

**ARROW TSA**  
**SOCIO-ECONOMIC ANALYSIS**

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Economics & Trade Branch

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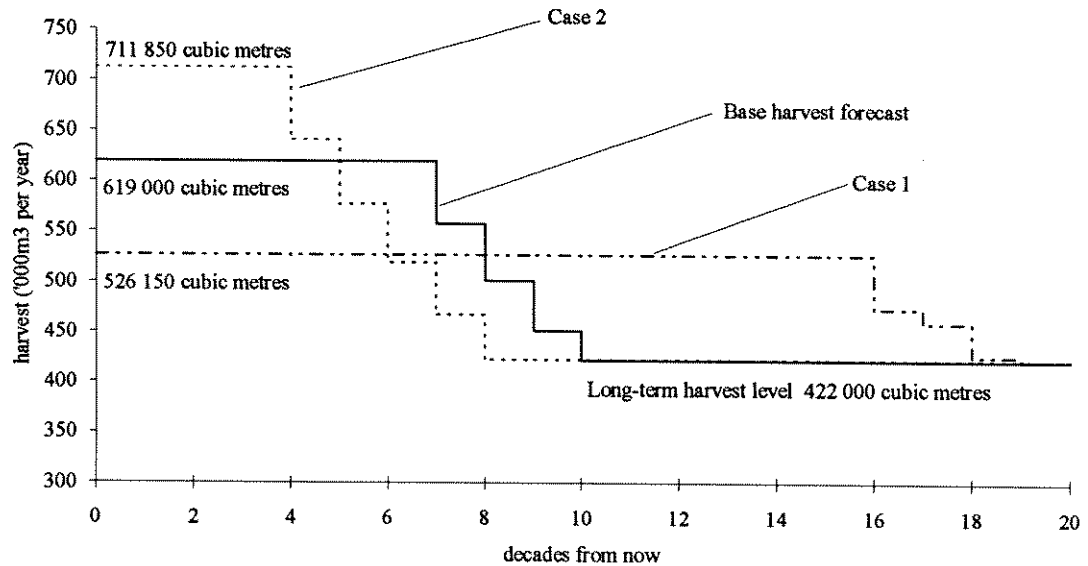


## ***EXECUTIVE SUMMARY***

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- This socio-economic impact report has been written to accompany the *Arrow TSA Timber Supply Analysis* by the Ministry of Forests. Together, the timber supply analysis report and this impact assessment will be used as input for the development of a discussion paper by the Arrow Forest District. The discussion paper will be the focus for public discussion regarding the issues surrounding changes to the timber harvest level.
- This report has two components:
  - a profile and description of the local economy, and the physical and community setting within the Arrow Forest District; and
  - an assessment of the socio-economic and environmental implications within the Arrow TSA related to the range of forecast harvest levels specified in the *Arrow TSA Timber Supply Analysis*.
- Several impacts precipitated by the forecast harvest levels for the Arrow TSA, both quantitative and qualitative, have been evaluated in this report using a multiple accounts analysis approach. The harvest scenarios assessed are as follows:
  - **The base harvest forecast**, referred to as the Base Case in the Ministry of Forests' *Timber Supply Analysis* Report, begins at an initial harvest level of 619 000 m<sup>3</sup>. This level can be maintained for six decades; however, the average age of harvested stands would drop significantly in the first twenty years. The forecast continues with 10 percent decreases in each of Years 70, 80, and 90. In Year 100, the harvest would fall by a further 65 percent to the long-term harvest level (LTHL) of 422 000 m<sup>3</sup>.
  - **Case 1: A harvest forecast starting 15 percent lower than the current AAC.**
  - **Case 2: A harvest forecast starting 15 percent higher than the current AAC.**

**Figure ES.1**  
**Arrow TSA Timber Harvest Forecasts**



The choice of harvest levels has been made by the Ministry of Forests as a means of illustrating the sensitivity of employment, income and government revenue, as well as the social and environmental implications, to different harvest levels. It does not indicate preferred options.

- The results of this analysis are derived from the best available information; however, the precision of the estimates are limited by the following factors:
  - It is assumed that the current timber harvesting land base and forest management practices will remain the same in the future. Therefore, the analysis does not take into account the implications of changes in forest management practices, land use processes such as the Protected Areas Strategy, Land and Resource Management Plans, Local Resource Use Plans, or comprehensive land claims negotiations.
  - Quantitative results are calculated for the forest sector only.
  - Due to data limitations, impacts are presented as if they would occur concurrently with a change in the harvest level, which means that "lag effects" are not captured in the model.
  - Employment coefficients used to calculate future employment levels are based on

the assumption that the current level of labour-intensity will hold over time, and that a linear relationship exists between the harvest level and the level of employment. Threshold effects, such as mill closure due to a shortage of wood, are not accounted for in the economic analysis.

## **Area Profile**

- The Arrow TSA forms part of the Arrow Forest District, situated in the southwest portion of the Nelson Forest Region. The TSA covers a land area of 754 000 hectares and is divided into one large, four moderately sized, and two small parcels.
- Approximately 217 000 hectares, or 29 percent, of the Arrow TSA's total land base is considered available for timber harvesting under current management practices. The TSA accounts for 30 percent of the 2.0 million m<sup>3</sup> of timber required annually by processing plants in the Arrow Forest District.

## **Socio-Economic Setting**

- In 1991, the population of the Arrow Forest District was 42 145. The largest communities within the Arrow Forest District are Trail, Castlegar and Rossland, while the area supports another eight incorporated and unincorporated small communities.
- The three key areas of the forest district can be described as follows:
  - Castlegar area - forest sector dependent, and region's main service centre;
  - Rossland-Trail area - predominated by mining; and,
  - Slocan Valley - forest sector dependent, and a growing "non-traditional" economic sector.
- Population growth has been mixed in the Arrow Forest District. Since 1981, Castlegar and Rossland have both increased in size, while the populations of Trail, Nakusp and Slocan have declined. Most recently, however, population throughout the forest district has been increasing as retirees, semi-retirees and professionals are attracted to the natural beauty of the study area. This has fueled economic growth and diversification.
- Historically, the labour force of the Arrow Forest District has been highly dependent upon primary resource sectors, specifically forestry and mining. With the loss of forest sector and mining jobs during the past decade, there has been a shift towards lower income service sector jobs or self employment.
- The unemployment rate in the Arrow Forest District was 13 percent in 1991.
- Forestry and mining have historically been the two prime economic sectors of the

communities in the Arrow Forest District. Tourism and outdoor recreation has been growing in importance, although it is still a relatively small sector compared to mining and forestry. Other key sectors include construction, agriculture and agroforestry and wildcrafts; however, they, too, are relatively small.

- The Arrow Forest District does not contain any First Nations' reserves or communities. However, the long standing presence of First Nations' people has been documented and is evident from various archaeological finds.
- Issues and concerns:
  - the high rate of unemployment and lack of jobs;
  - uncertainty about job retention in mining and forestry sectors;
  - the continuing shift from high paying, full time jobs in the resource sector to lower income jobs or self-employment in other sectors;
  - increasing importance of secondary incomes, and subsistence and underground economic activities (e.g., bartering);
  - increased economic pressure on families who must rely on second income sources or subsistence activities to make ends meet;
  - reduced tax base to support service demands of growing population;
  - polarization regarding issues of environmental protection and resource sector jobs and growth;
  - a desire for local control over resource management;
  - increased opportunities for value-added manufacturing of forest products, tourism and agroforestry/wildcrafts;
  - resource management provisions, including tenure or access arrangements, accommodating agroforestry requirements;
  - chip trucks on highways;
  - growth management and economic diversification; and,
  - interest pertaining to land claims.

### **Environmental Setting**

- The Arrow Forest District is bounded by the Selkirk Mountain Range to the east and the Monashee Mountain Range to the west, with the Valhalla Range at its centre. An important feature of the study area is the east arm of the Columbia River system, which includes the Upper and Lower Arrow Lakes.
- The Upper Arrow is within the Central Columbia Mountains Ecosection of the Columbia Mountains and Highlands Ecoregion, which is characterized by high ridges with deep wide-trenched and narrow valleys. The Lower Arrow is situated in the Selkirk Foothills Ecosection of the Selkirk-Bitterroot Foothills Ecoregion. The topography is more subdued as compared to the Upper Arrow.

- The Arrow Forest District supports an abundance and wide variety of wildlife species, including both some unique and endangered species. The diversity of habitats found in the forest district account for the over 60 species of birds, both resident and migratory, that can be found in the area. All ungulate species present in B.C. can be found within the Arrow Forest District. A wide variety of fish species are also found within the Arrow Forest District.
- Issues and concerns identified are as follows:
  - protection of unique or limited habitats;
  - harvest impacts on forest seral distribution (i.e., maximum amount in early seral stages);
  - maintenance of old growth and old growth diversity;
  - provisions for retention of cavity trees and coarse woody debris;
  - increased protection of caribou winter range;
  - provisions for forest ecosystems networks;
  - improved protection of riparian areas;
  - harvest distribution impacts on special habitats (i.e., high elevation) and wildlife species (i.e., grizzly bears, caribou and goats);
  - enhanced forest management practices;
  - harvesting and road maintenance impacts on water quality;
  - the ability to manage second growth forests to provide old growth value.

### **TSA Forestry Operations**

- The Allowable Annual Cut within the Arrow TSA is 619 000 m<sup>3</sup>. Timber is apportioned as follows:

| <b>Table ES1: Arrow TSA Timber Apportionment 1992</b> |                            |                       |
|-------------------------------------------------------|----------------------------|-----------------------|
|                                                       | <b>AAC (m<sup>3</sup>)</b> | <b>Percent of AAC</b> |
| Forest Licences                                       | 489 758                    | 79.1                  |
| SBFEP                                                 | 113 336                    | 18.3                  |
| Woodlot licences                                      | 9 700                      | 1.6                   |
| Forest Service Reserve                                | 6 206                      | 1.0                   |
| <b>Total</b>                                          | <b>619 000</b>             | <b>100.0</b>          |

The major licensees in the TSA are Slocan Forest Products, Atco Lumber, Riverside Forest Products, Kalesnikoff Lumber Company Ltd., and Bell Pole Company Ltd. Approximately 79 percent of Arrow timber is held under Forest Licence. The largest processing operations in the Arrow Forest District are Atco Lumber, Kalesnikoff Lumber, Slocan Forest Products (relying on

the TSA for approximately 55 - 60 percent of their wood supply), and Pope and Talbot, Celgar Pulp, and Forest Fibre Ltd (relying to a much lesser degree on Arrow TSA timber).

- Based on information provided by industry representatives in the Arrow Forest District, approximately 85 percent of wood from the Arrow TSA is processed inside the TSA, and the rest outside.
- Approximately 600 PYs of direct employment are generated annually by timber from the Arrow TSA within the TSA. Approximately three quarters of these jobs are in the harvesting and processing sectors. Another 34 direct PYs are created outside the TSA, primarily in processing. Overall, wood from the Arrow TSA generates approximately 634 PYs of direct employment annually in BC.

## **Economic Development Impacts**

### **Base Harvest Case - TSA**

- If the initial harvest level of 619 000 m<sup>3</sup> were sustained for six decades, as in the base harvest scenario, estimated harvest dependent forest activity would generate approximately 600 PYs of direct employment, plus an additional 432 PYs of indirect and induced employment, for a total of approximately 1 032 PYs in the Arrow Forest District.
- Associated with this is about \$32 million of after-tax employment income, of which about \$20 million is direct forest sector income.
- Under the base harvest scenario, the harvest level would begin to decline in Year 70, with corresponding losses of employment and income. Over the entire forecast period, total annual direct, indirect and induced employment would decline from 1 032 PYs to 703 PYs, representing an loss of 329 PYs. Total income would decline correspondingly by \$10.2 million.
- The economic development implications in non-forestry sectors arising from different Arrow TSA harvest levels would be limited in most cases, with the exception of tourism related to outdoor recreation and agroforestry/wildcrafts, which could be expected to respond positively to lower harvest rates.

### **Base Harvest Case - Provincial**

- A TSA harvest of 619 000 m<sup>3</sup> would support 634 PYs of harvest dependent employment in the forest sector, plus an additional 951 PYs of indirect and induced employment in other sectors for a provincial total of 1 585 PYs. Associated with the direct, indirect and induced jobs is about \$47 million in after-tax employment income (including cash benefits), of which \$21 million would be direct forest sector income.

- As in the case of TSA level impacts, jobs and income related to the harvest in the Arrow TSA would remain unchanged over the next 69 years. In Years 70, 80, 90 and 100, however, employment losses would occur. Over the entire forecast period, years 0 to 100, a total loss of approximately 200 PYs of direct forest sector employment in the province, and 6.8 million in direct employment income would result.
- During the entire forecast, a total of approximately 505 PYs would be lost (direct, indirect and induced employment), and \$15 million in after-tax income.

### **Case 1 Harvest Forecast**

- An initial harvest rate of 526 150 m<sup>3</sup> (which is 15 percent less than the base harvest of 619 000 m<sup>3</sup>) could be sustained for 16 decades before declining to the long-term harvest level of 422 000 m<sup>3</sup>. Thus, while there would be significantly fewer jobs in Year 0 vis a vis the base harvest, they would be sustained at a constant level for a much longer period.
- In Year 0 of the forecast period, 510 PYs of employment and \$17.0 million in income would be generated under Case 1, compared to 600 PYs and \$20.0 million in the base harvest forecast. An initial loss of 90 PYs of direct employment and \$3 million in employment income results in Case 1 as compared to the base harvest forecast.
- The lower initial harvest level of Case 1 would generate less annual TSA employment and employment income in the forest sector until Year 80 of the forecast period. Beginning in Year 80, however, a reversal would occur: more jobs would be associated with Case 1, as the base harvest continues to decline.
- This same trend would occur at the provincial level.

### **Case 2 Harvest Forecast**

- Case 2 assumes that the initial harvest level is 15 percent higher than that of the base harvest level. This would be sustained for 4 decades before starting a decline to the long-term sustainable level of 422 000 m<sup>3</sup>.
- In Year 0, Case 2 would generate 690 PYs of annual direct forest sector employment, and \$23.9 million in employment income, representing an increase of 90 PYs of annual employment and \$3.1 million as compared to the base harvest forecast in Year 0.
- The harvest level of Case 2 would start declining in the fourth decade, and would reach the long term level of 422 000 m<sup>3</sup> by Year 80. Consequently, forest sector employment and income would drop off correspondingly.

- Comparing Case 2 with the base harvest forecast, the initial employment and income gain associated with a 15 percent initial increase in harvest would be eroded starting in Year 40. By year 50, the employment and income generated by the base harvest forecast, however, would exceed that of Case 2.
- The trend at the provincial level would match that of the TSA level results.

## **Government Revenue Impacts**

- Changes in the Arrow TSA harvest level would directly affect government revenues through impacts on resource use and resource-related tax revenues, as well as through changes in personal income tax revenue. The principal resource-related impacts would be on the forestry sector, since tourism impacts (e.g. user and licence fees) would be relatively small, and no significant change to the mining industry is anticipated.
- Forest industry taxes at the provincial level include stumpage and rents, as well as corporate income tax, logging, sales, property and electricity taxes. At the federal level they include corporate income tax, and excise and withholding taxes.
- At a harvest level of 619 000 m<sup>3</sup> per year, the forest sector would generate total tax revenues of almost \$26.2 million per year, of which \$14.5 million would be provincial and the remaining \$11.7 million federal.
- Of the provincial revenues related to timber from the Arrow TSA, stumpage accounts for the largest share at \$5.5 million. Other provincial forest industry taxes would contribute almost \$3.8 million per year, while provincial income tax would contribute \$5.2 million annually. Just under half of this would come from direct forest sector employment.
- Of the total \$11.7 million in federal revenue from the Arrow TSA, \$10.6 million would come from personal income tax and only \$1.1 million from forest industry taxes. Again, just under half of the federal personal income tax would be derived from direct forest sector employment.
- Between Years 0 and 100 under the base harvest case, provincial and federal revenues would be approximately \$8.4 million less as a result of the harvest reductions in the Arrow TSA.

## **Social Implications**

- The base harvest forecast would provide job stability and continued employment at approximately the same level as today over the next 69 years. This stability would be welcome from a community standpoint given the local economy's dependence on the forest sector (except for Trail and Rossland), present uncertainty in the mining sector, and the

already high proportion of the working age population who are unemployed.

- A long period of stable forest sector employment would provide a much-needed base for future economic development, and enable the community to avoid or mitigate a new wave of population loss as well as the economic and social stress attendant with job losses.
- A fifteen percent lower initial harvest rate vis a vis the base harvest would eliminate approximately 90 PYs of direct forest sector employment in the forest district. This number should be seen in the context of the already high proportion of unemployment/social assistance and potential further job losses in the mining sector. It would likely result in some population loss, and ensuing social stresses.
- Conversely, if the initial harvest rate was 15 percent higher than the base harvest rate, approximately 90 additional forest sectors jobs could be created. A 40 year period of stable forest sector employment would support future diversification efforts and ensure population stability within the TSA.
- Negative implications of an initially higher harvest could include impacts on agroforestry/wildcrafts and subsistence activities, recreation, visual aesthetics and water quality.

## **Environmental Implications**

- While current management practices already include provisions to protect critical environmental features of the TSA, specifically deer and caribou winter range, riparian habitats, visually sensitive areas and Class 1 and 2 watersheds, a number of concerns have not been fully addressed. These concerns include additional protection for old growth values, cavity trees and coarse woody debris, ecosystems networks, riparian areas, wildlife winter range as well as unique or limited habitats. Although these concerns are common to all of the harvest forecasts, the rate of harvest may accentuate or diminish these concerns, as well as affect both age distribution of the forest and harvest distribution, that in turn affect dependent species.
- The Ministry of Environment has also expressed concern that the base harvest forecast could negatively affect both early and old growth stages of seral distribution, in effect narrowing the forest age class distribution. Other concerns include the possible liquidation of low elevation old growth, harvesting in high elevation special habitats, and possible greater focus on special management zones, particularly watersheds, as a result of constraints on other areas.
- The lower and higher initial harvest levels implicit in Case 1 and 2 respectively, will either modify or exacerbate the environmental implications related to the base harvest.



