup>	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total
955 000	764	1146	1910	\$26.0	\$23.9	\$49.9

As the table shows, employment income associated with the direct, and indirect and induced

<sup>61</sup> Includes harvesting, log hauling, road building, processing, silviculture, and administrative employment. (See Appendix B.)

<sup>62</sup> Based on direct, indirect and induced income. (See Appendix B.)

<sup>63</sup> See Section 6.3.4 for a detailed breakdown.

<sup>64</sup> Includes harvesting, log hauling, road building, processing, silviculture, and administrative employment. (See Appendix B.)

employment levels is estimated at \$26.0 million and \$23.9 million respectively. Total (direct, indirect and induced) employment income associated with deciduous harvesting and processing is approximately \$49.9 million annually.

#### 6.4.3 Government Revenues

Variable provincial and fixed regional government revenue estimates associated with the deciduous processing volume of 955 000 cubic metres are summarized in Table 6-4.<sup>65</sup> Variable government revenues change proportionally as the harvest level changes while fixed government revenues depend on other variables.

Variable provincial annual government revenues are derived from the following: stumpage and rent of \$1.2 million; personal income taxes of \$4.9 million; scaling, residue and waste fees of \$0.5 million; and other provincial sources of \$3.8 million.<sup>66</sup> Fixed government revenues consist of local taxes for the two deciduous processing facilities and represent approximately \$1.5 million.<sup>67</sup>

Category	Volume - 955 000 m <sup>3</sup> /year (\$1993 millions/year)
<b>Variable Provincial</b>	
Stumpage and Rent	\$1.2
Personal Income Tax	4.9
Scaling, Waste and Residue Fees	0.5
Other Taxes	3.8
<b>Fixed Local</b>	
Local Revenues	1.5
<b>Total Revenues</b>	<b>\$11.9</b>

<sup>65</sup> Government revenue estimates assume that all the timber comes from Crown lands.

<sup>66</sup> In this report, a three-year average (1991 1992, and 1993) is used to determine a stumpage rate of \$780 per 1000 cubic metres. In 1994, the stumpage rate for deciduous harvest from Crown lands in Dawson Creek was \$1380 per 1000 cubic metres.

<sup>67</sup> This does not include federal government revenues. Federal personal income taxes are estimated to be an additional \$10.1 million at the 955 000 cubic metre harvest level.

<sup>68</sup> See Appendix C.

## **7.0 Social and Environmental Implications**

This section presents the possible effects of the Dawson Creek TSA coniferous harvest forecast (the revised base harvest forecast) in conjunction with the level of deciduous harvesting necessary to maintain the current level of deciduous processing in the Dawson Creek TSA. These possible effects are discussed in terms of the TSA communities, First Nations, and the environment.

### **7.1 Community Implications**

#### **7.1.1 Coniferous Base Harvest Forecast**

Dawson Creek TSA community impacts resulting from coniferous harvest level changes proposed under the revised base harvest forecast, are difficult to predict accurately. As well, there are two issues to consider before the proposed impacts are translated into economic growth in the forest sector.

First, although the availability of the private timber supply is not certain, area mills currently utilize large volumes of timber from private lands. Therefore, the potential increase of conifer harvest from TSA (Crown) lands may be offset by declines in private timber volumes. In this situation, the increased TSA harvest would serve only to sustain the current workforce and no new employment would result.

The second consideration is the fact that the 150 000 cubic metre increase (1990) in the AAC (Height Class 2 pine) has never been allocated. Therefore, assuming the 150 000 cubic metres are allocated, the actual change from the current harvest to the revised base harvest forecast represents a 40.6 percent increase rather than the 15.5 percent increase in the AAC. As well, since the increase in AAC would be subject to an apportionment to tenure type by the Minister of Forests followed by a competitive process to assign licences, it is difficult to forecast which communities would benefit.

In general terms, however, it is reasonable to expect that an increase in the harvest will increase employment in the TSA. Increased employment may provide currently under-employed individuals and contractors the opportunity to realize more stable, full-time employment. It would also likely create new employment opportunities and contribute to a reduction in the TSA's unemployment rate. However, without knowing where the timber is to be processed and what type of tenure it is to be apportioned under, it is difficult to identify the magnitude of the contribution of an increased coniferous harvest level to specific communities in the TSA.

#### **7.1.2 Deciduous Processing**

The labour force associated with the deciduous processing is concentrated in the communities of Dawson Creek and Chetwynd. These two communities benefit from processing employment and also from employment associated with harvesting and log hauling. The community of Pouce Coupe also has several contractors involved in the harvesting and hauling of deciduous volumes for Louisiana-Pacific.

Employment associated with harvesting and log hauling is done on a contract basis and most of the

contractors who provide deciduous timber to Louisiana-Pacific are also involved in the coniferous harvest in the area. Other contractors involved in silviculture and engineering show even greater flexibility, often working for many companies in different parts of the province. Therefore, individuals involved in the deciduous harvest and the specific communities they come from are continually changing. However, any change in the deciduous harvest level will result in a corresponding change in the harvesting and log hauling labour force.

Individuals employed in processing are closely tied to the deciduous harvest since flexibility to switch to other timber types does not exist. However, employment levels associated with processing typically remain at set levels for a range of processing volumes, characterized by certain threshold levels. When certain threshold levels are reached at processing facilities, an entire shift may be eliminated or the mill may have an extended shut-down. Similarly, when processing increases, current staff may be sufficient to handle the increased work load or they may work overtime before additional staff are hired. Louisiana-Pacific's processing employees may experience employment disruptions if the aspen fibre supply is reduced in the future.

In the Chetwynd area, the Louisiana-Pacific pulp mill represents the only deciduous fibre processing plant, while Louisiana-Pacific's OSB plant is the only major forest processing facility in Dawson Creek. In Chetwynd the Louisiana-Pacific pulp mill supports 173 PY of employment, while in Dawson Creek, manufacturing activity at Louisiana-Pacific's OSB plant supports 175 PY of employment. Louisiana-Pacific has provided numerous employment opportunities to local residents and has attracted skilled tradesmen from other areas in Canada.

### 7.3 First Nations Implications

The Treaty 8 Tribal Association has advised the Ministry of Forests that in the absence of a mutually acceptable consultation process, specific comments on the Timber Supply Review process or any particular scenario would be premature.<sup>69</sup> The Ministry of Forests is presently working with the Treaty 8 Tribal Association to develop a mutually acceptable consultation process to ensure that First Nations' treaty rights are protected where applicable. However, based on the concerns of First Nations people regarding current forestry activity, it is likely the revised coniferous base harvest forecast and the expected deciduous processing will continue to compromise many of the land values that are of concern to First Nations people in the Dawson Creek TSA.<sup>70</sup>

All Bands including Kelly Lake First Nations would like an opportunity to become more involved in harvesting, fire suppression and silviculture activities. The proposed rate of harvesting under the coniferous base harvest forecast and the expected deciduous level may help to accommodate the community's desires.

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<sup>69</sup> Treaty 8 Tribal Council meeting October 28, 1994.

<sup>70</sup> First Nation's Information Session in Fort St. John, February 18, 1994.

## 7.4 Environmental Considerations

This section addresses the environmental implications associated with potential future harvest levels.

### 7.4.1 Specific Community Environmental Issues<sup>71</sup>

In addition to the government initiatives designed to address environmental concerns, residents of the Dawson Creek TSA have identified specific environmental issues that require special consideration. These issues include; the protection of the (approximately 50) islands in the Peace River from logging activity<sup>72</sup>, logging within the municipal boundaries of Hudson's Hope and logging in valleys that contain major travel corridors for which there are visual sensitivity concerns. Local residents have indicated that if logging is to take place in such areas it must be sensitive to other resource values.