# CONTENTS

---

|                                                                       |            |
|-----------------------------------------------------------------------|------------|
| Executive Summary .....                                               | i          |
| List of Figures .....                                                 | xiii       |
| List of Tables.....                                                   | xiv        |
| <br>                                                                  |            |
| <b>1.0 INTRODUCTION .....</b>                                         | <b>1-1</b> |
| 1.1 Background.....                                                   | 1-1        |
| 1.2 Study Objectives and Approach .....                               | 1-2        |
| 1.3 Structure of the Report.....                                      | 1-2        |
| <br>                                                                  |            |
| <b>2.0 AREA PROFILE .....</b>                                         | <b>2-1</b> |
| 2.1 Location & General Features .....                                 | 2-1        |
| 2.2 Communities and Demographic Characteristics.....                  | 2-3        |
| 2.2.1 Castlegar Area .....                                            | 2-3        |
| 2.2.2 Rossland/Trail Area.....                                        | 2-4        |
| 2.2.3 Slocan Valley .....                                             | 2-4        |
| 2.3 Population Characteristics and Trends .....                       | 2-5        |
| 2.4 Labour Force.....                                                 | 2-7        |
| 2.5 Economic Base of the Arrow Forest District.....                   | 2-10       |
| 2.5.1 Forestry .....                                                  | 2-10       |
| 2.5.2 Mining .....                                                    | 2-10       |
| 2.5.3 Tourism and Recreation .....                                    | 2-11       |
| 2.5.4 Construction .....                                              | 2-16       |
| 2.5.5 Agriculture.....                                                | 2-17       |
| 2.5.6 Agroforestry and Wildcrafts .....                               | 2-17       |
| 2.6 Environmental Setting .....                                       | 2-18       |
| 2.6.1 Biogeoclimatic Characteristics.....                             | 2-18       |
| 2.6.2 Wildlife Resources .....                                        | 2-20       |
| 2.6.3 Fisheries Resources .....                                       | 2-21       |
| 2.6.4 Water Resources .....                                           | 2-22       |
| 2.6.5 Protected Area Strategy .....                                   | 2-23       |
| 2.7 First Nations.....                                                | 2-24       |
| 2.8 Issues and Concerns .....                                         | 2-25       |
| <br>                                                                  |            |
| <b>3.0 ARROW TSA FOREST PROFILE .....</b>                             | <b>3-1</b> |
| 3.1 Timber Harvesting Land Base.....                                  | 3-1        |
| 3.1.1 Current Management Practices.....                               | 3-2        |
| 3.1.2 Special Management Zones .....                                  | 3-3        |
| 3.2 Potential Changes Affecting the Land Base and Timber Supply ..... | 3-4        |

|            |                                                                                      |            |
|------------|--------------------------------------------------------------------------------------|------------|
| 3.3        | Critical Factors .....                                                               | 3-6        |
| 3.4        | Current Timber Supply and Timber Harvest Forecasts .....                             | 3-8        |
| 3.4.1      | Timber Harvest Forecasts.....                                                        | 3-9        |
| <b>4.0</b> | <b>FOREST INDUSTRY PROFILE.....</b>                                                  | <b>4-1</b> |
| 4.1        | Current TSA Apportionment .....                                                      | 4-1        |
| 4.2        | Forest Sector Employment.....                                                        | 4-3        |
| 4.2.1      | Harvesting .....                                                                     | 4-3        |
| 4.2.2      | Processing.....                                                                      | 4-4        |
| 4.2.3      | Fibre Supply Of Major Licensees.....                                                 | 4-6        |
| 4.2.4      | Lumber Remanufacturing.....                                                          | 4-7        |
| 4.2.5      | Silviculture.....                                                                    | 4-8        |
| 4.2.6      | Ministry of Forests (MoF).....                                                       | 4-8        |
| 4.3        | Summary of Employment and Estimation of Coefficients .....                           | 4-8        |
| 4.4        | Average Employment Income .....                                                      | 4-12       |
| 4.5        | Capital Investment and Other Expenditures in Arrow Forest District .....             | 4-13       |
| <b>5.0</b> | <b>ECONOMIC DEVELOPMENT IMPACTS .....</b>                                            | <b>5-1</b> |
| 5.1        | Base Harvest Forecast - Forestry Sector Economic Impacts.....                        | 5-1        |
| 5.1.1      | TSA Employment and Employment Income Impacts .....                                   | 5-2        |
| 5.1.2      | Provincial Employment and Employment Income Impacts .....                            | 5-4        |
| 5.2        | Case 1 and 2 Alternative Initial Harvest Forecasts - Forestry Economic Impacts ..... | 5-6        |
| 5.2.1      | Comparison of Case 1 with Base Harvest Forecast .....                                | 5-6        |
| 5.2.2      | Comparison of Case 2 with Base Harvest Forecast .....                                | 5-8        |
| 5.3        | Other Economic Sectors.....                                                          | 5-8        |
| 5.3.1      | Mining .....                                                                         | 5-9        |
| 5.3.2      | Outdoor Recreation/Tourism.....                                                      | 5-9        |
| 5.3.3      | Construction .....                                                                   | 5-10       |
| 5.3.4      | Agriculture.....                                                                     | 5-11       |
| 5.3.5      | Agroforestry and Wildcrafts .....                                                    | 5-11       |
| <b>6.0</b> | <b>GOVERNMENT REVENUE IMPACTS .....</b>                                              | <b>6-1</b> |
| 6.1        | Forest Sector .....                                                                  | 6-1        |
| 6.1.1      | Forest Industry Taxes.....                                                           | 6-2        |
| 6.1.2      | Personal Income Tax.....                                                             | 6-4        |
| 6.1.3      | Total Government Revenues .....                                                      | 6-4        |
| <b>7.0</b> | <b>SOCIAL IMPLICATIONS .....</b>                                                     | <b>7-1</b> |
| 7.1        | Implications for Communities .....                                                   | 7-1        |
| 7.1.1      | Base Harvest Forecast.....                                                           | 7-1        |
| 7.1.2      | Alternative Initial Harvest Forecasts.....                                           | 7-2        |

|                   |                                                                               |            |
|-------------------|-------------------------------------------------------------------------------|------------|
| 7.3               | First Nation Concerns .....                                                   | 7-3        |
| <b>8.0</b>        | <b>ENVIRONMENTAL IMPLICATIONS .....</b>                                       | <b>8-1</b> |
| 7.2               | Environmental Impacts .....                                                   | 8-1        |
| 7.2.1             | Implications of Timber Harvest Forecasts.....                                 | 8-1        |
| <b>9.0</b>        | <b>SUMMARY OF RESULTS .....</b>                                               | <b>9-1</b> |
| 9.1               | TSA Impacts .....                                                             | 9-1        |
| 9.2               | Provincial Impacts .....                                                      | 9-3        |
| <b>APPENDIX A</b> | List of Contacts                                                              |            |
| <b>APPENDIX B</b> | Glossary of Terms                                                             |            |
| <b>APPENDIX C</b> | Bibliography and Acknowledgements                                             |            |
| <b>APPENDIX D</b> | Notes on Methodology                                                          |            |
| <b>APPENDIX E</b> | Incremental Economic Impacts of the Arrow TSA Base<br>Timber Harvest Forecast |            |

## List of Figures

|             |                                                          |      |
|-------------|----------------------------------------------------------|------|
| Figure ES1: | Arrow TSA Timber Harvest Forecasts.....                  | ii   |
| Figure 2-1: | Arrow Forest District .....                              | 2-2  |
| Figure 3-2: | Current Arrow Forest District AAC & Actual Harvest.....  | 3-8  |
| Figure 3.3: | Arrow TSA Timber Harvest Forecast and Alternatives ..... | 3-10 |

## List of Tables

|            |                                                                                                                           |      |
|------------|---------------------------------------------------------------------------------------------------------------------------|------|
| Table ES1: | Arrow TSA Timber Apportionment 1992 .....                                                                                 | v    |
| Table 1-1: | Regional Level Accounts .....                                                                                             | 1-2  |
| Table 2-1: | Estimated Population Arrow Forest District Communities.....                                                               | 2-6  |
| Table 2-2: | Arrow Forest District — Selected Demographic Information .....                                                            | 2-7  |
| Table 2-3: | Basic Sector Dependence in Central Kootenay & Kootenay<br>Boundary Region.....                                            | 2-8  |
| Table 2-4: | Arrow Forest District Labour Force by Industry .....                                                                      | 2-9  |
| Table 2-5: | Estimate of Tourist/Local Resident Outdoor Recreation User Days<br>(1993) .....                                           | 2-14 |
| Table 2-6: | Priority 1 & 2 PAS Study Areas in Arrow Forest District.....                                                              | 2-24 |
| Table 3-1: | Arrow TSA Long Term Timber Harvesting Land Base .....                                                                     | 3-2  |
| Table 3-2: | Arrow TSA Special Management Zones .....                                                                                  | 3-4  |
| Table 3-3: | Base Timber Harvest Level Assumptions .....                                                                               | 3-10 |
| Table 4-1: | Arrow TSA Apportionment of AAC by Licensee - 1992 .....                                                                   | 4-1  |
| Table 4-2: | Arrow TSA Wood Flows to Primary Processing Operations .....                                                               | 4-2  |
| Table 4-3: | Major Processing Operations .....                                                                                         | 4-5  |
| Table 4-4: | Fibre Source of Major Licensees (m <sup>3</sup> ) .....                                                                   | 4-7  |
| Table 4-5: | Direct Forest Sector Employment Currently Attributable to Arrow<br>TSA Timber Harvest Only .....                          | 4-9  |
| Table 4-6: | Arrow TSA Direct Employment and Coefficients.....                                                                         | 4-10 |
| Table 4-7: | Average Annual Pre-Tax Income Including Cash Benefits.....                                                                | 4-13 |
| Table 5-1: | Arrow TSA — Base Harvest Forecast:<br>TSA Annual Forestry Related Employment and Employment Income<br>Impacts.....        | 5-3  |
| Table 5-2: | Arrow TSA — Base Harvest Forecast:<br>Provincial Annual Forestry Related Employment and Employment Income<br>Impacts..... | 5-5  |
| Table 6.1: | Provincial and Federal Government Revenue From Arrow TSA<br>(Millions 1993 \$) .....                                      | 6-2  |
| Table 6-2: | BC Average Forest Industry Tax Revenues.....                                                                              | 6-3  |
| Table 9-1: | Timber Supply Area Accounts - Arrow TSA.....                                                                              | 9-4  |
| Table 9-2: | Provincial Accounts - Arrow TSA .....                                                                                     | 9-5  |



### 1.1 Background

The British Columbia Forest Service is presently conducting a provincial timber supply review to assist the Chief Forester in reassessing Allowable Annual Cut (AAC) levels. Four documents are being prepared as part of this review process for each of the province's 36 Timber Supply Areas (TSA):

- *A Timber Supply Analysis* — provides a technical analysis of the amount of timber available for current and future harvesting in TSAs based on current management practices. The analysis addresses critical factors<sup>1</sup> that influence harvest levels and the implications of a base harvest forecast level<sup>2</sup> over time as well as initial higher and lower harvest levels that may result because of positive or negative deviations in these critical factors.
- *A Socio-Economic Analysis* — evaluates the social, economic and environmental implications of different harvest levels examined in the *Timber Supply Analysis*.
- *A Discussion Paper* — summarizes the technical information and provides a focus for public discussion of the issues surrounding timber harvest levels.
- *A Final AAC Rationale Report* — presents the AAC level set by the Chief Forester and describes the rationale for this decision.

This report represents the second of these documents for the Arrow Timber Supply Area, namely *The Socio-Economic Analysis of the Arrow TSA*. The assessment contained in this report was carried out by Resource Systems Management International (RSMI) on behalf of the Ministry of Forests, based on information provided by the Ministry as well as interviews and research by RSMI documented in the Appendix of this report. RSMI appreciates the assistance and contribution of all contacts and, in particular, thanks Ministry of Forests — Economics and Trade Branch, Arrow Forest District and Nelson Forest Region personnel for their helpful direction and input.

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- <sup>1</sup> Short term timber supply is primarily sensitive to volume estimates for existing stands, forest cover requirements, green-up periods and cut block adjacency rules, and size of the timber harvesting land base.
- <sup>2</sup> The "base harvest forecast level" represents the flow of potential timber harvests that (1) begins at or as close to the current AAC as possible, and (2) declines/increases to the long term sustainable harvest level at a gradual rate of change.

## 1.2 Study Objectives and Approach

The purpose of *The Socio-Economic Analysis* is to address the impact of different harvest levels identified in the *Timber Supply Analysis* in terms of direct and indirect jobs, employment income and government revenues generated by the forest sector, as well as their implications in other economic sectors (e.g., tourism) and to community, environmental and First Nations' concerns.

The approach adopted for this study is based on Multiple Accounts Analysis. Multiple Accounts Analysis is an evaluative framework which focuses on a range of values inherent in a given resource, in this case the provincial forests. This methodology analyzes the implications of various harvest levels from a number of social, economic and environmental perspectives (or "accounts") on a TSA or regional and provincial basis. The final result is a matrix of information which integrates, in as objective a way as possible, indicators of how these different accounts are affected by the various harvest levels.

| <b>Table 1-1: REGIONAL LEVEL ACCOUNTS</b> |                                                                                                                                                                                                                                                                    |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Economic Development</b>               | local income and employment effects                                                                                                                                                                                                                                |
| <b>Community</b>                          | impacts on population, provision of local services, local government revenues and the provision of local government services and infrastructure and, ultimately, the impact on community goals such as stability, cohesiveness and economic autonomy and diversity |
| <b>First Nations</b>                      | impact on First Nations' communities, cultural values and traditional activities.                                                                                                                                                                                  |
| <b>PROVINCIAL LEVEL ACCOUNTS</b>          |                                                                                                                                                                                                                                                                    |
| <b>Economic Development</b>               | impact of different options on economic activity in communities inside the area and in the province as a whole; direct and indirect                                                                                                                                |
| <b>Environment</b>                        | implications of the options on the benefits people derive from, or the values they attach to, environmental resources and attributes in the area                                                                                                                   |
| <b>Provincial Government Revenue</b>      | government resource-related taxes and other revenues less expenditures associated with the options                                                                                                                                                                 |

## 1.3 Structure of the Report

The remainder of this report is organized into seven chapters.

**Chapter 2.0:** Profiles the socio-economic and environmental setting of the Arrow TSA by describing the communities, economy, and environmental features of the Arrow Forest District as a whole.

**Chapter 3.0:** Profiles the Arrow TSA including the timber harvesting land base, management practices, critical factors, and potential changes affecting the future land base and timber supply. This Chapter also presents the timber harvest forecast upon which

the economic analysis is based.

- Chapter 4.0:** Profiles the forest industry in the Arrow TSA by examining the current TSA apportionment and wood flows inside and outside the TSA, employment associated with TSA harvest, average employment income and capital and other expenditures.
- Chapter 5.0:** Presents an analysis of the economic development impacts of timber harvest on forestry and other sectors of the economy.
- Chapter 6.0:** Provides an analysis of the government revenue impacts.
- Chapter 7.0:** Discusses the implications of TSA timber harvest on community, environmental and First Nations concerns.
- Chapter 8.0:** This final chapter summarizes the study results and provides conclusions.



Although this assessment focuses on the Arrow Timber Supply Area (TSA), timber harvest and other activities within the TSA are inextricably linked with and have a major influence on the people, economy and environmental resources of the Arrow Forest District as a whole. To properly understand the impact of changes in timber supply from the TSA, therefore, requires a complete understanding of the TSA's socio-economic and environmental setting. This chapter describes the communities, economy and environmental features of the Arrow Forest District, thereby providing a context and reference point for the ensuing analysis.

The chapter is organized into seven sections. Section 2.1 outlines the location of the forest district and its broad physical characteristics. Sections 2.2 and 2.3 describe the communities found within the forest district, and demographic statistics and trends. Section 2.4 deals with labour force characteristics and employment trends. Section 2.5 describes the main economic activities in the area and their significance. Section 2.6 summarizes the principal environmental attributes of the area. Section 2.7 reports on First Nations' interests in the area.

### 2.1 Location & General Features

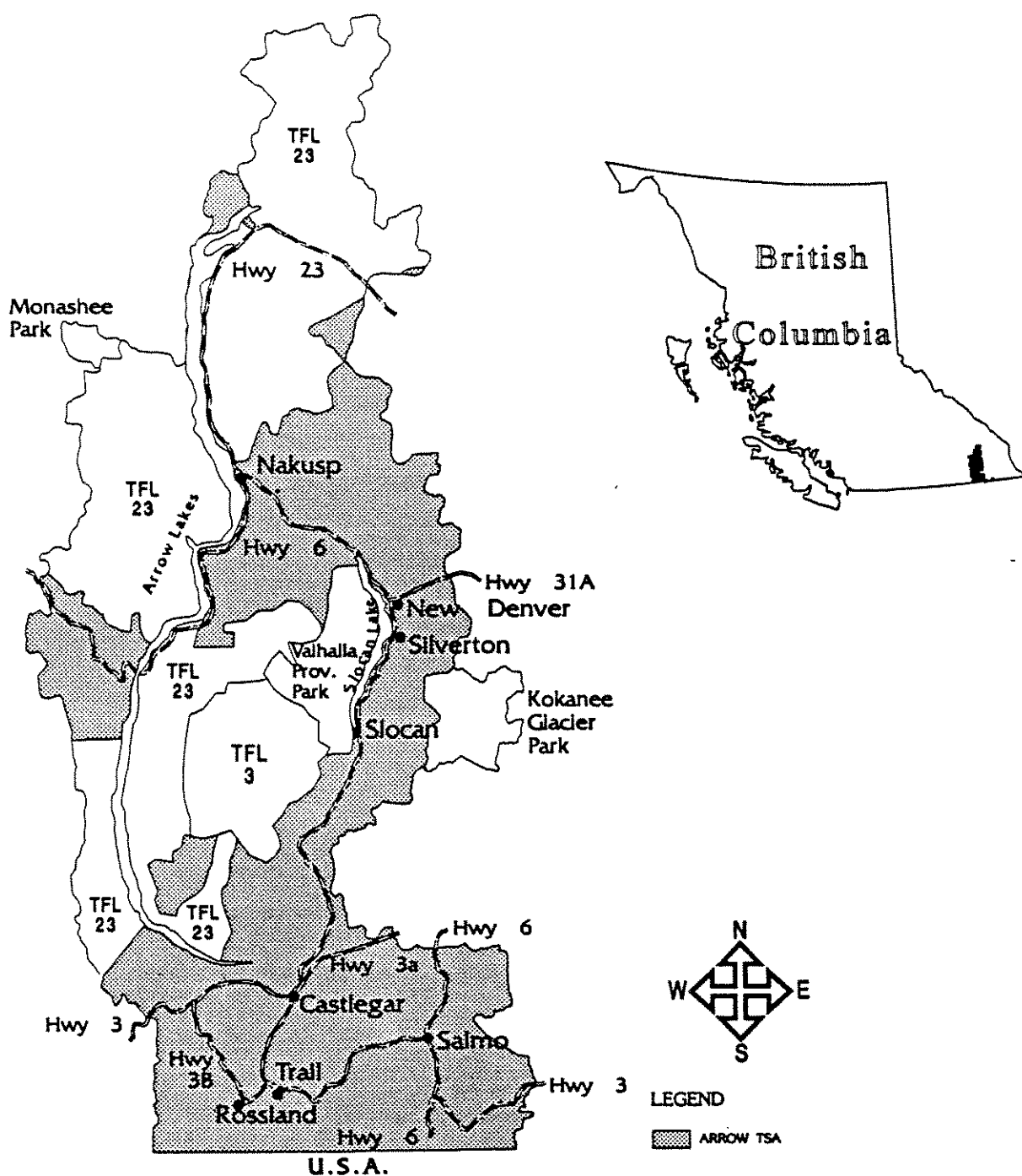
The Arrow TSA forms part of the Arrow Forest District, which is one of seven forest districts in the Nelson Forest Region. Situated in the southwest part of the Region, the forest district extends from the Canada-U.S. border in the south, to the southern boundary of Glacier National Park in the north. The Monashee Mountain range is the forest district's western boundary and the Selkirk Mountains are its eastern boundary. These two mountain ranges create a north-south valley within which lies the Arrow Lakes-Columbia River system, a dominant feature of the area. The forest district also includes the Salmo and Slocan River Valleys and part of the Kootenay River Valley, along which most settlement has occurred.

*Figure 2-1* shows the Arrow Forest District, which comprises the TSA as well as Tree Farm Licenses #3 and #23. Note that TFL #3, TFL #23, Valhalla Provincial Park and the Nancy Green Recreation Area as well as privately-owned lands within the forest district are not part of this study. Privately-owned lands are not shown on *Figure 2-1* because of their sometimes small size and fragmented distribution. Generally, privately-owned lands consist of areas around communities as well as some larger parcels in the southern portion of the forest district in the vicinity of Rossland/Trail and in the area east of the Columbia River, south of the Kootenay River.

Administered by the Arrow Forest District Office, the Arrow TSA covers a land area of 754 000 hectares. The TSA is discontinuous, divided into one large, four moderately sized and two small parcels. About 217 000 hectares or 29 percent of the TSA's total land base is considered available for timber harvesting under current management practices. The TSA accounts for 30 percent of the 2.0 million cubic metres of timber required annually by processing plants in the Arrow District.

Figure 2-1:

# ARROW FOREST DISTRICT



## **2.2 Communities and Demographic Characteristics**

The Arrow Forest District falls within three Regional Districts: Kootenay Boundary, Central Kootenay and Columbia Shuswap. However, the majority of the Arrow TSA's area is located in the Regional District of Central Kootenay. The largest communities within the forest district are Trail, Castlegar and Rossland, in that order. The area also supports at least eight other incorporated and unincorporated small communities with over 200 inhabitants.

Partly because of geography and partly social and economic differences, the forest district comprises three distinct sub-areas. The three sub-areas are

- the Castlegar area, which is the region's main service centre and has strong ties to the forest sector yet has benefited in the past, and will perhaps again in future from major hydro-electric construction projects;
- the Rossland-Trail area which is predominated by mining; and,
- the Slocan valley which is an area that has attracted people seeking alternative lifestyles and non-traditional economic activities, such as wildcrafts, yet is still heavily dependent on forestry.

### **2.2.1 Castlegar Area**

The City of Castlegar, with a 1991 population of 6 580,<sup>3</sup> is situated at the southern end of the Arrow Lakes, at the confluence of the Kootenay and Columbia Rivers. The neighbouring communities of Blueberry Creek, Genelle, Brilliant, Pass Creek, Robson, Shoreacres, Tarrys, Thrums and Ootischenia add another 8 500 people to its catchment area. Castlegar serves as the hub of the Arrow Lakes region and for much of the central Kootenays, since it is the junction point of several major regional highways (Highways 3, 3A and 22) and has the only year round airport.

Mineral processing, hydro-electric generation, agriculture and forestry give Castlegar a fairly broad economic base. Warehousing distribution and service industries have also been increasing in importance as a result of the City's strategic location. In addition, construction related to the Columbia River hydro-electric projects and, more recently, expansion and upgrading of the Celgar pulp and paper mill have contributed significantly to the local economy. Nevertheless, the major employers in Castlegar and the immediate area are primarily forestry-related and its economy is heavily dependent on the forest sector.<sup>4</sup> The largest employers are the Celgar Pulp Company which employs 330 people and Pope & Talbot which employs 265 people.

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<sup>3</sup> 1991 Census, Statistics Canada.

<sup>4</sup> Horne and Robson, BC Community Economic Dependencies, Prepared for the BC Round Table on the Environment and the Economy, March 1993.

Celgar's expansion together with the attraction of retirees and semi-retirees from large urban centres, has reversed Castlegar's population and economic decline of the 1980's. The community is now lobbying strongly for approval of the new Columbia River hydro construction projects, including installation of the fifth turbine at Hugh Keenleyside dam and work at Waneta dam, which promise many years of construction employment for not only Castlegar residents but residents throughout the Arrow Forest District.

### **2.2.2 Rossland/Trail Area**

The Rossland-Trail area, including the communities of Rossland, Trail, Fruitvale, Montrose, Warfield, Beaver Falls, Oasis and Riverdale, had a population of approximately 22 000 people in 1991.<sup>5</sup> The economy of Rossland-Trail is dominated by the mining industry with the presence of the Cominco smelter at Trail which produces lead, zinc, silver and gallium arsenide. Forestry plays a relatively small role in the local economy.

Cominco remains the largest employer in the area, in spite of extensive layoffs over the last decade that have reduced its workforce from a high in 1980 of 5 000 to 1 500 workers today. Although a recent commitment to install new smelter technology was supported by provincial government assistance and tax relief promises to stabilize the industry, levels of future processing, hence employment, still remain uncertain. The cause of this uncertainty is the projected depletion of the Sullivan mine in Kimberley by the year 2000 which is a major ore source for Cominco.

### **2.2.3 Slocan Valley/Nakusp**

The Slocan Valley comprises several small communities, including Nakusp, Slocan, New Denver and Silverton, as well as a scattered rural population. Valley residents in 1991 totaled 4 965.<sup>6</sup> The area originally developed because of mining during the 1860's gold rush. However, over the years, mine deposits have been depleted and the importance of mining has diminished.

Today, forestry dominates the local economy but has declined in importance in terms of job creation. Growth industries include small, home-based businesses, especially in tourism, arts and crafts, and personal services, agroforestry and wildcrafts,<sup>7</sup> as well as the service sector. The retail and construction sector have also grown in recent years in response to population increases attributed to retirees and "urban refugees".<sup>8</sup> In addition, subsistence and "underground"<sup>9</sup> economic

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<sup>5</sup> 1991 Census, Statistics Canada.

<sup>6</sup> 1991 Census, Statistics Canada.

<sup>7</sup> Agroforestry and wildcrafts include such activities as mushroom picking, yew and medicinal plant collecting, and bracken fern harvesting.

<sup>8</sup> City-based professionals seeking lifestyle changes who are able to semi-retire or work from home.

activities play an important economic role, contributing anywhere from 1-2 percent of income for persons engaged in the forestry, retail/wholesale and personal service sector to 40 percent for those in the agriculture sector.<sup>10</sup>

Located at the junction of Highways #6 and #23 on the eastern shore of Upper Arrow Lake, Nakusp is the largest community within the Slocan Valley-Nakusp area, with a population of 1 375 in 1991.<sup>11</sup> Pope & Talbot operates a harvesting division in Nakusp. However, the community has a growing tourism sector that serves both drive-through tourists and tourists who come to use local facilities and services, such as the Nakusp Hot Springs and Lodge, Canadian Mountain Holidays (helicopter skiing), and Kokanee Helicopter Skiing.

Although many Valley residents rely on the forest sector for their livelihood, others view forestry as a barrier for economic growth. Divergent lifestyle and economic dependence among Valley residents has sometimes led to violent conflict over logging activities. Chip trucks on Highway #6, forest management practices, the current forest tenure system and increased polarization regarding environmental protection and resource sector jobs and growth are major concerns to Valley residents.<sup>12</sup>

### **2.3 Population Characteristics and Trends**

Table 2-1 summarizes the population distribution in the Arrow Forest District based on 1981, 1986 and 1991 census data. Although the area's total population increased marginally (1.1 percent) between 1986 and 1991, the population in 1991 was 9 percent less than 1981. This population loss directly reflects downsizing particularly in mining but also in the forest sector as a result of the early 1980's recession. Population change, however, also varied by community. For example, Castlegar and Rossland increased in population over the 1980's by almost 10 percent (200 people) and 2.4 percent (85 people) respectively, while other centres, including Trail, Nakusp and Slocan, experienced population losses.

More recently, population throughout the forest district has been increasing, primarily because of the emerging trend of retirees, semi-retirees and other urban professionals moving into the area seeking lifestyle changes and an improved quality of life. This trend has been observed in a number of B.C. communities, most notably on Vancouver Island and in the Okanagan, but appears

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<sup>9</sup> The underground economy mainly consists of bartering of goods and services, mushroom harvesting, wolf beas, and growing and selling of illegal substances.

<sup>10</sup> Source: Economic and Social Trends in the Slocan Valley, prepared for the Commission on Resources and the Economy, June 1994.

<sup>11</sup> 1991 Census, Statistics Canada.

<sup>12</sup> Source: Social and Economic Trends in the Slocan Valley, Prepared for the Commission on Resources and the Economy, June 1994.

to be now spreading into the Kootenays. Moreover, as the neighbouring Okanagan becomes increasingly popular and expensive, this spillover into Arrow communities may be expected to continue. Low housing prices, relatively moderate climate and a well-developed community service infrastructure are some of the reasons credited for this in-migration. The trend has been both positive and negative. Population increase has spurred economic growth and diversification but has also introduced increased demand for local services and divergent views about resource use.

The age structure of the population in 1991 also changed relative to 1981. The most significant change was in the 15-34 age group which showed a decline from 35 percent to 26 percent of the total population. One explanation of this demographic change could be the higher impact in job layoffs among younger workers because of seniority issues, and a lack of job opportunities for workers entering the labour market. Apart from those who left the area, most of the remaining population remained relatively stable. Over 60 percent of families lived in the same house or same community between 1986 and 1991.

| <b>Table 2-1: ESTIMATED POPULATION<br/>ARROW FOREST DISTRICT COMMUNITIES</b> |                        |                        |                        |                               |
|------------------------------------------------------------------------------|------------------------|------------------------|------------------------|-------------------------------|
| <b>Community</b>                                                             | <b>1981 Population</b> | <b>1986 Population</b> | <b>1991 Population</b> | <b>% Change<br/>1986-1991</b> |
| Trail                                                                        | 9 599                  | 7 978                  | 7 919                  | (0.7)                         |
| Castlegar                                                                    | 6 902                  | 6 385                  | 6 579                  | 9.7                           |
| Roseland                                                                     | 3 967                  | 3 472                  | 3 557                  | 2.4                           |
| Fruitvale                                                                    | 1 904                  | 1 932                  | 2 062                  | 6.7                           |
| Warfield                                                                     | 1 969                  | 1 840                  | 1 814                  | (1.4)                         |
| Nakusp                                                                       | 1 495                  | 1 409                  | 1 374                  | (2.6)                         |
| Montrose                                                                     | 1 229                  | 1 183                  | 1 197                  | (0.9)                         |
| Salmo                                                                        | 1 169                  | 1 015                  | 1 069                  | 5.3                           |
| New Denver                                                                   | 642                    | 596                    | 571                    | (4.2)                         |
| Slocan                                                                       | 351                    | 291                    | 263                    | (10.5)                        |
| Silverton                                                                    | 280                    | 233                    | 231                    | (0.9)                         |
| Rural                                                                        | 16 758                 | 15 401                 | 15 509                 | 0.7                           |
| <b>Total</b>                                                                 | <b>46 265</b>          | <b>41 735</b>          | <b>42 145</b>          | <b>0.9</b>                    |

Source: Statistics Canada 1991 Census.

From an education perspective, the area is comparable to other non-metropolitan areas within British Columbia. Over 60 percent of the population 15 years and older has either a high school graduation certificate or some training beyond high school, which is important given that high school education provides a foundation for skills retraining and upgrading. Moreover, based on anecdotal information about newcomers to the area, education levels appear to be increasing. A more skilled labour force bodes well for the area in terms of increased potential for economic

diversification and a resource pool for mentoring and training of personnel within the area.

| <b>Table 2-2: ARROW FOREST DISTRICT<br/>SELECTED DEMOGRAPHIC INFORMATION</b> |                             |                  |
|------------------------------------------------------------------------------|-----------------------------|------------------|
| Indicator                                                                    | Arrow<br>Forest<br>District | Nelson<br>Region |
| <b>Total Population (1991)</b>                                               | 42 145                      | 149 420          |
| <b>% Change Since 1981</b>                                                   | (9%)                        | (4%)             |
| <b>Age Structure (1991)</b>                                                  |                             |                  |
| % under 15 years of age                                                      | 21%                         |                  |
| % 15 to 34                                                                   | 26%                         |                  |
| % 35 to 44                                                                   | 17%                         |                  |
| % 45 to 54                                                                   | 11%                         |                  |
| % 55 and over                                                                | 25%                         |                  |
| <b>Mobility (1991)</b>                                                       |                             |                  |
| % population in same household/community for last 5 years                    | 62%                         |                  |
| <b>Education (1991)</b>                                                      |                             |                  |
| % population whose highest schooling less than Grade 9                       | 11%                         | 11%              |
| % population past Grade 9 but without high school certificate                | 24%                         | 29%              |
| % of population with high school graduation certificate or training beyond   | 61%                         | 60%              |
| <b>Unemployment</b>                                                          |                             |                  |
| 1991 - % of labour force 15 years and older                                  | 13%                         | 12%              |
| 1986 - % of labour force 15 years and older                                  | 16%                         | 15%              |
| <b>Average Income by Census Family</b>                                       |                             |                  |
| 1991                                                                         | \$46 194                    | \$46 396         |
| 1986                                                                         | \$34 202                    | \$34 585         |

Source: Statistics Canada

## 2.4 Labour Force

Historically, the labour force in the area has been highly dependent upon the primary resource sectors, specifically forestry and mining. Apart from being the primary drivers of the local economy, these sectors have been the largest employers and have provided the benefit of relatively high paying, full time jobs. Now, job opportunities are increasingly shifting to lower income jobs or self-employment in the service sector. As a result, when job losses occur in the forestry or mining sectors, alternative employment, if available, frequently does not wholly compensate income loss. This trend is resulting in increased economic pressure on families who must rely on more than one job or subsistence activities to make ends meet and a declining tax base to pay for infrastructure and services needed by a growing population.

A 1993 province-wide analysis of economic dependence found that a significant portion of basic income<sup>13</sup> is attributed to the forest and mining industries in many B.C. communities. The study also revealed that pensions, investments and government transfer payments comprise a significant share of basic income. Table 2-3 below confirms the dependence of communities in the Central Kootenay region (including the Arrow Forest District and neighbouring areas) on forestry and mining.

| <b>Table 2-3: BASIC SECTOR DEPENDENCE<br/>IN CENTRAL KOOTENAY &amp; KOOTENAY BOUNDARY REGION<br/>(Sector Income as a Share of Total Basic Income)<sup>14</sup></b> |     |     |     |    |     |     |     |    |     |     |     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|----|-----|-----|-----|----|-----|-----|-----|
|                                                                                                                                                                    | FOR | MIN | F&T | AG | TOU | H&E | OTH | UN | PEN | INV | TRA |
| Castlegar-Arrow Lakes                                                                                                                                              | 45  | 1   | 0   | 1  | 5   | 5   | 1   | 8  | 17  | 10  | 7   |
| Grand Forks Greenwood                                                                                                                                              | 35  | 3   | 0   | 4  | 6   | 3   | 6   | 5  | 20  | 12  | 6   |
| Trail-Rossland                                                                                                                                                     | 4   | 43  | 0   | 0  | 6   | 3   | 1   | 5  | 22  | 12  | 4   |
| Revelstoke                                                                                                                                                         | 20  | 1   | 0   | 1  | 12  | 0   | 23  | 7  | 16  | 12  | 7   |
| Nelson                                                                                                                                                             | 28  | 3   | 0   | 2  | 8   | 2   | 4   | 8  | 23  | 15  | 7   |

Source: G. Horne and L. Robson, *BC Community Economic Dependencies*, Prepared for the BC Round Table on the Environment and the Economy, March 1993.

The data reveals that the two areas of Central Kootenay and Kootenay Boundary region, which correspond to the Arrow Forest District (Castlegar/Arrow Lakes and Trail/Rossland), exhibit sharp differences in the primary source of basic income. In the Castlegar/Arrow Lakes area, basic income derived from the forest sector far exceeds any other income source. In the Trail/Rossland area, the importance of Cominco to the local economy is evident from the area's dependence on the mining sector. However, in both areas, pensions followed by investment income represent the second largest sources of basic income.

Table 2-4 shows a breakdown of the labour force by employment sector. Note that these figures do not necessarily represent jobs as they include workers who may presently be unemployed. Also, government-related forestry and mining employment (e.g., Ministry of Forests personnel), and employment in processing are included in the government services and manufacturing categories respectively, rather than under "logging and forestry" and "mining", thus giving the impression of a smaller number of jobs being associated with these sectors.

<sup>13</sup> Basic Income flows into the community from outside and is considered the driver of the local economy.