### 7.4.2 Environmental Impacts of Current Forestry Activities

In addition to the environmental considerations already accounted for in the timber supply analysis, there are several outstanding environmental issues and concerns in the Dawson Creek TSA. Among these specific issues are road impacts and access development, aquatic ecosystems and fisheries, riparian habitat, biodiversity and wildlife. Concerns about these specific issues in the Dawson Creek TSA all contribute to the underlying concern about the current level of strategic planning.

#### Road Impacts and Access Development

Logging activity has contributed to the extensive network of roads in the TSA. While these roads have provided access for recreation and other less intrusive resource activities, they have become a concern because of the environmental impacts they can cause and the access they provide. Roads often must traverse sensitive riparian habitat and thus, problems such as siltation and debris blockage may arise<sup>73</sup>. Roads themselves remove forest habitat from an area, but they also improve some roadside habitat. It is anticipated that future road construction will remove approximately 20 000 hectares (0.9 percent) of forested land from the Dawson Creek TSA.<sup>74</sup>

In terms of wildlife, grizzly bear, caribou and mountain goat are sensitive to the immediate (construction, truck and airplane traffic) and extended (hunting and poaching) disturbances associated with access, road development and use. Moose are only moderately affected by the immediate disturbances associated with access but along with the other species may be significantly impacted by extended disturbances.<sup>75</sup> Though it is often physically and politically difficult to manage motorized access after an area is logged, following this strategy can mitigate the identified impacts associated with extended disturbances.<sup>76</sup> Access management tools (both physical and

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<sup>71</sup> Local environmental concerns expressed by L. Rutledge and W. Sawchuk.

<sup>72</sup> The Peace River islands are administered by the Fort St. John Forest District, and are recommended for PAS designation.

<sup>73</sup> D. Russell, Forest Ecosystem Specialist, Ministry of Environment, Lands and Parks.

<sup>74</sup> Ministry of Forests (1994), *Dawson Creek TSA Timber Supply Analysis*.

<sup>75</sup> D. Russell, Forest Ecosystem Specialist, Ministry of Environment, Lands and Parks.

<sup>76</sup> McLellan, B., *Relationships Between Human Industrial Activity and Grizzly Bears*. International Conference on Bear Research and Management, 8, p. 57-64; and J.D. Beale, Operations Manager, Dawson Creek Forest District.

administrative) and conservation monitoring and enforcement, although physically and politically difficult to implement, comprise one identified strategy that can mitigate extended disturbances.

### **Riparian Ecosystems and Fisheries**

Riparian habitat areas in the TSA are ecologically diverse. Environmental impacts in these areas tend to have significant impacts on the area's inhabitants. In the TSA, several concerns have been raised about timber harvesting near riparian habitats, including the removal of vegetation near waterways. In general terms, clearcut harvesting affects the hydrology of drainage and may increase sediment loading, water temperature, and can alter stream flow rates and timing. Changes in stream flow or vegetative cover can impact stream temperatures which may be detrimental to fish populations. Increased sedimentation from poor road building practices and increased stream bank instability from increased flow can be detrimental to the survival of fish eggs. Increased angling pressure due to changes in access can negatively impact fish populations and in some cases fragment or isolate portions of a population. Excessive disturbance, or improper forest practices within a community watershed may also impact water quality and domestic water supplies.

### **Biodiversity**

Biodiversity may be discussed in terms of four levels: genetic diversity, species diversity, ecosystem diversity and landscape diversity.<sup>77</sup> The biodiversity of the forest ecosystems in the TSA is reflected in dynamic mosaics of plants, animals, insects, fungi and micro-organisms. No single component survives in isolation; therefore, an impact on one species could have additional impacts within the forest ecosystem, potentially altering the balance of the ecosystem.

In order to better manage for and conserve biodiversity, both the Ministry of Forests and the Ministry of Environment, Lands and Parks are mandated with the responsibility to administer the *Forest Practices Code of B.C. Act*, Regulations, and Guidebooks, to develop strategic plans of landscape units, and to establish biodiversity objectives.

### **Wildlife**

In addition to the wildlife impacts discussed in other sections of this chapter, timber harvesting activities may have impacts specific to grizzly bears, caribou, marten, warbler and bulltrout. Grizzly bear populations could be negatively impacted by continued forest fragmentation, loss of wilderness and increased road densities. However, if industrial activity is conducted with adequate guidelines to maintain important habitats, properly locate camps, incinerate garbage, restrict use of firearms and close access to logged areas, the bear population could likely be maintained at a satisfactory level.<sup>78</sup>

Caribou populations could be negatively impacted by increased roading and fragmentation of habitat, the loss of habitat linkages and the loss of forest cover old enough to support lichen growth. Caribou utilize low population densities to avoid predators and this may become more difficult as old growth cover is lost. Increased access could result in increased predator travel corridors and predator success. Marten populations may be negatively impacted by loss of canopy cover, diminished levels of coarse woody debris, and the loss of interior forest habitat due to forest cover fragmentation. Some warbler species require old growth, interior forest habitat and mixed wood forest stands. Current forest management practices do not consider mixed wood management and therefore mixed

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<sup>77</sup> See Appendix A for definition of biodiversity types.

<sup>78</sup> McLellan, B., *Relationships Between Human Industrial Activity and Grizzly Bears*. International Conference on Bear Research and Management, 8, p. 57-64.

wood stands are often converted to single species stands (see above). Bulltroat are a head-water species, slow growing and maturing. This species is sensitive to sedimentation and very susceptible to increased angling pressure due to increased access. As with bears, these impacts could potentially be mitigated through the adoption of guidelines designed to maintain important habitats, and implemented through Fish and Wildlife monitoring and enforcement. As with the management and conservation of biodiversity, many wildlife management issues should be dealt with in this way.

#### **7.4.3 Environmental Implications of Coniferous and Deciduous Processing**

The administration of Crown lands for forestry purposes is only one part of the complete “environmental picture” in the Dawson Creek TSA. The cumulative impact of all resource and economic sectors, both on private and Crown land, has been mentioned as a major environmental concern in the area. Therefore, in the context of current management, the increase in the coniferous harvest level, as proposed under the base harvest forecast, and the maintenance of current deciduous processing requirements could further burden local ecosystems in the Dawson Creek TSA, although it should be noted that this assumption is not fully conclusive.

Furthermore, it should be noted that the potential environmental impacts outlined above are associated with the status quo fish and wildlife management strategy. Many of these impacts, especially those related to extended disturbances are not inevitable. There may be reasonable and effective ways of mitigating the potential impacts of changes to the landscape, for example, through the adoption of more stringent monitoring and enforcement strategies.

#### **7.4.4 Future Environmental Considerations within the Timber Supply Analysis**

Although British Columbia’s Forest Practices Code (FPC) was not considered in the Dawson Creek timber supply analysis, all future harvesting in the Dawson Creek TSA will follow the FPC, which contains mandatory and enforceable standards for forest practices. Regulations under the FPC will limit cutblock size and will protect community watersheds where alternative harvesting systems are more appropriate. The FPC also will contain a comprehensive set of environmental sensitivity standards based on basic principles of ecosystem management. FPC standards will set out detailed requirements for forest practices, including operational planning, soil conservation, recreation, range management, silviculture, road and bridge construction, timber harvesting, forest health and cultural and heritage values. Provisions for resource management areas and wildlife habitat areas will contribute to the maintenance of biodiversity and sustainable forestry practices.

Another development in terms of environmental considerations is *British Columbia's Forest Renewal Plan*. The Forest Renewal Plan is designed to help restore and protect the health of forest-based ecosystems by facilitating the rehabilitation of environmental damage, and by supporting research into environmentally-sound forest practices. This plan will involve proactive activities, such as fish restocking and hillside restoration, including repairing or removing unnecessary logging roads.<sup>79</sup>

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<sup>79</sup> Province of British Columbia (1994), *British Columbia's Forest Renewal Plan*.

## 8.0 Summary and Conclusions

The social, economic and environmental impacts associated with the current coniferous harvest, the coniferous base harvest forecast and the expected deciduous volume are summarized in Table 8-1.

In this analysis, the current allocated coniferous AAC (691 323 cubic metres) is assumed to be the current coniferous harvest level. The current total (allocated and non-allocated) coniferous AAC for the Dawson Creek TSA includes an additional 150 000 cubic metres of Height Class 2 pine which remains to be apportioned and thus is not being harvested. The revised base coniferous harvest forecast is the base coniferous harvest forecast from the *Dawson Creek TSA Timber Supply Analysis Addendum*. The revised base harvest forecast indicates the TSA can support an immediate 40.6 percent increase in the coniferous harvest (to 972 000 cubic metres). The rate of harvest is considered to be the non-declining long-term harvest level and thus, no changes in future decades would be required.

The deciduous processing level reflects the harvest requirements that would be considered "typical" for operations at the two deciduous processing facilities in the Dawson Creek TSA. These two Louisiana-Pacific facilities draw on Crown tenures and on private B.C. and Alberta sources to operate. However, the supply from each of these sources may vary considerably from year to year, hence impacts of future changes in the deciduous AAC are not estimated. Further, due to complications introduced by the requirements of the Pulpwood Agreements, all fibre sources (not just the TSA), are included when estimating associated economic levels.

### 8.1 Economic Impacts

The current coniferous harvest level of 691 323 cubic metres supports approximately 629 PY of direct forestry employment and 947 PY of indirect and induced employment at the provincial level. Under the revised base harvest forecast, employment levels would rise to approximately 885 PY of direct forestry employment and 1332 PY of associated indirect and induced employment. In total, approximately \$56.8 million in annual employment income is associated with this level of provincial employment.

Government revenues would also increase in proportion to the increase in the coniferous harvest level. At the 691 323 cubic metre current harvest, associated annual government revenues are approximately \$17.4 million. At the 972 000 cubic metre harvest level, of the base harvest forecast, annual government revenues would be approximately \$24.1 million.

The expected 955 000 cubic metre deciduous harvest level supports approximately 764 PY of direct forestry employment and 1 146 PY of indirect and induced employment. This level of provincial employment is estimated to generate a total of \$49.9 million in annual employment income. Government revenues associated with the harvesting and processing of deciduous timber are approximately \$11.9 million per year.

## **8.2 Social and Environmental Implications**

### **8.2.1 Community Implications of the coniferous base harvest forecast**

Two issues play a role in clouding the community-level impacts associated with the potential increase in the coniferous harvest level. First, current processing in the TSA depends, to a certain extent, on timber from private lands. If the private timber supply is reduced, it is possible that the potential increase in volume available from Crown lands will be required to replace the reduced private volume. Second, since the increase in the AAC would be subject to an unknown apportionment, it is difficult to predict where the economic benefits would accrue. The analysis makes no attempt to speculate on the possible capital investment or employment that might be generated from any possible mill expansion or new construction associated with a possible increase in the coniferous harvest level.

### **8.2.2 Community Implications of Deciduous Processing**

The labour force associated with deciduous harvesting, processing and silviculture is concentrated in the communities of Dawson Creek and Chetwynd. Since most of the labour is contracted, there is some flexibility for these employees to relocate to coniferous or private land volumes to supplement their income. However, processing employees lack this mobility, and if deciduous volumes become scarce in the TSA, mill curtailment could occur that could result in skilled tradesmen and other key staff seeking employment with other companies.

### **8.2.3 First Nations Implications**

The Treaty 8 Tribal Association has advised the Ministry of Forests that in the absence of a mutually acceptable consultation process, specific comments on the Timber Supply Review process or any particular scenario would be premature. The proposed rate of harvesting under the coniferous base harvest forecast and the expected deciduous level may best accommodate First Nations members' desires to become more involved in harvesting, silviculture, and fire suppression activities. Mutually acceptable consultation processes will be required to ensure the protection of treaty and aboriginal rights where applicable, and to ensure a balanced implementation of forest management operations (harvesting, silviculture, and restoration).

### **8.2.4 Environmental Implications**

Since 1987, numerous provincial guidelines have been implemented to improve the management of provincial forest resources. However, despite these considerations, there remain several specific environmental concerns in the TSA. Among these concerns are road impacts, access, water quality, habitat alterations and community concerns over recreation and visual quality. Another environmental concern in the area is not so much the impact of the forest sector in isolation, but the cumulative impacts of several sectors (*i.e.*, agriculture, mining, oil and gas exploration and development, and forestry) on the environment. Given these concerns, the increased harvest associated with the base harvest forecast would likely be perceived as a further burden on the local ecosystems in the TSA.

**Table 8-1**  
**Summary of Local and Provincial Economic Impacts: Current Coniferous Harvest, Base Harvest Forecast and Deciduous Processing**

Impact Account (By Decade)	Current Coniferous Harvest		Revised Base Harvest Forecast		Expected Deciduous Processing	
	TSA	Provincial	TSA	Provincial	Forest District	Provincial
<b>Employment and Employment Income Harvest Level (m<sup>3</sup>/year)</b>	691 323	691 323	972 000	972 000	955 000	955 000
Direct Employment (PY/year)	470	629	661	885	745	764
Total Employment (PY/year)	650	1576	914	2217	1098	1910
Direct After-Tax Income (\$1993 millions/year)	\$15.2	\$20.8	\$21.4	\$29.2	\$25.3	\$26.0
Total Income (\$1993 millions/year)	\$19.0	\$40.5	\$26.7	\$56.8	\$32.6	\$49.9
<b>Government Revenues: Decade One</b>						
Total Revenues (\$1993 millions/year)		\$17.4		\$24.1		\$11.9
<b>Summary of Social and Environmental Implications: Base Harvest Forecast and Expected Deciduous Processing</b>						
<b>Community</b>						
<ul style="list-style-type: none"> <li>The base harvest forecast would increase the rate of coniferous harvest; however, it is difficult to determine the implications of this scenario for specific communities in the TSA.</li> <li>Due to the uncertain nature of the deciduous fibre supply, there is concern that there could be a curtailment at deciduous processing facilities. Louisiana-Pacific management is concerned a lengthy closure could result in the loss of skilled tradesmen and other key staff.</li> </ul>						
<b>First Nations</b>						
<ul style="list-style-type: none"> <li>The Treaty 8 Tribal Association has advised the Ministry of Forests that, in the absence of a mutually acceptable consultation process, specific comments on the Timber Supply Review process or any particular scenario would be premature.</li> <li>In general however, three main areas of concern with respect to forestry activities are: economic and cultural impacts, environmental impacts and policy and administrative problems.</li> </ul>						
<b>Environmental Considerations and Impacts</b>						
<ul style="list-style-type: none"> <li>From an environmental perspective, the accumulated impacts from all industrial sectors (i.e., mining, oil and gas, agriculture and forestry) in the Dawson Creek TSA are of concern. Given this concern and others, the increase in harvest proposed under base harvest forecast will likely be perceived as a further burden on the local ecosystems in the TSA.</li> </ul>						