<sup>14</sup> FOR = Forestry, MIN = Mining, F&T = Fishing and Trapping, AG = Agriculture, TOU = Tourism, H&E = Health and Education, OTH = Other Basic Industries, UN = Unemployment Insurance, PEN = Pension, INV = Investment, TRA = Other Transfer Payments and Social Assistance Payments.

| <b>Table 2-4: ARROW FOREST DISTRICT<br/>LABOUR FORCE BY INDUSTRY</b> |               |               |
|----------------------------------------------------------------------|---------------|---------------|
| <b>Employment Sector</b>                                             | <b>1986</b>   | <b>1991</b>   |
| Agriculture                                                          | 190           | 260           |
| Fishing and Trapping                                                 | 10            | 25            |
| Logging and Forestry                                                 | 870           | 795           |
| Mining                                                               | 505           | 845           |
| Manufacturing                                                        | 4 385         | 4 295         |
| Construction                                                         | 930           | 1 035         |
| Transportation and Storage                                           | 575           | 670           |
| Communication and Utilities                                          | 610           | 670           |
| Wholesale Trade                                                      | 245           | 450           |
| Retail Trade                                                         | 2 365         | 2 410         |
| Finance, Insurance and Real Estate                                   | 625           | 705           |
| Business Services                                                    | 420           | 565           |
| Government Services                                                  | 780           | 965           |
| Educational Services                                                 | 1 405         | 1 480         |
| Health and Social Services                                           | 1 610         | 1 875         |
| Accommodation, Food and Beverage Services                            | 1 470         | 1 420         |
| Other Service Industries                                             | 1 085         | 1 355         |
| <b>TOTAL</b>                                                         | <b>18 080</b> | <b>19 820</b> |

Source: Statistics Canada

Based on the census, unemployment in the Arrow Forest District fell from 16 percent in 1986 but remained high at 13 percent in 1991. More recent statistics from the Canada Employment and Immigration Centre in Trail<sup>15</sup> indicate the number of active unemployment insurance claims averaged 8.1 percent of the total population age 15 to 64 in 1993. In addition, another 6.2 percent were employable social assistance recipients, resulting in an unemployment rate of 14.3 percent of the employable working age population.<sup>16</sup> This rate was up from 12.8 percent in 1992 and 11.4 percent in 1991.<sup>17</sup> Whether this trend will continue remains to be seen and depends, to a large

<sup>15</sup> The CEIC in Trail is the regional office covering the Arrow Forest District.

<sup>16</sup> Unemployment as measured by the census and as reported as unemployment statistics by Canada Employment and Immigration differ. The census includes persons who wish to work but are unemployed, whereas CEIC report on active UIC claims. The latter measure does not include persons who are ineligible to claim UIC or those whose benefits have run out. By adding the number of employable people receiving social assistance, the statistics become more comparable. However, this still leaves out those persons who are not receiving UIC or social assistance but who are seeking work.

<sup>17</sup> Canada Employment and Immigration. Note that the difference in this figure and the previous figure cited from the 1991 Census is explained in footnote 16.

extent, on conditions in the forestry and mining sectors as well as employment growth in other sectors.

## **2.5 Economic Base of the Arrow Forest District**

The following sections provide brief descriptions of the main sectors of economic activity within the Arrow Forest District. Note that the forest industry will be described in detail in Chapter 4 of this report. However, given its importance to the local economy of the Arrow Forest District, general highlights of forest industry activity are provided here.

### **2.5.1 Forestry**

The forest sector provides direct employment totaling about 1 700 full time equivalent jobs within the Arrow Forest District. Not all of this employment, however, is attributable to wood harvested in the TSA. This figure includes jobs related to wood harvested in TFL# 3, TFL #23, on private lands as well as wood derived from outside the Arrow Forest District. These jobs provide basic employment in several areas, including harvesting, processing, silviculture and provincial government employment through the Ministry of Forests, and represent approximately 10 percent of total employment.<sup>18</sup>

This level of employment provides a substantial economic base to the area, injecting an after tax employment income of about \$71 million into the local economy. Moreover, this direct forestry sector base supports another 560 or so indirect jobs (e.g., industry suppliers) with a corresponding \$15 million in after tax employment income. Apart from basic employment and income provided by the forestry sector, the major processing operations (mills) in Slocan, Castlegar, Thrums, Salmo and Fruitvale provide further economic impetus through substantial investments in plant and equipment, although often much of the equipment and plant materials are purchased from outside the forest district.

### **2.5.2 Mining**

Historically, mining has been one of the prime economic sectors of communities in the forest district and was the catalyst for settlement of the area in the mid-1800s. Sites of traditional mining activity were Salmo, Rossland, and the Slocan region, east of New Denver. Mining does not account for the same level of economic activity that it once did. However, the area is rich in lead, zinc and silver resources with smaller quantities of tungsten, gold, molybdenum and copper, and is still thought to contain significant potential for geological discovery.

Cominco, located in Trail, is the largest mining operation, although it does not receive any raw

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<sup>18</sup> Total employment is based on the 1991 labour force according to Statistics Canada less the percentage of the labour force represented by active UIC claims and employable social assistance recipients.

material from within the forest district. Cominco has recently reduced its workforce by 200 to 300 people through attrition, leaving total mill employment at approximately 1 500. Apart from Cominco, current mining activity within the forest district centres around small scale mining and exploration. Several thousand claims in the area generate approximately \$1 million annually in exploration expenditures.<sup>19</sup> This level of activity has been down from past years due to relatively soft mineral market prices, but may be turning around now that world prices are recovering. How this trend will affect the Arrow Forest District is too soon to tell.

The Silvana Mine in Sandon, which mined silver lead ore, ceased operations in 1991, resulting in a loss of 35 jobs. Although considered a temporary shut-down, no date for resumption of activity is scheduled. However, increased metal prices on world markets are reviving interest in the suspended mining operation.

Activities in mining and forestry are relatively unrelated except at the exploration stage when access provided by logging roads can reduce exploration costs. In the case of the Arrow Forest District, most watersheds are already roaded.

### **2.5.3 Tourism and Recreation**

The natural beauty of the Arrow Lakes area lends itself to a wide number of outdoor-based recreation opportunities. Large lakes, scenic terrain, an abundance of fish and wildlife, a warm summer climate and winter snow conditions suitable for skiing, all contribute to the region's tourism potential. Largely because of poor access, tourism has historically played a relatively minor role in the local economy, accounting for only 5-6 percent of basic income.<sup>20</sup> However, in recent years, the tourism sector has been growing, both as a result of improvements to transportation infrastructure and general growth in tourism throughout the province.

The recreational resource base for tourism in the Arrow Forest District is diverse, providing for such varied activities as mountain-biking, heli-skiing, camping, boating, hiking, cross-country skiing and snowmobiling. However, in contrast to the Kootenay Lake Forest District immediately to the east, the Arrow has only a limited number of commercial developments to serve the visitor needs and, therefore, tourist numbers are correspondingly lower. The 120 mile long Arrow Lake is the central attraction, around which many activities revolve. However, little in the way of tourist facilities have been developed along the lakes.

The most significant tourism development has occurred in the southern parts of the forest district in the Trail-Roseland area. The Red Mountain Ski Area offers some of the best alpine powder skiing in the province, while in the summer, mountain bikers and hikers take advantage of the hundreds of

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<sup>19</sup> Source: Ministry of Energy, Mines and Petroleum Resources.

<sup>20</sup> G. Horne and L. Robson, BC Community Economic Dependencies, Prepared for the BC Round Table on the Environment and the Economy, March 1993.

kilometres of trails in the resort area. Further to the north, tourist attractions, such as the Nakusp Hot Springs, attract visitors from all over the world. Other major attractions include Valhalla Provincial Park, the Nancy Greene Provincial Recreation Area and the Hugh Keenleyside Dam as well as several small parks, private campgrounds, marinas and mountain lodges located throughout the area.

Recreational resources are accessed both by highway and logging roads. The main east-west route, Highway #3 that runs between Grand Forks and Salmo, passes through the southern portion of the forest district. The main north-south route is Highway #6, which runs between Crescent Valley, through Nakusp, along the east side of Arrow Lake crossing the lake via the Needles-Fauquier ferry, and then heads west towards Vernon. This particular route is popular as it provides good access to many of the tourism/recreation resources of the forest district. The other major highway corridor is Highway #23 between Nakusp and Revelstoke. This route follows the east side of Arrow Lake to Galena Bay before crossing the lake via a ferry to Shelter Bay and continuing along the west side of the lake to Revelstoke. All these routes are designated provincial highways and are kept in good condition year round.

Access to the backcountry is provided by the extensive network of logging roads throughout the forest district. These remote areas are popular for hiking, camping, mountain-biking, fishing and other wilderness-related outdoor recreation activities. Within the District, the BC Forest Service maintains and/or manages 41 hiking trails and 3 cross-country ski trails covering 269 km, and 37 recreation campsites consisting of 194 vehicle units.

### **Level of Tourism Activity**

For purposes of this study, only outdoor recreation/tourism activities that might be affected by changes in the level of forestry activity are relevant. In order to provide a basis for the subsequent analysis, an understanding of three key factors is important, namely:

- the level of tourism/recreation use;
- the types of recreational activities pursued and linkages to the forestry sector (if any); and,
- the average expenditures of tourists and recreation users.

Clearly, tourism and recreation<sup>21</sup> generate economic value to the Arrow Forest District and the province. However, the current level of use, typically measured by user days and average daily expenditure, is not necessarily indicative of the full economic value that users place on resource use.

Actual expenditures for outdoor recreation activities by local residents undervalue the benefit residents derive from these experiences. Residents typically spend very little more for these

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<sup>21</sup> In general, recreation is defined as any recreational activity performed by individuals living within 50 kilometres of the activity. All other recreational activity is considered to be tourism.

excursions, above what they would normally spend living in the area. The estimated provincial daily average expenditure for outdoor recreation is \$4 per person.<sup>22</sup> However, people gain mental and physical satisfaction from the forest, through viewing and hiking for example, not easily quantifiable in dollar terms.

Approximately 110 000 non-local tourist days, and 440 000 local user days can be ascribed to the outdoor recreation and adventure tourism sector (see Appendix D). Approximately, fifty percent, or 55 000 non-local tourism days are backcountry experiences. See table 2-5 for a breakdown of tourist and local user days involved in outdoor recreation.

| <div> <input type="checkbox"/> <b>Table 2-5: ESTIMATE OF TOURIST/LOCAL RESIDENT OUTDOOR RECREATION USER DAYS (1993)</b> </div> |                |                |
|--------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|
| <b>Overall Outdoor Recreation</b>                                                                                              | <b>Summer</b>  | <b>Winter</b>  |
| Tourists                                                                                                                       | 77 000         | 33 000         |
| Local Residents                                                                                                                | 308 000        | 132 000        |
| <b>TOTAL</b>                                                                                                                   | <b>385 000</b> | <b>165 500</b> |

Source: Estimate based on Visitor '89 and Resident Travel in British Columbia surveys, Ministry of Tourism.

### *Outdoor Recreation*

This category includes activities, such as camping, hiking, fishing, mountain-biking and cross-country skiing, that require little in terms of infrastructure and/or supervision and can be undertaken at relatively low cost. Although most participants in outdoor recreation are local residents, conditions for snowmobiling and cross-country skiing also attract large numbers of visitors from other parts of BC, Alberta and Washington State.

Summer activities are reported to be more sensitive to logging than winter activities, in part due to the snow cover but also because more of these activities involve direct contact with logging areas in the backcountry.<sup>23</sup> In winter, a large portion of tourism visits are to downhill ski resorts, involve heli-skiing above the tree line, or entail snowmobiling which takes advantage of logging roads to access backcountry areas. A number of summer and fall activities, including hiking, mountain biking and hunting, also benefit from logging road access into more remote areas.

<sup>22</sup> Source: Ministry of Tourism, Recreation and Culture.

<sup>23</sup> Interviews with local tourism operators.

## *Adventure Travel*

Adventure travel is a distinct sub-market of tourism/recreation sector.<sup>24</sup> Adventure travel activities centre around wilderness resources and are considered extremely sensitive to forestry activities. Unlike outdoor recreation activities such as camping and hiking, which are relatively inexpensive and generate little in the way of employment or expenditures, adventure travel appeals primarily to foreign visitors who are willing to pay significant prices in order to be guided through undisturbed wilderness areas of the province.

The Kootenays are an extremely popular region for adventure travel tourism, particularly heli-skiing, which is reputed to be the best available in the world. However, because of the smaller snowpacks, less spectacular scenery (i.e., less rugged), and smaller wildlife/big game populations of the Arrow Lakes area, development of adventure travel in the Arrow Forest District has lagged behind the other parts of the Kootenays. The most popular forms of adventure travel in the Arrow are winter-based activities such as cat-skiing and ski touring. Much of this activity, however, is focused on Valhalla Provincial Park as well as Kokanee Glacier Park which abuts the Arrow Forest District to the east.

Data from the Ministry of Environment, Lands and Parks indicates an average growth rate of over 17 percent per year in nature-based tourism and recreation in Valhalla Park since 1986. Nevertheless, adventure travel remains a comparatively small portion of the overall tourism market. Based on discussions with industry operators and other agency sources, the best estimate of total visitor days per year in the adventure tourism sector is approximately 2 000.<sup>25</sup> Visitors originate almost exclusively from outside the province, and pay on average \$350 per day<sup>26</sup> for these experiences.

As this wilderness sensitive tourism market requires relatively natural and uncrowded outdoor experiences, growth potential is limited by carrying capacity<sup>27</sup> of the area. Once the carrying capacity is reached, any further increases in visitors would be offset by an equal reduction by those for whom the attractiveness of the area has been compromised. The precise point at which carrying capacity will be reached depends on a number factors, the most important being the amount of land suitable and available for these kinds of activities.

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<sup>24</sup> Adventure travel is defined as a non-traditional outing, requiring direct personal involvement with an experienced outdoorsperson or guide. Activities falling within this sector include guide outfitting, cat-skiing and heli-skiing/hiking among others.

<sup>25</sup> Industry contacts indicated that approximately 10 percent of wilderness sensitive tourism is related to adventure travel. This figure is corroborated by actual use figures obtained from guides and other industry sources.

<sup>26</sup> This price includes, food, transportation, accommodation and guiding.

<sup>27</sup> Carrying capacity is the maximum number of people which the area can accommodate before losing the uncrowded quality of the outdoor adventure experience.

### ***Guide Outfitting/Fish Guiding***

The Arrow Forest District offers the diversity of big game found in the East Kootenays but not in the quantity of some species, such as elk, that are popular with trophy hunters. However, hunting is a popular activity among local residents. In addition, the Arrow Lakes and Slocan Lake provide good sport fishing, with Dolly Varden, Gerrard rainbow trout, bull trout, brook trout and kokanee being the most important sport species. These lakes are fed by numerous tributary streams and small lakes, which are also popular fishing areas, particularly for remote outdoor recreation enthusiasts.

Five registered guide outfitters/fishing guides operate in the Arrow Forest District, serving this tourist market. In interviews with several of the operators, they report no conflict or impact on their businesses because of logging activities. Approximately 2 500 visitors per year are estimated to use these services, paying on average \$150 per day.

### **Tourism/Recreation Expenditure and Employment**

Figures on total employment and income generated by wilderness-sensitive tourism use of the Arrow Forest District are based on an average daily expenditure of \$18.85 per tourist<sup>28</sup> and \$4.00 per local recreation user for outdoor recreation<sup>29</sup> and \$350.00 per person<sup>30</sup> for adventure travel (1993\$). For every thousand dollars of tourism expenditure, an estimated 0.044 person-years (PY) of employment results from outdoor recreation activities and .007 PY of employment from adventure travel.<sup>31</sup> On this basis, the outdoor recreation/tourism sector is estimated to generate about \$3 million in revenue per year and support 175 direct PYs.

#### **2.5.4 Construction**

Throughout the late 1960's and again in the 1980's, the Arrow Forest District, particularly Castlegar, benefited from the construction of the Hugh Keenleyside Dam and Kootenay Canal hydro-electric projects. These major projects injected millions of dollars in construction

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<sup>28</sup> Source: BC Ministry of Tourism Visitor '89. Only those expenditures related to outdoor recreation have been included in the total expenditure figure. Items excluded include expenditures on activities such as shopping, restaurants and entertainment. Figures have been scaled to \$1993 with CPI.

<sup>29</sup> Source: Ministry of Tourism.

<sup>30</sup> Based on figures from industry operators offering full service packages which include transportation, meals and accommodation.

<sup>31</sup> Source: Guiding Hands Recreation Society, Outdoor Recreation: A Kootenay Industry, 1989. Coefficients derived using figures for total expenditures and total employment in PYs for the outdoor recreation and adventure tourism sectors of the Kootenay region, which includes the Regional Districts of Central Kootenay, Kootenay Boundary and East Kootenays.

employment into the local economy. Moreover, BC Hydro continues to spend significant sums of money each year to maintain its local operation and in local project contributions, including environmental enhancement projects such as the Norns Creek fan at Castlegar.

More recently, the expansion and upgrading of the Celgar pulp and paper mill has supported local people and attracted others into the area to work on this major project over the past two years. Now, the newly proposed Columbia River hydro projects, including installation of a fifth turbine at Hugh Keenleyside and work at Waneta dam, offer the prospect of many years of sustained or increased employment in construction. In addition, the disposition of downstream benefits, as a result of renegotiation of the Columbia River Treaty, may bring further investment into the area.

#### **2.5.5 Agriculture**

Very little agricultural production takes place in the Arrow Forest District. Most of the activity that does occur falls in the category of hobby farming with limited commercial output. Commercial dairy operations exist in the Trail-Rossland area, shipping milk either to Vancouver or Calgary for processing. In addition, the forest district supports a large number of livestock operations, particularly south of Nakusp in the Slocan Valley and the Edgewood Valley, and on the west side of Lower Arrow Lake in the Inonoaklin Valley and southeast of Mount Faith.

Livestock operators rely on forage crops for grazing. The Ministry of Forests grant six range permits for grazing on Crown Land within the TSA during the spring, summer and fall. Cattle grazing on Crown Land occurs in clearcuts that provide a source of interim forage. The Arrow Forest District does not have as much grazing on Crown Land as other forest districts because most grazing occurs in sub-alpine areas which are not extensive within the Arrow. For this reason, a reduction or conversely an increase in timber harvesting within the TSA would likely have little impact on agricultural operations.