## Appendix A

### Glossary of Terms

<b>Allowable Annual Cut (AAC)</b>	The volume of timber which may be cut each year from a forest management unit ( <i>e.g.</i> , a TSA), set by the Chief Forester in accordance with Section 7.0 of the Forest Act.
<b>Biodiversity</b>	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.
<b>Biological Diversity</b>	<b>Genetic diversity</b> --describes the range of genetic traits found within a species and among different species. <b>Species diversity</b> --refers to the range of plant, animal and micro-organism species on Earth. <b>Ecosystem diversity</b> --describes the variety of natural systems found within a region. <b>Landscape diversity</b> --describes the broad linkages and ecosystems within a landscape type.
<b>Biogeoclimatic Zones</b>	Areas which are defined by similar biological, physical and atmospheric characteristics.
<b>Cut-block Adjacency</b>	Integrated management guidelines that restrict harvesting in areas adjacent to a cut block until that cut block has satisfied certain regeneration requirements ( <i>i.e.</i> , green-up requirements).
<b>Direct Income and Employment</b>	Income and employment associated with the forestry sector ( <i>i.e.</i> , harvesting, transportation, silviculture, and processing) arising from timber harvesting.
<b>Ecosystem</b>	Any complex of living organisms together with all the other biotic and abiotic (non-living) factors which affect them.
<b>Environmentally Sensitive Area</b>	Area with notable non-timber values, fragile soils or unstable soils; or an area that has problems in establishing a new stand; or an area where timber harvesting may result in land slides.
<b>Ecoprovince</b>	An area characterized by very broad ecological interactions between the four major environmental components of the ecosystem: air, water, land and biota (animal and plant life).
<b>Green-up Period</b>	The time needed for a stand of trees to reach a desired condition ( <i>e.g.</i> , height) to ensure maintenance of water or visual quality, wildlife habitat, soil stability or aesthetics. Green-up requirements refer to the desired conditions.
<b>Indirect Employment or Income</b>	Indirect employment and related economic activity is the result of direct businesses purchasing business related goods and services.
<b>Induced Employment or Income</b>	Induced employment and related economic activity is the result of the employees of direct companies spending their incomes on consumer goods and services.
<b>Integrated Resource Guidelines</b>	Guidelines requiring that forest management activities (such as harvesting, road building and silviculture treatments) be conducted in a special way to protect or enhance timber and non-timber forest resource values.

<b>Land and Resource Management Planning (LRMP)</b>	A sub-regional integrated resource planning process for B.C. LRMP considers all resource values and depends upon public participation and consensus based land and resource management decisions.
<b>Log grades 3, 5, and 6</b>	Log Grade 3 refers to dead sawlogs from catastrophic causes (more than 50 percent sound); Grade 5 refers to dead and not suitable to mill into lumber; Grade 6 refers to undersized. These three wood classes do not contribute to the AAC component when operable lands are harvested and therefore represent additional timber volumes
<b>Long-term Harvest</b>	The timber harvesting level which allows the volume of timber harvested in any given period to be replaced by a similar volume of regenerated stands within the same period.
<b>Multiplier</b>	A number used to estimate total income or employment (direct and indirect) relative to the direct value. Multipliers are generally greater than 1.0, since 1.0 represents the direct income or employment component.
<b>Person-year (PY)</b>	A standard measure of employment that takes into account part-time or seasonal full-time work. For example, if an employee works full-time for six months ( <i>i.e.</i> , for half a year), he or she accounts for 0.50 PY of employment. Using person-years allows different types of employment to be compared on a similar basis. In this report, 1 800 hours of work per year represents one person-year.
<b>Protected Area</b>	An area designated under the B.C. Protected Areas Strategy for protection in its current state, based on special physical and environmental qualities it may possess.
<b>Recreational User Day (RUD)</b>	All or part of a calendar day spent participating in any form of recreation.
<b>Riparian Zone</b>	The stream bank and flood plain adjacent to streams or water bodies, with particular reference to the vegetation.
<b>Seral Species</b>	Organisms which are part of a biotic community which is in a development or transitory stage in an ecological succession.
<b>Timber Supply Area (TSA)</b>	An integrated resource management unit established in accordance with Section 6 of the Forest Act.
<b>Umbrella Species</b>	Wide-ranging species that, if their habitat is protected, should promote the conservation of a greater number of species with similar habitat requirements.
<b>Visual Quality Objective (VQO)</b>	Defines a level of acceptable landscape alteration resulting from harvesting and other activities. Several visual quality classes have been created based on the maximum amount of alteration permitted.
<b>Watershed</b>	An area drained by a particular stream or river. A large watershed may contain several smaller watersheds.
<b>Wind Throw</b>	After harvest in an area, trees not previously exposed to direct wind paths become exposed. Often these trees do not have the root systems required to withstand the direct winds and as a result are blown over, becoming "wind throw."

## Appendix B

### Employment and Employment Income Estimates

Appendix B describes the methodology employed to calculate direct, indirect and induced employment and employment income levels and impacts associated with potential changes in timber harvesting levels. Direct employment includes forest industry activities involved with harvesting, processing and basic silviculture. Indirect employment results from the purchase of goods and services by direct forest industry firms. Induced employment is derived from the spending of direct and indirect employment income on consumer goods and services. The methodology applied to estimate employment impacts relies on assumptions and is subject to limitations as outlined below.

**Timing of Impacts** - The presentation of impacts suggests that employment changes occur simultaneously with harvest level changes. This assumption may not hold for all industry sectors. As there is a lag period associated with changes in business and consumer spending, induced employment impacts in particular, may arise over a longer period of time.

**Proportional Impacts and Threshold Effects** - Employment changes within the forest industry may vary across sectors. Changes in harvest levels are most closely tied to changes in harvesting employment. Processing employment impacts are less likely to be directly proportional to harvest level changes. Processing impacts are more likely to occur in a step-wise manner where, at some quantity of fibre supply (a threshold), the number of shifts may be reduced or as a worst case, the mill may shut down.

**Distribution of Impacts** - The methodology employed yields estimates of aggregate employment impacts. This methodology does not estimate the distribution of impacts among individual licensees, companies and communities within the TSA.

**Income Support Programs and Migration** - The impacts presented make use of a long run (migration) employment multiplier which is based on the assumption that the income of all impacted employees immediately falls to zero. In reality, income support programs would, in the short run, mitigate employment income and thus would lessen the induced employment impacts. Note that direct and indirect employment impacts would not be affected.

**Proportional Harvest Reductions** - Harvest reductions are assumed to be spread evenly among all licensees and all forms of tenure.

### Direct Employment and Employment Income

Estimates of direct forestry employment and employment income generated by the Dawson Creek TSA's AAC rely primarily on information collected from the licensees, forest contractors, forest industry unions, and forest district staff.

In this analysis, employment impacts for coniferous and deciduous timber volumes were calculated separately. Coniferous Dawson Creek TSA harvesting, processing and forestry services employment coefficients, used to estimate future employment levels, are related to the 1993 TSA harvest level. The coniferous employment relates only to the TSA AAC, and does not include employment generated by the harvesting and processing of fibre from Tree Farm Licences, Timber Licences,

private land or any other extra-TSA sources.

Estimating employment impacts for the Dawson Creek TSA deciduous harvest is complicated by the two pulpwood agreements (PA's) in the Dawson Creek Forest District. Pulpwood agreement regulations require that licensees maximize the amount of deciduous timber from alternative sources (*i.e.*, private lands) prior to accessing Crown timber supplies. In effect, Crown lands are used to supplement deciduous timber short-falls, below the 452 000 cubic metre level outlined for each PA. Therefore, depending on the available private land volume, the Dawson Creek TSA AAC contribution to Louisiana Pacific's fibre requirements are highly variable. Further, during the year for which the data were collected, Louisiana-Pacific's Chetwynd pulp mill only processed approximately 12 percent of the mill's capacity volume.

For these reasons, deciduous direct employment coefficients are developed for the level of harvesting required to provide the two TSA deciduous processing facilities with the expected future processing volume of timber, regardless where in the Dawson Creek Forest District it was sourced. Also, because of the uncertain link between the deciduous AAC and the level of deciduous AAC harvesting future employment impacts are not estimated.

To allow for direct comparisons, employment figures are expressed in person-year (PY) equivalents (1800 hours per year), although one job was considered to represent one PY if the normal work-year ranged between nine and 12 months.

Local, (TSA-based (coniferous), forest district-based (deciduous)) and provincial estimates of direct forest industry employment and average wages are presented in Tables B-1 and B-2. Provincial coefficients include local employment.

**Direct Employment Coefficients** - Employment coefficients derived from information on harvesting are collected from licensees and contractors. Employment coefficients represent the amount of employment in PY required to harvest and process 1000 cubic metres of timber. The employment coefficients can be further separated into specific forestry activities. Employment coefficients are used in this report to estimate linear employment impacts associated with possible changes in timber harvesting volumes. This approach assumes that market conditions and production technology remain constant over the harvest forecast. While the accuracy of the employment estimates may decrease as the length of the forecast period increases, for the short-term the estimates are considered reasonably accurate.

Activity	Coniferous Harvest		Deciduous Processing	
	TSA Employment Coefficient	Provincial Employment Coefficient	TSA Employment Coefficient	Provincial Employment Coefficient
	(PY / 1000 m <sup>3</sup> )	(PY / 1000 m <sup>3</sup> )	(PY / 1000 m <sup>3</sup> )	(PY / 1000 m <sup>3</sup> )
<b>Harvesting</b>	<b>0.32</b>	<b>0.33</b>	<b>0.32</b>	<b>0.33</b>
Site Employment	0.20	0.21	0.20	0.21
Log Hauling	0.07	0.07	0.07	0.07
Road Building	0.05	0.05	0.05	0.05
<b>Forestry Services</b>	<b>0.04</b>	<b>0.07</b>	<b>0.02</b>	<b>0.02</b>
Silviculture	0.03	0.05	0.01	0.01
Other	0.01	0.02	0.01	0.01
<b>Processing</b>	<b>0.32</b>	<b>0.51</b>	<b>0.44</b>	<b>0.45</b>
Mill Site	0.28	0.45	0.38	0.38
Administration	0.04	0.06	0.06	0.07
<b>Total</b>	<b>0.68</b>	<b>0.91</b>	<b>0.78</b>	<b>0.80</b>

### Direct Employment Income

In the forest industry there is a wide variety of employment income arrangements. For example, some contractors pay their employees by the tonne of timber harvested, and log haulers often earn a percentage of the truck's earnings. Therefore, employment income will vary for a variety of reasons within each forestry category. For each category the employment income estimates reflect the average income in the forest industry associated with the Dawson Creek TSA.

Gross employment income (employment income and employment benefits) and holiday pay rates have been supplied by the following: Canadian Forest Products Ltd.; West Fraser Mills Ltd.; Louisiana-Pacific Canada Ltd.; union representatives; and independent forest contractors. Wages used in the analysis are presented after-tax and net of non-cash benefits. All estimated income figures are denominated in 1993 dollars.

Employment income taxation levels have been determined from Revenue Canada's *British Columbia--Pay-roll Deduction Tables* for January 1993. In order to determine the taxation category from the 1993 Personal Tax Credit Return (TD1(E)) it is assumed all individuals fall within claim code 1. Holiday pay has been added back into employment income in order to more accurately reflect the income tax paid by an individual. By including holiday pay and determining taxation under Claim Code 1, the maximum level of personal income tax will be deducted in the report.

The deductions from Revenue Canada's Tax Deduction Tables include the following: the federal tax rate based on taxable income; federal tax credits claimed by employees on their TD1 form; federal tax credits for Canada Pension Plan contributions and Unemployment Insurance premiums; the federal surtax of 3 percent that applies to the basic federal tax; an extra federal surtax of 5 percent

that applies to any amount over the \$2500 basic federal tax; the provincial tax rate; any provincial surtaxes that apply and any provincial tax reductions that apply.

The provincial tax bill is accounted for under the government revenues account (see Appendix C). Federal government revenues are not considered in this report. However, federal taxes paid from personal income have been removed from the after-tax employment income reported in this document.

Table B-2 presents the average wages by employment category.

<b>Table B-2</b>				
<b>Average Direct Forestry Employment Income Estimates</b>				
	<b>Gross Employment Income</b> (Including Benefits)	<b>Employment Income</b> (Excluding Benefits)	<b>Employment Income Including Holiday Pay</b>	<b>After-tax Employment Income</b>
	(\$1993)	(\$1993)	(\$1993)	(\$1993)
<b>Harvesting</b>				
Site Employment and Log Hauling	52 040	41 900	43 990	32 560
Road Building	55 910	42 340	44 600	33 000
<b>Forestry Services</b>				
Silviculture	44 450	38 520	40 300	30 360
Other	44 450	38520	40 300	30 360
<b>Processing</b>				
Sawmill Processing	54 810	38 610	43 540	32 300
Pulpmill Processing	61 780	47 280	52 800	37 880
Processing salaried	60 740	50 440	52 870	37 900
Administration	46 500	38 270	40 130	30 180
<b>Direct Employment Weighted Average Wages</b>				
TSA Direct Coniferous				32 832
Provincial Direct Coniferous				32 983
Forest District Direct Deciduous				33 984
Provincial Direct Deciduous				34 015

The direct employment average wages (weighted by employment in each respective category) presented in the last line of the table are used to calculate direct employment income levels associated with the direct forestry employment. The average wage differences reflect the different composition of the direct employment totals.

## Harvesting

**Site Employment** - Information on timber volumes harvested, required crews and residences of crews, has been obtained directly from the major licensees, individual contractors (conventional harvesting contractors and horse logging contractors) and the Ministry of Forests. Employment associated with harvesting varies greatly, depending on the method of logging, size of the harvest site, volume of timber on site and experience of the crew.

Harvesting coefficients for horse logging were determined to be 1.11 PY for every 1000 cubic metres of timber harvested. Harvesting sites that used fellerbunchers typically required 0.17 PY of harvesting employment for every 1000 cubic metres. The provincial average harvesting coefficient for the Dawson Creek TSA is 0.21 PY per 1000 cubic metres. The harvesting of deciduous and coniferous stands is assumed to require similar amounts of labour.

The average TSA gross employment income is \$45 950 per PY, with this sector receiving holiday pay of approximately 4 percent. The after-tax employment income associated with harvesting is \$34 920 per PY.

**Log Hauling** - Log hauling is similar to harvesting operations in that all work is performed by independent contractors. Several of the contractors in the TSA operate both logging trucks and harvesting equipment. The employment coefficient for log hauling varies depending on the distance that the timber must be transported and the tonnage that the truck can carry. Some harvest sites are only a few kilometres from the mill, while in other instances, the timber may need to be trucked to Prince George. The average employment coefficient for log hauling is estimated to be 0.07 PY per 1000 cubic metres in the TSA and is assumed to be similar for coniferous and deciduous harvest sites.

The average gross employment income is \$45 950 per PY, with this sector receiving holiday pay of approximately 4 percent. The after-tax employment income associated with harvesting is \$34 920 per PY.

**Road Building** - Information on road building activities, crew size and crew residence has been obtained from Canadian Forest Products and West Fraser Mills Ltd. The average employment derived for these major licensees has been applied to volumes associated with the SBFEP harvests, except the amount associated with horse logging (approximately 20 000 cubic metres). Horse logging is estimated to require approximately half the amount of roads as conventional logging. Therefore, the coefficient for horse logging has been reduced by 50 percent. The average provincial coefficient for road building employment is 0.05 PY per 1000 cubic metres. It is assumed that the magnitude of the coefficient for coniferous and deciduous harvest sites are similar.

Gross road building employment income is estimated to be \$55 910 per PY. This sector typically receives 4 percent holiday pay and has an after-tax employment income of \$33 970.