#### **2.5.6 Agroforestry and Wildcrafts**

Agroforestry and wildcrafts, although practiced over hundreds of years throughout the world, are only now being recognized in British Columbia as a serious area of economic potential. Numerous species of herbs, floral greenery, mushrooms and other native vegetation products are known to grow in commercial quantities in B.C.'s forests. Cottage industries that are associated with wildcrafting include such activities as basket-making, twig furniture construction, Christmas decoration crafting, salve-making, herbal medicine collecting, and floral greenery harvesting.

Within the Arrow Forest District, Nakusp and the Slocan Valley is a major focus of interest for these emerging enterprises. These activities provide an important source of primary and secondary income to Valley residents. Mushroom harvesting is presently the leading activity and main source of income in this sector. Matsutake or pine mushrooms for export to Japan are the principal species harvested, although some chanterelle and morel mushrooms are also collected and dried for export to Europe. Commanding a market price of \$300 per pound, pine mushrooms offer

considerable financial gain. In 1993, an estimated 10 000 pounds of mushrooms were harvested in the Slocan Valley, yielding a market price of \$3 million dollars and providing \$200 000 in wages to mushroom pickers who were mostly local but included some itinerant pickers from other areas.

Pine mushrooms have been sited and harvested in most seral stages of forest growth, but appear to predominate in hemlock-fir-pine.<sup>32</sup> stands over 100 years of age. In 1993, 85 percent of the mushrooms harvested in the Slocan Valley were collected from Crown forest land virtually all within the TSA, with the remaining 15 percent from privately-owned lands. Almost all of the Crown forest land is also of interest to logging companies. A particular concern to the mushroom industry is that protection of access to Crown forest lands is presently unavailable through tenure or other means.

## **2.6 Environmental Setting**

The Arrow Forest District is bounded by the Selkirk Mountain Range to the east and the Monashee Mountain Range to the west, with the Valhalla Range, an offshoot of the Selkirk Mountain Range, at its centre. The north-south dividing line between the mountain ranges and a predominant feature of the study area is the east arm of the Columbia River system, which includes the Upper and Lower Arrow Lakes.

Other major waterbodies within the study area include the following:

- the Slocan Lake/River system, which runs along a north-south axis separating the Valhalla Range and Slocan Range of the Selkirks;
- the westernmost section of the Kootenay River, which runs to the west from Kootenay Lake dividing the Selkirks into the Slocan Range and the Nelson Range; and,
- the Pend D'Oreille River and its tributary the Salmo River system at the southern boundary of the forest district along the U.S. border.

### **2.6.1 Biogeoclimatic Characteristics**

The Upper and Lower Arrow Lakes are characterized somewhat differently, thus fall within two different Ecosections and Ecoregions<sup>33</sup> of the Southern Interior Mountains Ecoprovince. As part of the Interior Wet Belt, the forests within the Arrow Forest District have the distinction of being the most productive in the interior of the province.

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<sup>32</sup> Source: Ministry of Forests.

<sup>33</sup> There are ten ecoprovinces, areas of consistent climate or oceanography, and physiography, in B.C. Within an ecoprovince, ecoregions denote areas with major physiographic, minor microclimatic or oceanographic differences within the ecoprovince. There are 43 ecoregions in B.C. Within ecoregions, ecosections comprise areas with minor physiographic, climatic and oceanographic differences. There are 110 ecosections in B.C.

## Upper Arrow

The Upper Arrow is within the Central Columbia Mountains Ecosection of the Columbia Mountains and Highlands Ecoregion, which is characterized by high ridges with deep wide-trenched and narrow valleys. The Arrow Forest District includes two of the three main valleys within this ecosection, specifically the Upper Arrow and Slocan River valleys, with the third being the North Arm of Kootenay Lake located in the neighbouring Kootenay Lake Forest District. The main valleys have north-south orientations, with subsidiary drainages flowing east or west.

Within this ecosection, the sequence of biogeoclimatic zones<sup>34</sup> typically is:

- Interior Cedar - Hemlock (ICH) on lower slopes and valley bottoms;
- Engelmann Spruce - Subalpine Fir (ESSF) at mid-elevations; and,
- Alpine Tundra (AT) at high elevations.

At lower elevations, stands include Douglas-fir, western larch, and hybrid white spruce. Climax stands are primarily western red cedar and western hemlock. At higher elevations, lodgepole pine, Engelmann spruce, and sub-alpine fir are common. The Alpine Tundra zone consists primarily of rock, snow and ice, with only a minor component vegetated with grasses, sedges, saxifrages, willows, buttercups and mountain heather.

## Lower Arrow

The Lower Arrow is situated in the Selkirk Foothills Ecosection of the Selkirk-Bitterroot Foothills Ecoregion. This ecosection has more subdued terrain as compared to the Upper Arrow, featuring a lower mountain relief marked by wide valleys and trenches throughout. The main valley orientation is again north-south, with tributary streams flowing either east or west.

The most common sequences of biogeoclimatic zones in this ecosection are ICH at low elevations; and ESSF at mid to high elevations.

AT occurs only on a few high ridges. A small pocket of undifferentiated Interior Douglas-fir (IDFun) is found at low elevations in the driest part of the ecosection near Lower Arrow Lake, namely the south facing lower slopes on the east side of the lake from Syringa Creek Park north to Broadwater. In addition, pockets of unique and limited habitat representing sub-zone variants of ICHdw, ICHmw and ICHxw<sup>35</sup> exist within the ICH zone. These unique habitats have been earmarked for special attention and retention by the Ministry of Environment. It is noteworthy that low elevations of this ecosection have the greatest diversity of tree species in British Columbia.

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<sup>34</sup> Biogeoclimatic zones reflect the climax tree species composition on average sites.

<sup>35</sup> dw = dry warm, mw = moist warm, and xw = very dry warm.

Tree stands at low to mid elevations include western larch, Douglas-fir, lodgepole pine, western white pine, ponderosa pine, and some grand fir. At high elevations, lodgepole pine, Engelmann spruce, and sub-alpine fir are found. In contrast to the Upper Arrow, the AT zone includes extensive vegetated areas, including bear-grass, willows, sedges, Sitka valerian, mountain heather and grasses.

The forest cover within the study area is considered predominately immature,<sup>36</sup> with approximately 67 percent of all species falling into this category. Old growth stands are said to be relatively few, dispersed in location and more frequently found at higher elevations.<sup>37</sup> As a result, the maintenance of old growth and of diversity in old growth are specific concerns for wildlife management within the TSA. Wildlife habitats considered of particular importance include deer and caribou winter range as well as riparian habitats.

## 2.6.2 Wildlife Resources

The Arrow Forest District supports an abundance and wide variety of wildlife species, including both some unique and endangered species. The diversity of habitats found in the forest district account for the over 60 species of birds, both resident and migratory, that can be found in the area. Rare bird species include the canyon wren, white-throated swift, western grebe, american bittern, interior great blue heron, bald eagle, american avocet, long-billed curlew and Lewis' woodpecker.

All ungulate species present in B.C. can be found within the Arrow Forest District. However, the ungulate population is much larger in the Lower Arrow than in the Upper Arrow where snow depths and habitat conditions are less favourable. This includes Rocky Mountain big horn sheep, white-tailed deer, mule deer, moose, mountain goats, Rocky Mountain elk and caribou.

Deer winter range areas of particular note include:

- the Slocan valley or immediately adjacent to the valley along major tributaries, such as Winslaw and Lemon creeks;
- along Lower Arrow Lake in the Inonoaklin creek and Burton creek;<sup>38</sup>
- south slopes between Deer Park and the Keenleyside dam, with south-facing bluffs and outcrops from Keenleyside to Tulip Creek especially valuable as mule deer winter range and the Deer Park area containing about 70 percent class 1 deer and elk habitat and 30 percent class 2 habitat;

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<sup>36</sup> Maturity, as defined by the Ministry of Forests in the Timber Supply Analysis, is 80 years plus for lodgepole pine, and 120 years plus for all other species.

<sup>37</sup> Personal Communication, G. Woods, Habitat Protection Biologist, Fish & Wildlife Branch, B.C. Ministry of Environment, Nelson Region.

<sup>38</sup> Burton Creek is located in TFL #23 and, therefore, is outside the TSA study area.

- south slopes along the Kootenay River between Castlegar and South Slokan; and,
- south slopes in the Pend D'Oreille area.

Key areas of caribou winter range include the Kuskanax, Wilson and Bremner creek drainages and the area in vicinity of Stag Leap. Each of these deer and caribou winter range areas has been recognized in the *Timber Supply Analysis* as requiring special management, thus a higher percentage of retention.

Other large mammals include cougar, grizzly bear, wolf and black bear. Smaller mammals include bobcat, lynx, coyote, fisher, long-legged myotis, marten, red-tailed chipmunk, Townsend's big-eared bat, hoary marmot and wolverine. Two uncommon reptiles are also found here: the western skink and the northern alligator lizard.

Seven red-listed (endangered or threatened) species can be found at times in the forest district, namely the Townsend's big-eared bat, red-tailed chipmunk, western grebe, american white pelican, canyon wren, common poorwill and prairie falcon. Blue-listed (sensitive or vulnerable) species include four mammals,<sup>39</sup> 22 bird species and one reptile, the western rattlesnake. Of these, only the caribou is old growth dependent. However, seven others<sup>40</sup> require old growth attributes.

### 2.6.3 Fisheries Resources

A wide variety of fish species are also found within the Arrow Forest District. The most notable is the trophy-sized Gerrard rainbow trout, which is unique to the Kootenay region and of provincial significance. A unique and rare variety of the species, the yellow-fin Gerrard rainbow trout, is indigenous only to the Arrow Lakes. Sturgeon, which has been depleted almost to the endangered stage, is another important species. Other important sport fish include Dolly Varden, kokanee, Rocky Mountain whitefish, bull trout, brook trout, burbot and walleye. Coarse fish species include longnose dace, northern squawfish, longnose sucker, torrent sculpin, mottled sculpin, coarse-scale sucker, smooth scale sucker, pygmy whitefish, peamouth chub, shiners and carp.

Important tributaries for fisheries values which flow into the Upper Arrow include:

- Incomappleux River (a.k.a. Fish River);
- Hill Creek (important for spawning and has a fish hatchery);
- Tum Tum River;
- Jordan River;
- MacKenzie Creek;
- St. Leon Creek;
- Halfway River;

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<sup>39</sup> Badger, caribou, fisher and grizzly bear.

<sup>40</sup> common poorwill, Vaux's swift, Lewis' woodpecker, great blue heron, bald eagle, grizzly bear and fisher.

- Kuskanax Creek;
- Slewiskin/McDonald Creek; and,
- Mosquito Creek.

Important tributaries which flow into the Lower Arrow include:

- Caribou, Snow and Burton Creeks, which supply most of the kokanee for the Lower Arrow as well as substantial runs of bull and rainbow trout;
- Inonoaklin Creek;
- Taite Creek, where land has been purchased for a possible kokanee spawning facility;
- Octopus Creek; and,
- Deer Creek.

The Columbia River between Keenleyside dam and the U.S. border is particularly important for its fisheries values. The river supports a wide and unique variety of species that include walleye, rainbow trout, bull trout, brown trout, brook trout, Rocky Mountain whitefish, kokanee, burbot and sturgeon. Most of these species also use the Kootenay River up to Brilliant dam. Important drainages into the Columbia River below Keenleyside dam include Norns Creek and Genelle, as well as Murphy, Blueberry, China and Champion Creeks, which are of interest for fishery enhancement. A portion of the Pend D'Oreille River, which feeds into the Columbia River, is also extremely significant as a spawning area for sturgeon. Protection of fisheries values throughout the Arrow Forest District region are especially important because of the immense impact the Columbia River dams have had.

Slocan Lake and Trout Lake<sup>41</sup> are notable being the only major lakes within the Arrow region that have not been affected by dam building. Silvertown, Carpenter, Bonanza and, especially, Wilson Creeks produce most of the fish indigenous to Slocan Lake. The most important tributaries to the Slocan River are Koch and Grizzly Creeks. However, both these creeks are located within TFL #3, thus outside the TSA.

#### **2.6.4 Water Resources**

Although the Arrow region has an abundance of water resources, significant demands are placed on these resources for domestic and agricultural consumption as well as ecological maintenance of fisheries values. Maintenance of high water quality is an important consideration in both instances.

In the previous section, water bodies having particular importance for fisheries values were identified. Other streams that have importance from a consumptive perspective, include

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<sup>41</sup> Note: the west half of Trout Lake is within the Arrow Forest District, whereas the east half is in the Kootenay Lake Forest District. Moreover, this area falls within TFL #23 and, therefore, is outside the TSA study area.

watersheds in the vicinity of area communities, as well as numerous creeks with individual licensees. Some drainages of concern include Blueberry, Cayuse, Little Cayuse, Glade, Wensley, Renata, Hasty, Ladybird, Norns and Springer Creeks, as well as numerous creeks in the Slocan valley.<sup>42</sup> Residents in the Slocan Valley are particularly sensitive to watershed impacts because the Valley comprises numerous small watersheds with individual users. These watersheds are typified by steep, short drainages where changes in hydrology or water quality are felt more immediately.

### 2.6.5 Protected Area Strategy

The Protected Area Strategy (PAS) of the provincial government has two major goals: to protect viable, representative examples of natural diversity, and to protect special natural, cultural heritage and recreational features of the province. A 12 percent representation target is applied at a biogeoclimatic level for each ecosection.

In the Kootenay Boundary Region, a list of 102 proposed study areas was developed for consideration. In June 1993, a draft report, *An Assessment of Candidate Protected Areas in the Kootenay Region* was issued. Following review by the CORE<sup>43</sup> Table and the public, a second, more comprehensive assessment of study areas was carried out. In December 1993, the results of this second assessment, the *Best PAS Report*, which evaluated and ranked the significance of the study areas, was released. An *Alternatives Report* dealing with some of the impacts associated with designating areas for study was then issued in January 1994.

The process from this point is for the CORE Table to assess the social and economic benefits and costs resulting from possible study area designation and to make recommendations to the Provincial Cabinet on designating Protected Areas and establishing Revised Study Areas.

The *Best PAS Report* lists 53 areas ranked according to their significance and priority and another 49 unranked areas within the Kootenay-Boundary region. Approximately 20 areas or sub-units of areas are within the Arrow Forest District, some within the TSA and some within TFL #23.

Twelve Priority Three areas have also been identified within the Arrow Forest District. However, all but three of these are located within TFL #23, therefore outside the TSA<sup>44</sup>. The exceptions are:

- CPR, located just west of Castlegar along the south shore of the Lower Arrow;
- Big Sheep Creek, located immediately west of the Nancy Green Recreation Area; and,

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<sup>42</sup> Cayuse, Little Cayuse and Renata Creeks are all in TFL #23 and, therefore, outside the study area.

<sup>43</sup> Commission on Resources and Environment.

<sup>44</sup> Trout Lake, Caribou Creek, Snow Creek, Burton Creek, Hail Creek, Sangrida Creek, Two Bit Creek, Deer Park and Renata areas are all located in TFL #23.

- Valhalla Extension, located immediately to the north of Valhalla Provincial Park.

The following table identifies the Priority One and Two ranked study areas, their principal PAS value and location within the forest district.

| <b>Table 2-6: PRIORITY 1 &amp; 2 PAS STUDY AREAS<br/>IN ARROW FOREST DISTRICT</b> |                                                                                                                                 |                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
|                                                                                   | <b>PAS Value</b>                                                                                                                | <b>Location</b>                                           |
| <b>Priority One Areas (ranked)</b>                                                |                                                                                                                                 |                                                           |
| westernmost corner of Hadow sub-unit, #7-Lardeau study area                       | headwaters Kuskanax Creek, Halfway River; winter caribou range.                                                                 | approximately 10% in TSA; remainder in Kootenay Lake TSA. |
| #12-MacKenzie                                                                     | most important kokanee & rainbow spawning channel in Upper Arrow.                                                               | TFL #23                                                   |
| <b>Priority Two Areas (ranked)</b>                                                |                                                                                                                                 |                                                           |
| #25-Mt. Faith                                                                     | buffer for Gladstone study area.                                                                                                | one half in TFL #23; other half in TSA.                   |
| #28-Syringa Extension                                                             | provincially significant undifferentiated Interior Douglas-fir representation; important habitat for red & blue listed species. | one half in TFL #23; other half in TSA.                   |
| #30-St. Leon Creek                                                                | supports core mountain caribou population; important for grizzly bear and wolverine.                                            | majority in TSA; some in TFL #23.                         |
| Cooper Height of land, Wilson & London sub-units of #33-Goat Range study area     | high recreation values, grizzly bear habitat, watershed values and cultural heritage.                                           | TSA                                                       |
| #36-Hamling-Poplar                                                                | caribou, grizzly bear & wolverine habitats; recreation values.                                                                  | TSA                                                       |
| #46-Cascade-Bremner                                                               | moist, wet Interior Cedar Hemlock representation; connects with other study areas.                                              | TSA                                                       |

Source: Best PAS Report, Kootenay Regional Protected Area Team, November 1993.

In addition to the PAS study areas identified above, a number of areas of interest have been noted by environmental and other interest groups for possible study. Taken together the existing study areas and proposed areas of interest collectively represent over half of the forest district's total area. This, in itself, is an indication of the strong environmental interest held by local residents.

Although designation of some of these areas would have little impact on the operable timber land base of the Arrow TSA, selection of others, such as St. Leon Creek, Wilson subunit of the Goat

Range Study area, Hamling-Poplar, and Cascade-Bremner, would have a major effect on the timber supply.

## **2.7 First Nations**

The Arrow Forest District does not contain any First Nation reserves. However, the long standing presence of First Nations' people has been documented and is evident from various archaeological finds. The eastern portion of the TSA, up to and including the western shores of the Arrow Lakes, are under claim by the Kootenay Indian Area Council for negotiation under the British Columbia Treaty Commission.

The comprehensive claims settlement process is aimed at concluding an agreement that will resolve the legal ambiguities associated with the common law concept of aboriginal rights. The objective is to negotiate modern treaties that provide clear, certain and long-lasting definition of rights to lands and resources. The comprehensive claim agreement to be negotiated between the Kootenay Indian Area Council, British Columbia and the government of Canada will define a wide range of rights and benefits, such as full ownership of certain lands, guaranteed wildlife harvesting rights, participation in land and resource management throughout the comprehensive claims area, financial compensation, resource revenue-sharing and economic development measures. The Kootenay's filing of their intent to negotiate a comprehensive claim is the first step in a six-stage process, with no specified timetable for concluding the negotiations process.