## Processing

**Site Employment** - Information has been obtained directly from Canadian Forest Products Ltd., West Fraser Mills Ltd., and Louisiana-Pacific Canada Ltd. The licensees provided information on the following: total volumes processed at specific company mills in 1993; wages paid and the total labour force at each mill (including hourly and salaried staff); and TSA volumes processed at each

mill in 1993. Processing coefficients derived from this information are then applied to the harvest levels to determine employment associated with the TSA harvest.

Coniferous timber from licensee Crown tenures is processed at the West Fraser and the Canadian Forest Products sawmills in Chetwynd. With regard to the coniferous harvest associated with the SBFEP operators, it is assumed that these volumes will be sold for processing at the major licensee mills in Chetwynd. Approximately 10 000 cubic metres of the SBFEP harvest is assumed to be processed by small independent producers in the TSA: G. Redekopp's sawmill, A. Summer's sawmill, Emporium Investment's sawmill and R. Fell's log lathe. Wood from the TSA also contributes to volumes processed at the Canadian Woodworkers value-added facility near Prince George and the La Pas sawmill at Bear Lake.

Coniferous wood chips from West Fraser's and Canfor's sawmills generate additional pulp mill employment at Quesnel River Pulp, Prince George Pulp and Paper, Cariboo Pulp and Paper, Fletcher-Challenge, Fiberco and Northwood Pulp and Paper. Dawson Creek TSA wood chips contribute a portion of the total fibre supplied to these pulp mills and thus are assumed to support a portion of the pulp mill labour force. The coniferous provincial processing coefficient is approximately 0.51 PY per 1000 cubic metres.

Deciduous timber volumes in the Dawson Creek TSA are utilized at processing facilities operated by Louisiana-Pacific Canada Ltd. Louisiana-Pacific has two processing facilities in the TSA; an oriented strand-board plant in Dawson Creek and a pulp mill near Chetwynd. These plants do not produce surplus wood chips or hogfuel since they use all of it on-site. The deciduous provincial employment coefficient for processing is estimated to be 0.45 PY per 1000 cubic metres.

The employment income for this category is divided into three groups: hourly sawmill employees, hourly pulp mill employees, and salaried employees for both pulp mills and sawmills. Employment income between the area processing facilities (deciduous and coniferous) is similar. The gross employment income (income and benefits) for hourly sawmill employees is \$54 810 with an average rate of 9 percent for holiday pay. The associated after-tax employment income for this group is \$32 300. The gross employment income for hourly pulp mill employees is \$61 780 with an approximate 10 percent rate associated with holiday pay. The after-tax employment income for hourly pulp mill workers is \$37 880. Salaried processing employees receive gross employment income of approximately \$60 740 per PY, their holiday pay rate is typically 4 percent, and they have an after-tax employment income of approximately \$37 900.

**Administration** - Administration sector employment includes management and support staff located at regional and head offices. This information has been obtained from West Fraser Mills, Canadian Forest Products and Louisiana-Pacific. The administration labour force is pro-rated over the companies' entire harvest level to develop an employment coefficient. The employment coefficient for this category has been divided separately, with a deciduous provincial employment coefficient of 0.07 PY per 1000 cubic metres and a coniferous employment coefficient of 0.06 PY per 1000 cubic metres.

Wages for administrative staff vary widely with incomes ranging from those of senior management to those of administrative clerks. The average gross employment income is \$46 500 per PY. With a 4 percent holiday pay rate, the after-tax employment income is approximately \$30 180.

### **Forestry Services**

**Silviculture** - Information on silviculture spending has been obtained from the Dawson Creek Forest District and the licensees. Currently, the Ministry of Forests is responsible for funding silviculture for areas harvested under the SBFEP, while licensees are responsible for basic silviculture in their harvest areas. These activities include surveying, site preparation, planting, brushing, girdling, fertilization and spacing. Most silviculture is seasonal, and the employment estimates (in person-years) have been derived by summing the number of months worked.

The silviculture requirements between deciduous and coniferous harvest sites are different. Most of the deciduous harvest is dependent on natural regeneration and therefore does not require the same level of silviculture. In the TSA, the coniferous silviculture employment coefficient is approximately 0.05 PY per 1000 cubic metres while the deciduous silviculture employment coefficient is approximately 0.01 PY per 1000 cubic metres.

Gross silviculture employment income is \$44 450 per PY with holiday pay rates of approximately 4 percent contributing to the after-tax employment income level of \$30 360 per PY.

**Other** - This category is designed to capture employment associated with licensees' expenditures on contract labour to perform a variety of tasks related to harvest sites. These typically include engineering, reconnaissance, insect probing, mapping, cruising and block layout. Since many of these tasks occur under similar expenditures as silviculture expenditures, the same wage levels are used in this category as derived for silviculture employment.

### **Ministry of Forests**

The administration of the Dawson Creek TSA supports government employment at the Dawson Creek Forest District and the Prince George Forest Region offices. No employment coefficient is derived since the Ministry of Forests positions are assumed to be unaffected by direct change in the harvest. For example, in 1984 the provincial harvest was 74.55 million cubic metres while the Ministry of Forests directly employed 3 692 persons. In 1992, the harvest was 74.00 million cubic metres and the Ministry of Forests employment had increased to 4248 persons. As a result, government employment is considered to be less dependent on the size of the harvest and more closely associated with budgetary issues and the immediate priorities and responsibilities of the Ministry.

## **Indirect and Induced Employment and Employment Income**

**Local Indirect and Induced Impacts** - The Ministry of Finance and Corporate Relations has proposed a procedure for the estimation of regional-level impacts arising from economic shocks (Horne and Powell, 1995). This paper expands on earlier work conducted by the Ministry of Finance in the calculation and application of economic base income multipliers for 55 local areas of B.C. (Horne, 1994) and (Horne and Robson, 1993).

Economic base analysis assumes that the regional economy is comprised of two sectors, a basic, or export and non-basic, or service sector. The base sector of the regional economy is comprised of all activities whose final markets are external to the region. Examples of basic activity include sawmills that export lumber, mines that export ore and activities that serve the tourist market. The basic sector is assumed to be the primary source of regional economic growth. Non-basic or induced activities include retail sales and local services which serve the residents of the community. Growth

in this sector is assumed to be tied to growth in the basic sector. It is assumed the proportion of total activity that is non-basic remains constant over the period of the analysis.

The forest industry multipliers are predicated on the assumption that direct harvesting jobs do not include jobs associated with log hauling (trucking), or road construction. In the case of the Dawson Creek TSA SEA, however, a survey to identify the employment associated with these activities was conducted. Due to the fact that the majority of these transport and construction contractors are highly dependent on timber harvesting and in many cases engage in harvesting activities, their employment has been counted as direct. Therefore, to avoid double counting of the indirect and induced employment the TSA harvesting multiplier has been adjusted downward to 1.33 from the previous level of 1.56. The multipliers used in the analysis are presented in Table B-3.

	Logging and Forestry	Pulp and Paper	Other Wood Manufacturing
Migration	0.33	0.71	0.45
No-Migration <sup>80</sup>	0.11	0.46	0.26

The 1995 procedures suggest the following methodology for the application of employment ratios that represent the impact of a gain or loss of one job in the forest sector on the local economy.<sup>81</sup>

1. Estimate direct employment and separate into the employment categories: logging and forestry services, pulp and paper, and other wood processing.
2. Estimate the indirect and induced employment level by applying the appropriate indirect/induced employment ratio to the direct employment totals estimated above (step 1).
3. Estimate the indirect and induced employment income levels by multiplying the employment levels estimated above by the appropriate average after-tax wage level (\$20 826).<sup>82</sup>

**Provincial Indirect and Induced Impacts** - Provincial employment is defined as the total number of workers supported by the local area harvest, regardless where in B.C. they reside. For coniferous employment, the local area is defined as the Dawson Creek TSA. For deciduous employment the local area is larger, including the entire Dawson Creek Forest District. Provincial-level employment totals include local-level employment as well.

Provincial impacts are estimated using an employment multiplier of 2.5. The application of the provincial multiplier to direct provincial employment levels results in the corresponding combined

<sup>80</sup> Though only the migration multipliers were used in the analysis, the no-migration numbers are presented for purposes of comparison.

<sup>81</sup> For a more detailed account of the procedure please refer to Horne and Powell, 1995.

<sup>82</sup> The average wage \$20 826 represents combined indirect/induced wage for the Prince George area. Price Waterhouse, Prince George Timber Supply Area: Economic Value of the Forest Industry, October, 1994.

direct, indirect and induced employment levels.

Indirect and induced employment income levels were estimated by multiplying the indirect and induced employment levels by after-tax incomes of \$20 826 which represents the 1993 average annual indirect/induced wage for the Prince George Region.<sup>83</sup>

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<sup>83</sup> Since the provincial employment also occurs in the Prince George area, the same average indirect/induced wage is applied.

### Dawson Creek Forest District: Estimates of Employment and Income by Industry Sector

Tables B-4 and B-5 present employment and income estimates by industry sector for the Dawson Creek Forest District.<sup>84</sup> The forest industry totals include total employment associated with all coniferous and deciduous sources.

Industry Sector	Direct	Indirect	Nonbasic	Total
Logging	407	92	136	634
Pulp and Paper	180	58	69	306
Other Wood Man.	602	94	176	872
Mining	1591	167	593	1407
Mineral Processing	64	9	18	91
Petroleum	222	240	120	583
Agriculture	1168	59	180	1407
Tourism	758	5	85	848
Public Sector	2652	33	620	3305
Construction	780	123	206	1109
Other	822	374	289	1485
Non-Employment	0	0	667	667
<b>Total</b>	<b>9246</b>	<b>1255</b>	<b>3159</b>	<b>13 660</b>

Source: Ministry of Finance and Corporate Relations

Industry Sector	Direct	Indirect	Nonbasic	Total
Logging	\$11.3	\$2.1	\$2.4	\$15.8
Pulp and Paper	5.6	1.3	1.2	8.0
Other Wood Man.	15.4	1.9	3.1	20.5
Mining	54.9	3.6	10.5	69.0
Mineral Processing	1.6	0.2	0.3	2.1
Petroleum	6.7	5.2	2.1	14.0
Agriculture	16.6	1.2	3.2	21.0
Tourism	8.2	0.1	1.5	9.9
Public Sector	60.4	0.7	10.9	72.1
Construction	18.0	2.3	3.6	24.0
Other	19.5	9.0	5.1	33.6
Non-Employment	65.8	0.0	11.8	77.6
<b>Total</b>	<b>\$284.0</b>	<b>\$27.7</b>	<b>\$55.7</b>	<b>\$367.4</b>

Source: Ministry of Finance and Corporate Relations

<sup>84</sup> Horne, G., and Powell, C. *The Forest District Tables*, Ministry of Finance and Corporate Relations, March, 1995.

## Appendix C

### Government Revenue Estimates

Estimates of government revenues are based on information from the Ministry of Forests, Statistics Canada, and Revenue Canada Taxation, and are expressed in 1993 dollars per 1000 cubic metres. Variable government revenues associated with the coniferous harvest and the deciduous processing are summarized in Table C-1. Local revenues, which do not vary with the harvest level, are discussed separately under "Fixed Revenues".

#### C.1 Variable Government Revenues

**Stumpage and Rent** - Stumpage information for Dawson Creek TSA has been provided by the Valuation Branch of the Ministry of Forests and was calculated at a rate of \$13 190 per 1000 cubic metres for coniferous volumes and \$970 per 1000 cubic metres for deciduous volumes. Policy changes announced in April, 1994 as part of the Forest Renewal Plan, resulted in 1994 stumpage charges approximately 60 percent higher than the three year (1991-1994) average. Since stumpage rates vary with price levels, estimated stumpage payments are based on the ratio of the 1994 value of stumpage to 1994 lumber price index, averaged over the previous four years lumber index prices. Using this method, an estimate of future stumpage values based on the new stumpage rate averaged over the past four years of prices can be obtained. Rent estimates of \$278 per 1000 cubic metres are based on information from the Economics and Trade Branch of the Ministry of Forests, based on a five year average (1987/88 to 1991/92) inclusive.<sup>85</sup>

**Personal Income Tax** - Estimates of employment income (Appendix B) and average provincial income tax paid by income class are used to estimate provincial personal income tax. Taxation levels have been determined from Revenue Canada's *British Columbia--Pay-roll Deduction Tables* for January, 1994 (see Appendix B). Personal income taxes include income taxes paid by both direct and indirect employees. Government revenue estimates in this report do not include taxes paid to the federal government.

**Scaling Fees, Residue and Waste Charges** - The revenue derived from scaling, residue and waste charges are from the Valuation Branch in Victoria. These fees are based on the actual revenues derived from the Dawson Creek TSA in 1991, 1992 and 1993 and are averaged over the billed volumes in those years to obtain the average rate.

**Other Taxes** - Other taxes include corporate, logging, sales, and electricity taxes. These are estimated using a five year average (1988-1992).<sup>86</sup> Government revenues associated with property taxes have been deducted from the average and are reported under local taxes. Government revenues estimated in this report do not include corporate taxes paid to the federal government. Using a five year average (1988-1992), corporate taxes paid to the federal government average \$913 per 1000 cubic metres.

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<sup>85</sup> Ministry of Forests, Economics and Trade Branch (1992), *Economic Impacts of Timber Harvesting in British Columbia*.

<sup>86</sup> Ministry of Forests, Economics and Trade Branch (1993), *Economic Impacts of Timber Harvesting in British Columbia*.

<b>Revenue Type</b>	<b>Coniferous Revenues (\$ per 1000 m<sup>3</sup>)</b>	<b>Deciduous Revenues (\$ per 1000 m<sup>3</sup>)</b>
Stumpage and Rent <sup>87</sup>	\$13452	1257
Personal Income Tax <sup>88</sup>	6075	5131
Residue and Waste charges	518	518
Other Provincial Taxes (Logging, Sales, Electricity)	4018	4018
<b>Total Variable Revenue:</b>	<b>\$24063</b>	<b>\$10924</b>

## C.2 Fixed Revenues

**Local Revenues** - Government revenues also include local revenues paid by processing facilities to area municipal and regional governments in the form of property taxes. The Dawson Creek TSA has two large coniferous processing facilities within its boundaries: the West Fraser and Canfor sawmills in Chetwynd area. Collectively, these two plants paid approximately \$0.7 million in local taxes in 1993.

The Louisiana-Pacific facilities in Dawson Creek and Chetwynd represent the two deciduous processing facilities. Louisiana-Pacific's process facilities contributed \$1.5 million in local taxes in 1993.

Local revenues are not dependent on the volume of timber processed and revenues are anticipated to remain relatively constant as long as the processing facilities are in existence. Therefore, if harvest levels increase or decrease it is assumed that the amount of local revenues will remain constant. The exceptions would be if timber volumes increased to some threshold level, resulting in an expansion of an existing plant or a new plant being built, or if timber volumes declined to a level which resulted in a processing facility closing. Local revenues would then change accordingly.

<sup>87</sup> Stumpage revenues using only 1994 values would average \$15 180 per 1000 cubic metres for coniferous timber and \$1380 per 1000 cubic metres for deciduous timber. Rents were applied at a rate of \$0.278 per cubic metre of harvested Crown timber.