## **2.8 Issues and Concerns**

The preceding sections have outlined the social, economic and environmental setting of the TSA within the Arrow Forest District. In so doing, a number of issues and concerns related directly or indirectly to the forestry have been raised. The following section briefly summarizes these key issues and concerns.

### *Socio-Economic*

- the high rate of unemployment and lack of jobs;
- uncertainty about job retention in mining and forestry sectors;
- the continuing shift from high paying, full time jobs in resource sector to lower income jobs or self-employment in other sectors;
- increasing importance of secondary incomes, and subsistence and underground economic activities (e.g., bartering);
- increased economic pressure on families who must rely on second income sources or subsistence activities to make ends meet;
- reduced tax base to support service demands of growing population;
- the visual impact of logging activities, notably clear cutting;
- polarization regarding issues of environmental protection and resource sector jobs and growth;

- a desire for local control over resource management;
- increased opportunities for value-added manufacturing of forest products, tourism and agroforestry/wildcrafts;
- resource management provisions, including tenure or access arrangements, accommodating agroforestry requirements;
- chip trucks on highways; and,
- growth management and economic diversification.

#### *Environmental*

- harvesting, and road building and maintenance impacts on water quality;
- protection of unique or limited habitats;
- harvest impacts on forest seral distribution (i.e., maximum amount in early seral stages);
- maintenance of old growth and old growth diversity;
- provisions for retention of cavity trees and coarse woody debris;
- increased protection of caribou winter range;
- provisions for forest ecosystems networks;
- improved protection of riparian areas;
- harvest distribution impacts on special habitats (i.e., high elevation) and wildlife species (i.e., grizzly bears, caribou and goats);
- enhanced forest management practices;
- the ability to manage second growth forests to provide old growth value.

#### *First Nations*

- interest pertaining to land claims.



### **3.0 ARROW TSA FOREST PROFILE**

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This chapter profiles the Arrow TSA. The discussion is presented in four parts:

- Section 3.1 discusses the physical land base;
- Section 3.2 identifies potential changes which may affect the land base;
- Section 3.3 addresses critical factors affecting the timber supply;
- Section 3.4 discusses the current timber supply and the harvest forecasts.

#### **3.1 Timber Harvesting Land Base**

The Arrow TSA covers 754 000 ha, of which 54 percent is productive crown forest land<sup>49</sup>. However, much of this land base is unsuitable for timber harvesting because of steep or difficult terrain, environmentally sensitive soils, inaccessibility, or the presence of unmerchantable timber. As shown in Table 3-1, netting out these areas reduces the land base suitable for timber harvesting, under current management practices, to 29 percent, or 217 760 ha.

Forests in the Arrow TSA vary widely in terms of species composition. Of the total forested area, douglas-fir covers about 26 percent, balsam 24 percent, pine 18 percent, and larch 14 percent. Hemlock, spruce, cedar and deciduous species are less prevalent but provide a significant contribution to the diversity of species throughout the TSA. Located in the Interior Wet Belt, the forests are the most productive in the interior of the province.

The forest comprises more younger stands and less old growth than many other TSAs. Much of the forest within the TSA is between 60 and 100 years old because of fires that occurred in the late 1800's. Only 16.1 percent of the tree cover is old growth over 140 years, 3.3 percent over 250 years.

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<sup>49</sup> Productive forest land is the total TSA land base, net of non-crown and non-forest lands. The timber harvesting land base is the portion of total land area of a management unit considered to contribute to, and be available for long-term timber supply.

| <b>Table 3-1: ARROW TSA LONG TERM TIMBER HARVESTING LAND BASE</b> |                  |                      |                                    |
|-------------------------------------------------------------------|------------------|----------------------|------------------------------------|
| <b>Classification</b>                                             | <b>Area (ha)</b> | <b>% of TSA Area</b> | <b>% of Productive Forest Area</b> |
| <b>TSA land base</b>                                              | <b>754 079</b>   | <b>100.0</b>         |                                    |
| Non-crown land                                                    | (127 637)        | 16.9                 | n/a                                |
| Non-productive/non-forest land                                    | (222 178)        | 29.5                 | n/a                                |
| <b>Productive forest land</b>                                     | <b>404 264</b>   | <b>53.6</b>          | <b>100.0</b>                       |
| <b>Reductions:</b>                                                |                  |                      |                                    |
| Inoperable                                                        | (123 262)        | 16.3                 | 30.5                               |
| Environmentally sensitive                                         | (31 395)         | 4.2                  | 7.8                                |
| Non-merchantable types                                            | (17 432)         | 2.3                  | 4.3                                |
| Not satisfactorily restocked                                      | (13 862)         | 1.8                  | 3.4                                |
| Other <sup>50</sup>                                               | (17 250)         | 2.3                  | 4.3                                |
| <b>Total current reductions</b>                                   | <b>(203 201)</b> | <b>26.9</b>          | <b>50.3</b>                        |
| Additions <sup>51</sup>                                           | 15 697           | 2.1                  | 3.9                                |
| <b>Current timber harvesting land base</b>                        | <b>216 760</b>   | <b>28.7</b>          | <b>53.6</b>                        |
| Future Roads                                                      | (15 891)         | 2.1                  | 3.9                                |
| <b>Long-term timber harvesting land base</b>                      | <b>200 869</b>   | <b>26.6</b>          | <b>49.6</b>                        |

Source: Ministry of Forests.

### 3.1.1. Current Management Practices

Forests within the Arrow TSA are currently managed for a wide range of resources, including timber, range, recreation, wildlife, fish and water. Current management practices for all areas include:

- protection of streams and wildlife migration corridors;
- harvesting restrictions in watersheds used to supply domestic water;
- basic silviculture requirements to reforest harvested areas with free growing<sup>52</sup> stands of acceptable species within a specified timeframe;
- rate of restocking current and backlog not satisfactorily restocked<sup>53</sup> areas;

<sup>50</sup> Non-commercial cover, soils/steep slopes, and existing roads.

<sup>51</sup> Operable NSR (including restocked NSR) and timber licence reversions.

<sup>52</sup> Free growing refers to an established seedling of an acceptable species that is free from growth inhibiting brush, weeds, or excessive tree competition.

<sup>53</sup> Not satisfactorily restocked (NSR) refers to an area not covered by a sufficient number of tree stems of desirable species. If the expected regeneration delay has not elapsed, the land is defined as current NSR, whereas if it has elapsed, the land is classified as backlog NSR. Regeneration delays, on average, vary between 4 and 9 years.

- minimum harvest ages for tree species found in different ecosystems;
- soil conservation provisions;
- cut block adjacency guidelines, including provisions for cut block size/pattern, and reserve strips between blocks to facilitate wildlife movement;
- green-up<sup>54</sup> guidelines for the amount of time required for regenerated stands to reach a desired condition before adjacent mature timber may be harvested;
- forest cover objectives specifying the desired proportion of forest area by tree age or size class;
- allowance for timber losses resulting from fire, pests, and wind damage; and,
- minimum timber utilization requirements.

### 3.1.2 Special Management Zones

In addition to the above general requirements that are applied to all harvesting areas, a significant portion of the TSA is comprised of areas that are highly sensitive to harvesting activities, including visually sensitive areas, sensitive watersheds, and white tail deer and caribou winter range. These areas are categorized as "special management zones", where more stringent forest cover and management guidelines are applied to harvesting activities. The following sections briefly describe each of the special management zones.

- ***Retention Visual Quality Objective (VQO) Zone:***  
Areas where maintaining visual aesthetics is very important, and only a very little landscape alteration by harvesting is permitted. Based on recent studies which indicate that regenerated trees of five metres height create acceptable views, no more than 16 percent of the zone is allowed to be less than five metres tall (estimated to be 25 years old) at any one time.
- ***Partial Retention VQO Zone:***  
Areas where maintaining visual aesthetics is important, but some harvesting is possible while maintaining the visual quality objective. A maximum of 25 percent of this zone is permitted to be less than five metres tall at any one time.
- ***Class 1 & 2 Watershed Zone:***  
Areas which include small consumptive use watersheds and face units (springs, seeps, poorly defined catchment basins, etc.). The intent in this zone is to recognize the sensitivity of these areas and limit harvesting to a point where impact on water quality, quantity and timing of flow is minimized. A maximum of 30 percent of this zone is permitted to be less than a height of seven metres.

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<sup>54</sup> Green-up period refers to the time needed for a stand of trees to reach a desired condition (e.g., height) to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics.

➤ **Wildlife Winter Range Zone:**

Areas important as white tail deer and caribou winter range, where forest cover should be maintained to reduce snow depth. Maintaining certain percentages of forest cover in stands shorter than seven metres and stands taller than 19.5 metres is required to provide suitable habitat.

As shown in Table 3-2, 91 141 ha, or 42 percent of the TSA timber harvesting land base, is assigned to special management zones. However, increasing concerns over wildlife, water quality, recreation and other environmental values suggest that more restrictive guidelines on harvesting will be applied in the future. If this is the case, short and long timber supply will be impacted as significant volumes of mature timber are contained within these zones. Furthermore, new areas may be added to the special management zones in future which would again affect long and short term timber supply.

| <b>Table 3-2: ARROW TSA SPECIAL MANAGEMENT ZONES</b> |                        |                |
|------------------------------------------------------|------------------------|----------------|
| <b>Type Of Zone</b>                                  | <b>Total Area (ha)</b> | <b>% Share</b> |
| Retention VQO                                        | 3 156                  | 1.5            |
| Partial Retention VQO                                | 37 439                 | 17.3           |
| Class 1 & 2 Watersheds                               | 30 384                 | 14.0           |
| Wildlife Winter Range                                | 20 162                 | 9.3            |
| <b>Sub-total — Special Management Zones</b>          | <b>91 141</b>          | <b>42.0</b>    |
| Integrated Management                                | 125 618                | 58.0           |
| <b>Total Timber Harvesting Land Base</b>             | <b>216 760</b>         | <b>100.0</b>   |

Source: Ministry of Forests.

### **3.2 Potential Changes Affecting the Land Base and Timber Supply**

Several provincial government initiatives have the potential, either individually or collectively, to impact the TSA timber harvesting land base. However, as these initiatives are either in progress or pending, their outcome cannot be predicted and, consequently, have not been reflected in the timber land base assumptions used in the *Timber Supply Analysis*. The following sections briefly describe each of these initiatives in relation to the TSA.

➤ **Commission on Resources and Environment (CORE):**

CORE is an independent commission established in January 1992 by the provincial government to help resolve "valley-by-valley" conflicts over land use. The Kootenay region, which includes the Arrow TSA, is one of three regions in the province where a regional multi-sector land use plan is being developed under CORE's stewardship. One of the goals of the regional plan is to recommend areas to government which should be considered for protected area status. The Kootenay CORE tables have submitted their

reports to CORE, and CORE is expected to make its recommendations to government by September 1994.

The Slocan Valley pilot project, which is a by-product of the CORE process, is reassessing integrated resource management objectives for the Slocan Valley. This process, which is similar in intent to an LRMP (discussed later in this section), may result in more restrictive management practices, including reductions in timber harvesting.

➤ ***Protected Area Strategy (PAS):***

In 1992, the provincial government initiated PAS with the goal of protecting representative examples of natural diversity of major ecosystems across B.C.'s 119 ecosections, as well as protecting special natural (including rare and endangered species), cultural heritage and recreational features. Areas within the TSA that have been identified as candidate study areas and the status of this process were discussed in Section 2.7. Note that the candidate study areas form part of the timber harvesting land base. However, if these areas are designated as PAS study areas, they will be accorded interim protection from development activities pending a determination of their ultimate status (scheduled to be decided by the year 2000).

If all Priority One and Two areas in the TSA are designated as study areas, 110,000 ha, or 15 percent of the TSA land base, would be unavailable for short term timber supply. The impact on harvesting varies significantly by area but ranges medium to high for all areas, except the Syringa Extension candidate study area which is rated low<sup>55</sup>. Further reductions to the land base may also result, if Priority Three areas or other areas of interest are given study area status.

➤ ***Land and Resource Management Planning (LRMP):***

An LRMP is a sub-regional (i.e., forest district level) integrated, consensus building process that produces a Land and Resource Management Plan for review and approval by the provincial government. The process considers resource issues, such as wildlife management, ecosystem networks, recreation/tourism designated areas, and protected areas, and involves active participation by the public, aboriginal groups and government agencies. The plan specifies broad resource management objectives and strategies, and provides direction for more detailed resource planning by government agencies and the private sector. An LRMP is scheduled to be initiated for the Arrow Forest District (i.e., TSA, TFL #3 and TFL #23) after completion of the Timber Supply Review.

➤ ***Local Resource Use Plans (LRUP):***

An LRUP is carried out to develop area-specific resource management objectives and prescriptions (i.e., watershed level). Typically, LRUP are used in response to conflicts

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<sup>55</sup> Best PAS Report: Timber Impact Rating, Kootenay Regional Protected Area Team, November 1993.

that arise as a result of multiple demands on the resource base. Any resource can be the motivating issue to initiate an LRUP, including wildlife, fish or water resources. LRUP can take the form of an Integrated Watershed Management Plan (IWMP), Coordinated Resource Management Plan (CRMP), or Coordinated Access Management Plan (CAMP).

Twelve IWMPs (Springer, Glade, Fauquier, Hasty/Aylwyn, Perry Ridge, Wensly/Brouse, Merry/Blueberry, China, Deer, Ladybird, Cayuse and Blizzard Mountain Creeks) are being developed in the Arrow TSA. Three CRMPs (Lightening Peak/Galloping Hills, Johnson/Renatta and Pend D'Oreille) have also been developed. In addition, two CAMPs were developed in 1986/87, but were not completed.<sup>56</sup>

➤ ***Forest Practices Code:***

The newly introduced Forest Practices Code outlines enhanced provisions for integrated resource management. Potential impacts could include reductions in timber harvest to meet biodiversity, and enhance protection of lakes and streams.

### **3.3 Critical Factors**

The previous sections have discussed various physical (e.g., inoperable terrain) and imposed (i.e., management guidelines) constraints on harvesting as well as possible future changes in land base or management guidelines that may affect timber supply. However, harvesting is also affected by a number of critical factors that influence the actual volume of wood that is realized on the ground.

➤ ***Watersheds and Visually Sensitive Areas:***

Watersheds are the single most important factor determining timber availability in the Arrow TSA. The Class 1 and 2 watershed zone described in Section 3.1.2 includes only the most sensitive of the watersheds. Many other domestic watersheds exist throughout the TSA. In fact, about 80 percent of the productive Crown forest land in the Arrow TSA is also the source of one or more domestic water use licences. In total, 5,500 individual licences are held on seeps and creeks in the district. To put this into perspective, 13 percent of the total number of watersheds in the province are located in the Arrow TSA.

Nearly 40 percent of the timber supply land base<sup>57</sup> is visible from communities, highways and boats on the Arrow Lakes and Slocan Lake. The most sensitive areas are contained in VQO special management zones, while others overlap with Class 1 and 2 watersheds, thus also have enhanced protection.

At the same time, large volumes of mature timber are available in visually sensitive and watershed areas. Moreover, as little recent harvesting has occurred in Class 1 and 2

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<sup>56</sup> Source: Ministry of Environment, Lands and Parks.

<sup>57</sup> Source: Ministry of Forests.

watersheds and VQO zones, much of the mature timber is unrestricted by adjacency considerations. In contrast, much of the timber in integrated management zones is located in reserve strips between cut blocks that have not yet achieved green-up requirements.

In the past, strong local resistance by the public has been mounted against logging in many watersheds because of concerns about water quality, resulting in both harvest moratoriums (e.g., Hasty Creek) and extended periods when harvesting has not occurred. If similar opposition occurs in future, short term timber supply, in particular, could be reduced.

➤ ***Wildlife, Fisheries and Water Management:***

Although protection of biodiversity, wildlife and fisheries values and water resources are addressed under current management practices, a number of concerns remain which new (e.g., Forest Practices Code) and evolving management guidelines are attempting to address. These include:

- maintaining a higher percentage of old growth forest in caribou winter range;
- including provision for Forest Ecosystem Networks (FEN's);
- increasing forest cover requirements adjacent to streams as well as addressing how harvesting is operationally carried out in riparian areas;
- retaining wildlife trees and coarse, woody debris;
- addressing the impact of harvest distribution (e.g., relatively more harvesting occurring in remote areas because of public resistance elsewhere and its effect on grizzly bears, caribou and goats which prefer these remote areas); and,
- addressing the impact of harvesting on total distribution of early seral stages.

Changes in management practices will affect both short and long term timber supply.

➤ ***Forest Health***

A substantial portion of the leading Douglas-Fir stands in the TSA are affected by root rot, which raises concern about harvesting and silvicultural practices (i.e., clear cut vs. partial cuts) and future yields from stands regenerated following harvesting. Although the public are putting increasing pressure against clear cutting practices, partial cutting could increase the rate of root rot spreading. Root rot in regenerated stands of Douglas-fir could pose significant risk to expected yields from these stands in future.