<sup>88</sup> Personal government revenues do not include federal revenues. Federal revenues for the coniferous harvest would be approximately \$12 540 per 1000 cubic metres while the deciduous harvest would average \$10 684 per 1000 cubic metres.

## Appendix D

### Summary of Coefficients for the Dawson Creek TSA

This appendix provides a summary of information outlined in Appendices B and C. Table D-1 illustrates the coefficients associated with employment, employment income, and government revenues. These coefficients that can be applied to any harvest level to determine the employment, income and government revenue levels associated with that particular volume. All coefficients are expressed in terms of 1000 cubic metres of harvested timber. Note that resulting estimates are subject to the assumptions and limitations outlined in Appendix B.

<b>Table D-1 Summary of Coefficients</b>		
<b>Category</b>	<b>Dawson Creek TSA</b>	<b>Provincial (including local)</b>
<b>Coniferous Employment</b>		
Direct Forestry Employment	0.68 PY / 1000 m <sup>3</sup>	0.91 PY / 1000 m <sup>3</sup>
Indirect Forestry Employment	0.26 PY / 1000 m <sup>3</sup>	1.37 PY / 1000 m <sup>3</sup>
Total Forestry Employment	0.94 PY / 1000 m <sup>3</sup>	2.28 PY / 1000 m <sup>3</sup>
<b>Coniferous Employment Income</b>		
Direct Employment Income	\$21 987 / 1000 m <sup>3</sup>	\$30 015 / 1000 m <sup>3</sup>
Indirect Employment Income	\$5 497 / 1000 m <sup>3</sup>	\$28 438 / 1000 m <sup>3</sup>
Total Employment Income	\$27 484 / 1000 m <sup>3</sup>	\$58 453 / 1000 m <sup>3</sup>
<b>Government Revenue</b>		
Variable Government Revenue	N/A	\$24 063 / 1000 m <sup>3</sup>
Fixed Government Revenue	\$0.70 million	N/A
<b>Deciduous Employment</b>		
Direct Forestry Employment	0.78 PY / 1000 m <sup>3</sup>	0.80 PY / 1000 m <sup>3</sup>
Indirect Forestry Employment	0.37 PY / 1000 m <sup>3</sup>	1.20 PY / 1000 m <sup>3</sup>
Total Forestry Employment	1.15 PY / 1000 m <sup>3</sup>	2.00 PY / 1000 m <sup>3</sup>
<b>Deciduous Employment Income</b>		
Direct Employment Income	\$26 492 / 1000 m <sup>3</sup>	\$27 215 / 1000 m <sup>3</sup>
Indirect Employment Income	\$7 644 / 1000 m <sup>3</sup>	\$24 995 / 1000 m <sup>3</sup>
Total Employment Income	\$34 136 / 1000 m <sup>3</sup>	\$52 209 / 1000 m <sup>3</sup>
<b>Government Revenue</b>		
Variable Government Revenue	N/A	\$10 924 / 1000 m <sup>3</sup>
Fixed Government Revenue	\$1.50 million	N/A



## Appendix E

### Economic Impacts of Alternative Harvest Levels

The Ministry of Forests released the Dawson Creek TSA Timber Supply Analysis in September of 1994. Since the publication of the analysis report, an error was discovered that led to an incorrect estimate of the deciduous timber harvesting land base. In addition, a forest inventory audit indicates that the estimated volumes were initially underestimated. To assess the impacts of the error and the inventory audit on projected timber harvest levels in the Dawson Creek TSA, further analysis was conducted and the results presented in an addendum to the original analysis report.

The timber supply addendum indicated that the land base error and inventory audit would increase the projected base harvest forecast for both the coniferous and deciduous species. The increase in the coniferous base harvest forecast has implications for the economic impacts estimated in the Dawson Creek Socio-Economic Analysis. Tables E-1, E-2 and E-3 present the economic impacts that are associated with the higher coniferous base harvest forecast (972 000 cubic metres) that results when the land base error is corrected. The tables also present two sets of impacts associated with the higher harvest forecasts that reflect the different inventory information (1 100 000 and 1 300 000 cubic metres). Since the Socio-Economic Analysis did not estimate the economic impacts for the deciduous harvest forecast, no economic impacts relating to the deciduous harvest are presented in this appendix.

<b>Table E-1</b>							
<b>Alternative Coniferous Harvest Level:</b>							
<b>TSA Employment and Employment Income</b>							
<b>Scenario</b>	<b>Harvest (m<sup>3</sup>/year)</b>	<b>Employment (PY/year)</b>			<b>Employment Income (after-tax \$1993 millions/year)</b>		
		<b>Direct</b>	<b>Indirect/ Induced</b>	<b>Total</b>	<b>Direct</b>	<b>Indirect/ Induced</b>	<b>Total</b>
Current Harvest	691 323	470	180	650	\$15.2	\$3.8	\$19.0
Revised Base Harvest Level	972 000	661	253	914	\$21.4	\$5.3	\$26.7
Alternative Harvest Level 1	1 100 000	748	286	1034	\$24.2	\$7.1	\$30.2
Alternative Harvest Level 2	1 300 000	884	338	1222	\$28.6	\$6.0	\$35.7

Scenario	Harvest (m <sup>3</sup> /year)	Employment (PY/year)			Employment Income (after-tax \$1993 millions/year)		
		Direct	Indirect/ Induced	Total	Direct	Indirect/ Induced	Total
Current Harvest	691 323	629	947	1576	\$20.8	\$19.7	\$40.5
Revised Base Harvest Level	972 000	885	1332	2217	\$29.2	\$27.6	\$56.8
Alternative Harvest Level 1	1 100 000	1001	1507	2508	\$33.0	\$31.3	\$64.3
Alternative Harvest Level 2	1 300 000	1183	1781	2964	\$39.0	\$37.0	\$76.0

Category	Variable Provincial <sup>1</sup>	Fixed Provincial	Total Provincial
	(\$1993 millions/year)		
Current Harvest Level 691 323 m <sup>3</sup>	\$16.8	\$0.7	\$17.5
Revised Base Harvest Level 972 000 m <sup>3</sup>	\$23.4	\$0.7	\$24.1
Alternative Harvest Level 1 1 100 000 m <sup>3</sup>	\$26.5	\$0.7	\$27.2
Alternative Harvest Level 2 1 300 000 m <sup>3</sup>	\$31.3	\$0.7	\$32.0

Note: <sup>1</sup> Includes; stumpage and rent, personal income tax, scaling waste and residue fees and other taxes.  
<sup>2</sup> Federal government revenues include federal income tax, corporate income tax, sales tax, excise tax and withholding tax and are estimated at \$9.0 million (691 323 m<sup>3</sup>), \$12.7 million (972 000 m<sup>3</sup>), \$14.3 million (1 100 000 m<sup>3</sup>), and \$16.9 million (1 300 000 m<sup>3</sup>)

## Appendix F

### List of Contacts

#### Ministry of Forests

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M. Wilkinson	Valuation, Prince George Region
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#### Forest Industry

K. Fink	B.W. Fink Enterprises Inc.
D. Douglas	Canadian Forest Products Ltd.
T. Fazekas	Canadian Forest Products Ltd.
A. Zwiers	Canadian Woodworks
L. Gellings	Dakota Contracting
J. Lee	Emporium Investments Ltd.
G. Moore	G.F. Moore & Associates
G. Kalischuk	Horse Logging Association Representative

E. Parenteau	Horse Logger
I. Hanson	La Pas Lumber
M. Byl	Louisiana-Pacific Canada Ltd.
R. Fornelli	Louisiana-Pacific Canada Ltd.
N. Hanson	Louisiana-Pacific Canada Ltd.
R. Crick	Ralph Crick Logging
B. Roberts	Tri Team Construction
C. Bassett	W & D Contracting
J. Magowan	West Fraser Mills Ltd.
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