➤ ***Other Concerns:***

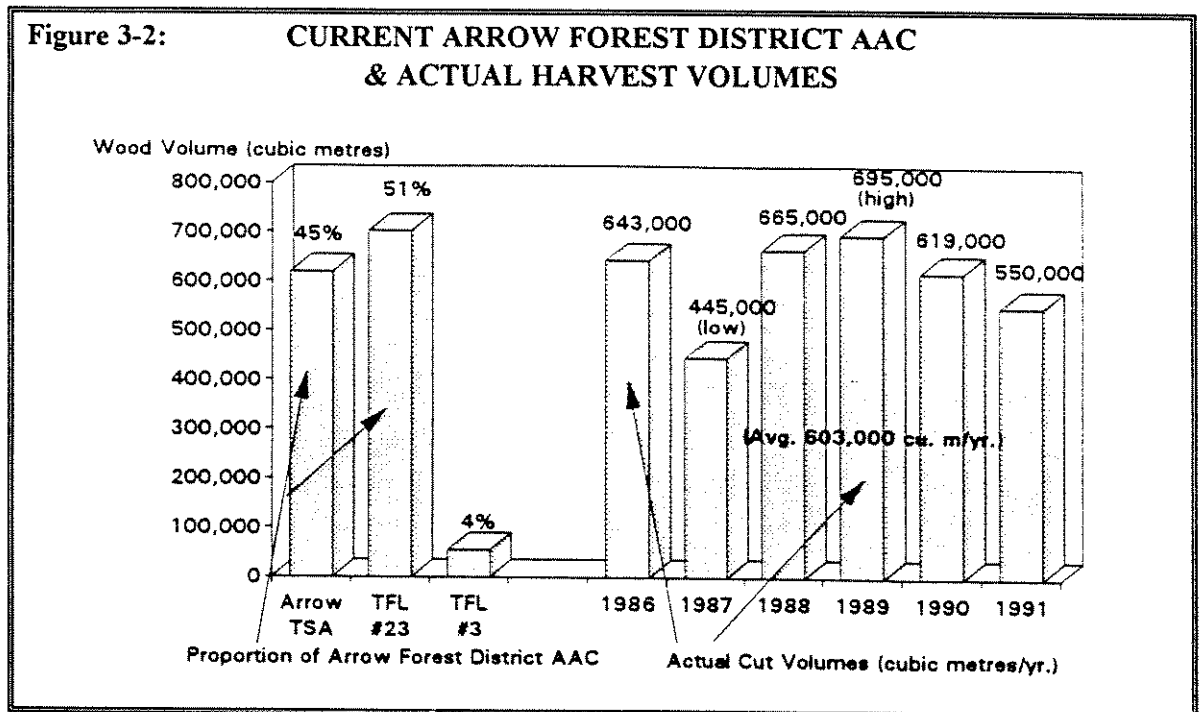
- Green-up (i.e., establishment and early height growth) is sometimes slower than expected.
- Cut block adjacency requirements (i.e., restrictions on harvesting next to cut blocks which have not reached green-up requirements) restricts the availability of harvest areas and extends the planned harvest schedule (i.e., five passes instead of

four passes may be required).

- The volume of merchantable timber derived from old stands of hemlock, cedar and balsam may be reduced by 10-15 percent because of decay.
- Operational constraints may limit access to older stands so that much of the short term harvest is taken from younger stands, resulting in lower volumes of timber.
- Maintaining sufficient mature growing stock to allow the operational flexibility required to find timber for harvesting is a concern.

### 3.4 Current Timber Supply and Timber Harvest Forecasts

As shown in Figure 3-2, within the Arrow Forest District, the TSA accounts for 45 percent of the current total District AAC and Tree Farm Licences #3 and #23 for the remaining 55 percent. The AAC for the Arrow TSA has been at its current level of 619 000 m<sup>3</sup> since 1986. Annual harvest levels over the period 1986-1991 fluctuated between a low of 445 000 m<sup>3</sup> and a high of 695 000 m<sup>3</sup>. Although a downward trend in harvesting appears indicated since 1989, harvest levels in 1992 and 1993 were higher than in 1991, thus bringing the average over the past five years back up to approximately 619 000 m<sup>3</sup>.



### 3.4.1 Timber Harvest Forecasts

The purpose of this study is to assess the economic, social and environmental implications of changing timber harvest levels within the Arrow TSA. This study is based on the *Arrow Timber Supply Analysis* by the Ministry of Forests, which assesses how current forest management practices affect the supply of wood available for harvesting over the next 200 years, and shows how the rate of harvest may change in order to reach a sustainable long-term harvest level.

The *Arrow Timber Supply Analysis* also examines how the Arrow TSA timber supply may be affected by variations in current management assumptions (e.g., uncertainty in green-up periods). In so doing, the impact of some of the critical factors discussed in Section 3.3 has been considered. The reader should note, however, that other factors may not be fully captured because of a lack of information (e.g., reductions for riparian areas and streamside management zones), new requirements since completion of the analysis (e.g., community watershed guidelines), or uncertainty (e.g., land use decisions).

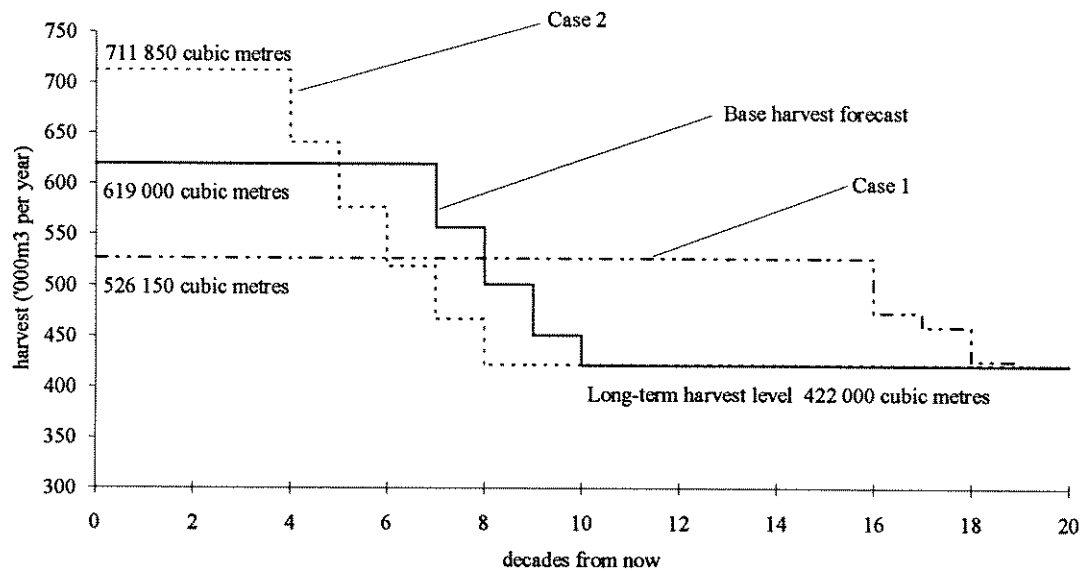
The forecasts produced in the *Arrow Timber Supply Analysis* used in this study are described below. These forecasts are not recommendations, but are intended to serve as a means of illustrating the social, economic and environmental implications of different harvest levels. See Table 3-3 and Figure 3-3.

- **The base harvest forecast for the Arrow TSA**, referred to as the Base Case in the Ministry of Forests' *Arrow TSA Timber Supply Analysis*, begins at an initial harvest level of 619 000 m<sup>3</sup>. This level can be maintained for six decades; however, the average age of harvested stands would drop significantly in the first twenty years. The forecast continues with 10 percent decreases in each of years 70, 80, and 90. In year 100, the harvest would fall by a further 6.5 percent to the long-term harvest level (LTHL) of 422 000 m<sup>3</sup>. The LTHL is 32% below the current AAC.
- **Case 1: A harvest forecast starting 15% lower than the current AAC.** Starting the harvest forecast at a level 15% lower (526 150 cubic metres) than the current AAC provides a more stable harvest over the forecast period and allows for a more gradual decline in the forest inventory. After the initial reduction to the harvest in the first year, further reductions would not be necessary until year 160, when a two decade decline to the long-term harvest level would begin. Long-term stability and a higher harvest after year 80 is the trade-off for the immediate lower harvest level.
- **Case 2: A harvest forecast starting 15% higher than the current AAC.** Based on sensitivity analyses in the *Arrow TSA Timber Supply Analysis*, it may be possible to maintain a higher harvest level than modeled in the base case. Starting the harvest forecast at a level 15% higher (711 850 cubic metres) than the current AAC would lower the inventory of mature growing stock more rapidly than either the base forecast, or Case 1.

As a result, the harvest would need to begin its decline to the LTHL in year 40, as opposed to decade 7 in the base case. The Case 2 harvest would reach the LTHL by year 80, two decades earlier than the base forecast. A higher harvest in the first 4 decades is the trade-off for the earlier reduction in available timber.

| Table 3-3: TIMBER HARVEST FORECASTS <sup>58</sup> |               |         |         |
|---------------------------------------------------|---------------|---------|---------|
| Year                                              | Cubic Metres  |         |         |
|                                                   | Base Forecast | Case 1  | Case 2  |
| 0                                                 | 619 000       | 526 150 | 711 850 |
| 40                                                | 619 000       | 526 150 | 640 665 |
| 70                                                | 557 100       | 526 150 | 467 045 |
| 80                                                | 501 390       | 526 150 | 422 000 |
| 90                                                | 451 257       | 526 150 | 422 000 |
| 100                                               | 422 000       | 526 150 | 422 000 |
| 200                                               | 422 000       | 422 000 | 422 000 |

Figure 3.3: Arrow TSA Base Timber Harvest Forecast and Alternatives.



<sup>58</sup> Ministry of Forests.

## 4.0 FOREST INDUSTRY PROFILE

This chapter outlines the distribution of timber harvested in the Arrow TSA and associated direct employment. The first section describes the apportionment of the current AAC. Section 4.2 then outlines employment in harvesting, processing, remanufacturing, silviculture and in the Ministry of Forests. For this analysis, note that some harvesting and processing jobs, although located in the TSA, are in no way associated with wood harvested in the TSA (i.e., Forest Fibre, Goose Creek).

Section 4.3 presents a summary of forest sector employment within the TSA which can be ascribed to wood from the TSA, and discusses how employment coefficients are developed. Details on the calculation of the coefficients are also included in Appendix D. Section 4.4 indicates average employment income for the various employment categories. Finally, Section 4.5 presents capital investment and other expenditures within the TSA.

### 4.1 Current TSA Apportionment

Arrow TSA timber is apportioned across a range of tenures, but is heavily concentrated with two licensees, Atco Lumber and Slocan Forest Products, which account for 60-65 percent of the total AAC. Apportionment by tenure is shown in Table 4-1. Overall, replaceable forest licences account for about 80 percent of the AAC. The SBFEP program accounts for nearly 18 percent,

| Table 4-1: ARROW TSA APPORTIONMENT OF AAC<br>BY LICENSEE - 1992 |                                              |                       |                   |
|-----------------------------------------------------------------|----------------------------------------------|-----------------------|-------------------|
| Licensee                                                        | Processing<br>Location by<br>Forest District | AAC<br>(cubic metres) | Percent<br>of AAC |
| <b>Forest Licences</b>                                          |                                              |                       |                   |
| Slocan Forest Products Ltd.                                     | Arrow                                        | 218 472               | 35.5              |
| Atco Lumber Ltd.                                                | Arrow                                        | 167 438               | 27.0              |
| Riverside Forest Products                                       | Okanagan                                     | 52 552                | 8.5               |
| Kalesnikoff Lumber Company Ltd.                                 | Arrow                                        | 38 322                | 6.2               |
| Bell Pole Company Ltd.                                          | Okanagan                                     | 12 974                | 2.1               |
| Sub-total                                                       |                                              | 489 758               | 79.1              |
| Small Business Forest Enterprise<br>Program (SBFEP)             |                                              | 113 336               | 18.3              |
| Woodlot Licences                                                |                                              | 9 700                 | 1.6               |
| Forest Service Reserve                                          |                                              | 6 206                 | 1.0               |
| TOTAL                                                           |                                              | 619 000               | 100.0             |

Source: Ministry of Forests.

and woodlot licences 1.6 percent. Only 1.0 percent of the wood is apportioned to a Forest Service Reserve, which is relatively little as compared to the adjacent Revelstoke and Kootenay Lake TSAs which apportion 4 percent and 15 percent respectively, to Forest Service Reserves.

As shown in Table 4-1, timber from the Arrow TSA is apportioned to five major forest industry licensees. Three of these licensees have processing operations within the TSA, while the other two process timber outside the TSA. The SBFEP program includes 38 registrants in Category 1 (market loggers) and 13 in Category 2 (processors). Category 1 and 2 account for 73 percent of the total SBFEP apportionment with the remainder mainly in bid proposals.

The estimated distribution of TSA wood flows to primary processing operations inside and outside the Arrow TSA is shown in Table 4-2.<sup>59</sup> For the major licensees, the harvest volumes apportioned to Atco, Kalesnikoff, and Slocan are processed inside the TSA and volumes apportioned to Bell Pole and Riverside are processed outside the TSA.<sup>60</sup>

For the SBFEP timber, 77 percent of Category 1 and Timber Sale Licence timber, 68 percent of Category 2 timber, and all bid proposal timber is milled inside the TSA.<sup>61</sup> Distribution of timber from woodlot licences is assumed to be the same as for major licensees.<sup>62</sup> Based on the weighted average of wood flows in Table 4-2 and AAC apportionment in Table 4-1, 85 percent of total TSA timber harvested remains inside the TSA for processing.

| <b>Table 4-2: ARROW TSA WOOD FLOWS TO<br/>PRIMARY PROCESSING OPERATIONS<br/>(Share of Total)</b> |                                                   |                     |
|--------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------|
|                                                                                                  | <b>Major Licensees &amp;<br/>Woodlot Licences</b> | <b>SBFEP Timber</b> |
| Processed inside TSA                                                                             | 86 %                                              | 80 %                |
| Processed outside TSA                                                                            | 14 %                                              | 20 %                |
| <b>TOTAL</b>                                                                                     | <b>100 %</b>                                      | <b>100 %</b>        |

<sup>59</sup> This does not include wood flows to secondary processing operations such as the Celgar pulp mill.

<sup>60</sup> This may be a slight understatement of the harvest volumes actually processed inside the Arrow District because Bell Pole trades away almost 95% of its Forest License Allotment for the particular type of logs it requires within its pole yard. Because of the higher value of pole logs, the two trade roughly on a 2:1 basis. Depending on where Bell Pole trades its logs, some of its harvest volumes are typically processed within the Arrow TSA. This amount varies widely from year to year.

<sup>61</sup> Source: Ministry of Forests, District Office.

<sup>62</sup> Op. cit.

## 4.2 Forest Sector Employment

Forest sector employment is reported in person years (PYs). A PY is equivalent to a full-time equivalent work year, where a full-time job is based on 9-12 months of employment. Part-time and seasonal employment is translated into a PY based on the number of months worked. Please see Appendix D for a more complete discussion of PYs.

### 4.2.1 Harvesting

An annual harvest rate of 600 000 - 619 000 m<sup>3</sup> in the Arrow TSA generates an estimated 220 - 240 PYs of employment in permit development, road construction and maintenance, logging and trucking. Most harvesting is done by contractors. Some contractors work exclusively for a particular licensee, but many bid for contracts from a combination of major licensees and the SBFEP program. Relatively few contractors bid exclusively on SBFEP timber.

Overall, harvesting employment per cubic metre of timber harvested has increased over the last decade and is likely to remain at or above current levels for the foreseeable future. The following four aspects of harvesting practices are key to this trend:

- the level of planning required to obtain harvesting permits;
- the proportion of cable relative to conventional logging;
- whether logging is selective or clear cut; and
- the size of harvesting blocks.

First, person days per cubic metre required for planning are significantly higher than they were a decade ago and are unlikely to decrease in the future as trends continue toward smaller harvesting blocks, selective logging, and competing uses for limited timber supplies.

Second, as a result of cable harvesting, person days per cubic metre required for logging have also increased over the past decade in the Arrow TSA. Cable methods tend to be more labour intensive than conventional methods. Typically, conventional logging in the Arrow TSA requires about 30 person-days per 1 000 m<sup>3</sup>, whereas cable logging requires about 50 person-days per 1 000 m<sup>3</sup>. Currently, 30 to 40 percent of timber in the TSA is harvested using cable methods. The proportion of harvesting using cable methods is up from 15 percent in the late 1980's and is expected to remain constant over the foreseeable future. In contrast, 30 percent of timber in the neighbouring Kootenay Lake TSA is harvested using cable methods.

Finally, the trend in harvesting is towards smaller harvest blocks and more partial logging as opposed to clear cut logging. Both these factors tend to increase the total number of person days required per cubic metre of timber harvested because of higher planning, road building, and landing site costs per cubic metre of timber.

#### 4.2.2 Processing

##### Principal Wood Processing Operations

The principal wood processing operations situated in the Arrow Forest District are:

- Atco Lumber Ltd.
- Kalesnikoff Lumber Co. Ltd.
- Slocan Forest Products Ltd.
- Celgar Pulp
- Pope & Talbot Ltd.
- Forest Fibre Ltd.

Of these, all but Pope & Talbot and Forest Fibre consume significant volumes of wood originating from the Arrow TSA. Atco, Kalesnikoff, and Slocan hold forest licences in the Arrow TSA and Celgar Pulp purchases about 2.2 million cubic metres of chips annually, of which about 7-8 percent (160 000 m<sup>3</sup>) originate in the Arrow TSA.<sup>63</sup> Pope & Talbot is supplied primarily from the company's Tree Farm Licence (TFL #23).<sup>64</sup> Forest Fibre operates a chipping plant in Salmo. However, relatively low volumes of timber chipped at Salmo appear to originate in the Arrow TSA, because virtually 100 percent of the timber harvest in the TSA is sawlogs according to the District MoF.

Some timber harvested in the Arrow TSA is shipped from the Arrow Forest District for processing elsewhere within the province. In particular, two of the Arrow TSA's five major licensees process timber outside of the TSA. These are Bell Pole Co. Ltd., and Riverside Forest Products Ltd., which together account for 11 percent of the TSA AAC.

The following table provides more detailed information about the processing operations of major licensees and of other major operations inside the TSA.

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<sup>63</sup> Chip sourcing data obtained from Celgar Pulp. The mill purchases all its fibre requirement in the form of chips, some of which come from sawmills with timber apportionment in the Arrow TSA. We assume that from each source, the share of chips originating in the Arrow TSA is equal to the share of timber originating from the Arrow TSA. For example, if Sawmill A obtains 50% of its timber from the Arrow TSA, then we estimate that 50% of the chips which Celgar purchases from Sawmill A originate in the Arrow TSA.

<sup>64</sup> Pope & Talbot along with other major sawmills in the District purchase timber harvested under the SBFEP program. These volumes are small relative to total mill throughput and they are difficult to trace.

**Table 4-3: MAJOR PROCESSING OPERATIONS**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• <b>Atco Lumber Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Lumber &amp; veneer</li> <li>- Location: Fruitvale (Arrow TSA)</li> <li>- Dependence on Arrow TSA: heavy; major licensee (see Table 4-4)</li> <li>- Union: IWA</li> <li>- No. of shifts: 2</li> <li>- Processing jobs (hourly): 120 PY</li> <li>- Comments: Operations include sawmill, veneer plant, and planer mill. Throughput over last five years averaged 310 000 - 315 000 m<sup>3</sup> annually. Constrained by lack of timber. Would prefer to run 360 000 m<sup>3</sup> with 2 shifts. Capital upgrades over last five years primarily resulted in better recovery. Plan move to higher value-added products w/ investment in planer mill.</li> </ul> </li> </ul>                                                             |
| <ul style="list-style-type: none"> <li>• <b>Bell Pole Co. Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Treated wood poles for the Canadian &amp; US electric utility market</li> <li>- Location of yard operations: Lumby (Okanagan TSA), Revelstoke (Revelstoke TSA), and Terrace (Kalum TSA).</li> <li>- Dependence on Arrow TSA: light; major licensee (see Table 4-4)</li> <li>- Processing jobs (hourly): 27 PY in BC</li> <li>- Comments: BC pole yards provide 27 PY processing positions. Additional processing done in Alberta and Minnesota. Bell Pole total annual harvest is 174 000 m<sup>3</sup>, of which about 95% is traded, often on a volume basis close to 2:1. Additional timber is purchased. Total annual pole timber throughput at Bell Pole's yard operations is about 130 000 m<sup>3</sup>.</li> </ul> </li> </ul> |
| <ul style="list-style-type: none"> <li>• <b>Kalesnikoff Lumber Co. Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Lumber</li> <li>- Location of sawmill: Castlegar (Arrow TSA)</li> <li>- Dependence on Arrow TSA: heavy; major licensee (see Table 4-4)</li> <li>- Union: no</li> <li>- No. of shifts: 2</li> <li>- Processing jobs (hourly): 80-85 PY</li> <li>- Comments: Mill in operation since the 1970's. New sawmill installed 1989. Sell dimension lumber and specialty items to US and Canada. Employees participate in profit share arrangement and a major priority of the Company is to retain employment at current levels (even with 5%-10% increase/decrease in AAC). This done, for example, by processing different species and log sizes.</li> </ul> </li> </ul>                                                             |
| <ul style="list-style-type: none"> <li>• <b>Riverside Forest Products Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Lumber &amp; veneer</li> <li>- Location of sawmill: Lumby (Okanagan TSA)</li> <li>- Dependence on Arrow TSA: light; major licensee (see Table 4-4)</li> <li>- Union: IWA</li> <li>- No. of shifts: 2</li> <li>- Processing jobs (hourly): 150 PY</li> <li>- Comments: Annual throughput was 560 000 m<sup>3</sup> until 1992, but dropped to 520 000 m<sup>3</sup> in 1993 due to timber shortage. Plan to stress veneer production in future.</li> </ul> </li> </ul>                                                                                                                                                                                                                                                      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• <b>Slocan Forest Products Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Lumber</li> <li>- Location of sawmill: Slocan (Arrow TSA)</li> <li>- Dependence on Arrow TSA: heavy; major licensee (see Table 4-4)</li> <li>- Union: IWA</li> <li>- No. of shifts: 2</li> <li>- Processing jobs (hourly): 116 PY</li> <li>- Comments: Annual throughput 1989-1993 ranged from 390 000 m<sup>3</sup> to 516 000 m<sup>3</sup>. Last major upgrade in 1989 changed mill flow and sawing technology. Plan to install new equipment to improve recovery.</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                         |
| <ul style="list-style-type: none"> <li>• <b>Pope &amp; Talbot Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Lumber</li> <li>- Location of sawmill: Castlegar (Arrow TSA)</li> <li>- Dependence on Arrow TSA: insignificant</li> <li>- Union: IWA</li> <li>- No. of shifts: 2</li> <li>- Processing jobs (hourly): 265 PY</li> <li>- Comments: Pope &amp; Talbot operates a timber division out of Nakusp which supplies three Pope &amp; Talbot sawmills, namely Castlegar, Midway, and Grand Forks. The latter two are located in the Boundary Forest District, adjacent to Arrow Forest District on the West. The only timber Pope &amp; Talbot obtains from the Arrow TSA is through the SBFEP program; some as Category #1 and Category #2 purchases from small operators and some through its AAC of 3 500 cubic metres under a timber supply license (TSL) in the SBFEP.</li> </ul> </li> </ul> |
| <ul style="list-style-type: none"> <li>• <b>Celgar Pulp</b> <ul style="list-style-type: none"> <li>- Products: Kraft Market Pulp</li> <li>- Location: Castlegar (Arrow TSA)</li> <li>- Dependence on Arrow TSA: approx. 7%-8% fibre supply</li> <li>- Union: PPWC</li> <li>- Processing jobs (hourly): 328-330 PY, (salaried): 125 PY, (chip transport): 94 PY.</li> <li>- Comments: Mill has 1 200 mtpd capacity for softwood kraft pulp. Its main wood supply is chips from sawmills and from the Forest Fibre Chip Plant (see below). The mill processes about 2.2 million cubic metres of chips annually of which we estimate that 150 000 - 170 000 m<sup>3</sup> originate in the Arrow TSA.</li> </ul> </li> </ul>                                                                                                                                                                                           |
| <ul style="list-style-type: none"> <li>• <b>Forest Fibre Ltd.</b> <ul style="list-style-type: none"> <li>- Products: Chips</li> <li>- Location: Salmo (Arrow TSA)</li> <li>- Dependence on Arrow TSA: insignificant</li> <li>- Union: no</li> <li>- Comments: Chipping plant purchases pulpwood from a variety of companies (both in the Arrow and other forest districts). It produces 250 000 - 300 000 chips annually and ships them to Celgar.</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                           |

#### 4.2.3 Fibre Supply Of Major Licensees

Table 4-4 indicates the degree to which each of the five major licensees is dependent upon the Arrow TSA for timber supply. The three companies with processing operations located in the Arrow TSA district rely on the TSA for anywhere between 45-60 percent of their timber throughput. In contrast, the two licensees with processing operations outside the TSA rely on TSA

timber for only 5-15 percent of their timber throughput. Variations do occur from year to year in the volumes of timber which licensees actually harvest in the Arrow TSA, in timber purchases, and in processing throughput. Also, significant volumes of timber are traded, and often volumes traded are not in a 1:1 ratio. Therefore, the data in Table 4-4 need to be interpreted recognizing that the percentages can fluctuate widely in future.

| <b>Table 4-4: FIBRE SOURCE OF MAJOR LICENSEES (m<sup>3</sup>)</b> |                                             |                                |                          |                  |                                        |
|-------------------------------------------------------------------|---------------------------------------------|--------------------------------|--------------------------|------------------|----------------------------------------|
|                                                                   | <b>Arrow<br/>TSA<br/>Forest<br/>License</b> | <b>Arrow<br/>TSA<br/>SBFEP</b> | <b>Other<br/>Sources</b> | <b>Total</b>     | <b>Arrow<br/>TSA<br/>Share<br/>(%)</b> |
| <b>Inside TSA</b>                                                 |                                             |                                |                          |                  |                                        |
| Atco                                                              | 167 000                                     | 8 000                          | 135 000                  | 310 000          | 55-60                                  |
| Kalesnikoff                                                       | 38 000                                      | 24 000                         | 70 000                   | 132 000          | 45-50                                  |
| Slocan Forest Products                                            | 200 000                                     | 30 000                         | 185 000                  | 415 000          | 55-60                                  |
| <b>Outside TSA</b>                                                |                                             |                                |                          |                  |                                        |
| Bell Pole Company                                                 | 6 500 <sup>65</sup>                         | 6 000                          | 117 500                  | 130 000          | 5-10                                   |
| Riverside Forest Products                                         | 55 000                                      | 10 000                         | 455 000                  | 520 000          | 10-15                                  |
| <b>TOTAL</b>                                                      | <b>466 500</b>                              | <b>78 000</b>                  | <b>962 500</b>           | <b>1 507 000</b> | <b>35-40</b>                           |

Source: Interviews with operators, Ministry of Forests.

#### 4.2.4 Lumber Remanufacturing

Some lumber remanufacturing is done by the major licensees at their primary processing facilities (e.g., in planer mills). However, other lumber remanufacturing in the forest district is still minimal. Aside from a few small 2-3 person mills, Goose Creek Lumber is the only sizeable remanufacturing operation in the Arrow Forest District. Goose Creek produces window components, finger jointed planks, and other products. Its lumber input is approximately 7-8 million nominal board feet (i.e., 35 000 m<sup>3</sup>), of which we estimate that less than 30 percent is obtained from the Arrow TSA.<sup>66</sup> In total, Goose Creek generates 32 PY jobs (with plans to increase this by 8 PY positions without changing throughput volume).

<sup>65</sup> Bell Pole's harvest from the Arrow TSA is actually 12 974 cubic metres. However, Bell Pole trades away almost 95% of its Forest License allotment for the particular type of log it requires within its pole yard. Because of the higher value of these pole logs, the two trade roughly on a 2:1 basis, i.e. with the 12 974 cubic metres of logs harvested contributing roughly 6 500 cubic metres of timber to Bell Pole's throughput.

<sup>66</sup> Goose Creek purchases 70% of its lumber input from Pope & Talbot and 30% from Slocan Forest Products. Insignificant volumes of the timber at Pope & Talbot originate in the Arrow TSA and Slocan Forest Products obtains timber from both the Arrow TSA and from its Tree Farm Licence (TFL#3). It is on this basis that we estimated that less than 30% of lumber throughput at Goose Creek originates in the Arrow TSA.

#### **4.2.5 Silviculture**

At an annual harvest rate of 600 000 - 619 000 m<sup>3</sup>, the Arrow TSA generates approximately 90-100 PYs of employment annually in basic silviculture surveys, site preparation, planting, brushing, and stand tending. Silviculture contractors who bid for work with the Ministry of Forests employ both local and outside-TSA workers (often university students) on a seasonal basis. The number of silviculture employees varies from year to year, as well as the share of work which is apportioned to local workers. However, contractors indicated that, in 1993, most of their employees resided within the TSA.

The new Forest Renewal Plan announced in April 1993 will result in more silviculture employment province-wide but it is too early to predict its precise effects.

#### **4.2.6 Ministry of Forests (MoF)**

The Arrow TSA is administered at the forest district level through the Arrow Forest District office in Castlegar and at the regional level through the Nelson Forest Region office in Nelson. Total MoF staffing is currently 61 PY positions in the forest district office and 120 PY positions in the Region office.

By prorating employment on the basis of AAC in the Arrow TSA relative to total AAC for the forest district, a harvest rate of 600 000 - 619 000 m<sup>3</sup> supports 25 - 30 PY positions in the district office. Employment at the Region office attributable to the Arrow TSA is calculated in a similar manner, by estimating the share of employment attributable to harvesting activity in the Arrow TSA based on the TSA's share of total harvest in the Nelson Forest Region. Assuming that Region office employment is proportional to harvest levels, 11 - 12 PY at the Nelson Forest Region office can be ascribed to Arrow TSA.

MoF employment in Victoria that can be directly attributed to the Arrow TSA has not been included, as many other factors including government policy influence these staffing levels.

### **4.3 Summary of Employment and Estimation of Coefficients**

As shown in Table 4-5, a total of 610 - 630 PY direct forest sector jobs located in the Arrow TSA are attributable to timber from this area. In addition, another 44 - 46 PY direct forest sector jobs are generated outside the Arrow TSA, resulting in a grand total of 655 - 675 PYs.

| <b>Table 4-5: DIRECT FOREST SECTOR EMPLOYMENT CURRENTLY ATTRIBUTABLE TO ARROW TSA TIMBER HARVEST ONLY<sup>67</sup></b> |                     |
|------------------------------------------------------------------------------------------------------------------------|---------------------|
|                                                                                                                        | <b>Person Years</b> |
| <b>Inside TSA</b>                                                                                                      |                     |
| Harvesting                                                                                                             | 220-240             |
| Processing:                                                                                                            |                     |
| Major Sawmills (Atco, Kalesnikoff, & Slocan)                                                                           | 210-215             |
| Small Sawmills                                                                                                         | 12-13               |
| Celgar Pulp Mill                                                                                                       | 40-41               |
| Total Processing                                                                                                       | 260-270             |
| Silviculture                                                                                                           | 90-95               |
| MoF District Office                                                                                                    | 25-30               |
| <b>Total Inside TSA</b>                                                                                                | <b>610-630</b>      |
| <b>Outside TSA</b>                                                                                                     |                     |
| Harvesting                                                                                                             | 0                   |
| Processing:                                                                                                            |                     |
| Large Operations (incl. Riverside & Bell Pole)                                                                         | 30                  |
| Small Sawmills                                                                                                         | 3-4                 |
| Total Processing                                                                                                       | 33-34               |
| Silviculture                                                                                                           | 0                   |
| MoF Regional Office (Nelson)                                                                                           | 11-12               |
| <b>Total Outside TSA</b>                                                                                               | <b>44-46</b>        |
| <b>Grand Total Inside &amp; Outside TSA</b>                                                                            | <b>655-675</b>      |

The first step in calculating the effects of proposed harvest changes on the local economy is to develop estimates of the number of jobs generated per thousand cubic metres of wood harvested. These employment coefficients, expressed as the ratio of employment to wood volume (i.e., PY/1000m<sup>3</sup>), are developed on the assumption that there is a linear relationship between forest sector employment and wood harvested which remains relatively constant over time. Once developed, the coefficients are used to evaluate the impacts of harvest changes in the Arrow TSA on total employment within the TSA and within the province as a whole.

The employment figures cited in the preceding sections are based on information collected from individual companies and contractors, and the Arrow Forest District office. They include all current employment created directly by the Arrow TSA harvest volume *within the TSA*, and exclude any employment created through the provision of goods and services for forest sector companies, or generated by employee expenditures for daily living.<sup>68</sup>

<sup>67</sup> Based on harvest volumes of 600 000 m<sup>3</sup> to 619 000 m<sup>3</sup>.

<sup>68</sup> Indirect and Induced employment and income are analyzed in Chapter 5.0 of this report.

In addition to employment created within the TSA, timber harvested from the Arrow TSA generates employment in other parts of the province. Again, we have used industry information to construct employment coefficients which capture these employment effects outside the TSA. To ensure the confidentiality of the individual companies which provided information, data from individual operators are aggregated by sector. Total estimated employment and coefficients are summarized in Table 4-6.

Note that no coefficient has been calculated for the Forest Service where employment is a function of government policy and budget decisions rather than wood volume. Therefore, throughout the analysis, Ministry of Forests employment is held constant and is not included in the coefficient and various impact tables.

| <b>Table 4-6: ARROW TSA DIRECT EMPLOYMENT AND COEFFICIENTS</b>                                                                                                                                                                                                                                                                                                               |                                    |                                                                 |                                                                  |                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                              | <b>TSA<br/>Employment<br/>(PY)</b> | <b>Total<br/>Provincial<br/>Employment<sup>1</sup><br/>(PY)</b> | <b>TSA<br/>Employment<br/>per unit<br/>(PY/000m<sup>3</sup>)</b> | <b>Provincial<br/>Employment<br/>per unit<br/>(PY/000m<sup>3</sup>)</b> |
| Harvesting <sup>2</sup>                                                                                                                                                                                                                                                                                                                                                      | 236                                | 236                                                             | .38                                                              | .38                                                                     |
| Processing <sup>3</sup>                                                                                                                                                                                                                                                                                                                                                      | 270                                | 304                                                             | .44                                                              | .49                                                                     |
| Silviculture <sup>4</sup>                                                                                                                                                                                                                                                                                                                                                    | 94                                 | 94                                                              | .15                                                              | .15                                                                     |
| <b>Total Harvest Dependent</b>                                                                                                                                                                                                                                                                                                                                               | <b>600</b>                         | <b>634</b>                                                      | <b>.97</b>                                                       | <b>1.02</b>                                                             |
| <b>Total Indirect &amp; Induced</b>                                                                                                                                                                                                                                                                                                                                          | <b>432</b>                         | <b>951</b>                                                      | <b>.70</b>                                                       | <b>1.54</b>                                                             |
| <b>Total Direct, Indirect &amp; Induced</b>                                                                                                                                                                                                                                                                                                                                  | <b>1 032</b>                       | <b>1 585</b>                                                    | <b>1.67</b>                                                      | <b>2.56</b>                                                             |
| Notes:                                                                                                                                                                                                                                                                                                                                                                       |                                    |                                                                 |                                                                  |                                                                         |
| 1. Provincial employment includes TSA employment. There will be some small discrepancies due to rounding. Note that these figures reflect harvest dependent employment, thus does not include Forest Service employment which is less responsive to the level of harvest. The Forest Service would add a further 27 PYs at the TSA level and 39 PYs at the provincial level. |                                    |                                                                 |                                                                  |                                                                         |
| 2. Harvesting includes permit development, logging, trucking and road construction & maintenance.                                                                                                                                                                                                                                                                            |                                    |                                                                 |                                                                  |                                                                         |
| 3. Processing includes sawmilling, pulp manufacture at the Celgar pulp mill and chip transport to Celgar.                                                                                                                                                                                                                                                                    |                                    |                                                                 |                                                                  |                                                                         |
| 4. Basic silviculture includes surveys, site preparation, planting, brushing & stand tending.                                                                                                                                                                                                                                                                                |                                    |                                                                 |                                                                  |                                                                         |

The employment estimates in Table 4-6 correspond with an average harvest level of 619 000 m<sup>3</sup> for the period 1986-1993. *For the reader comparing this table with Table 4-5, note that in Table 4-5, the employment estimates are provided as a range, while in Table 4-6 they are averages, for ease of computation.*

Table 4-6 indicates that wood harvested in the Arrow TSA generates approximately 600 PYs of direct forest sector employment annually, and an additional 34 PYs (primarily in processing) outside the TSA. The large share of processing jobs within the TSA is to be expected as most of the wood harvested in the TSA is processed there.

To estimate employment by category (i.e., harvesting, processing, etc.) the harvesting and processing coefficients are multiplied by the total volume of wood harvested in order to calculate direct harvest-dependent jobs. For example, average annual processing employment within the Arrow TSA for the period 1986 to 1991 is calculated by multiplying the coefficient 0.44 times 619 000 m<sup>3</sup>, and dividing by 1 000.<sup>69</sup> Note that only harvest-dependent employment is calculated as a function of wood volume, and that employment with the Ministry of Forests is held at a constant level throughout the forecast period. MoF employment can be added to harvest-dependent employment to arrive at total direct employment related to forestry.

Estimates of indirect and induced employment are calculated by applying a regional income multiplier to TSA direct income to determine jobs in other sectors within the TSA linked to TSA harvest. A provincial employment multiplier is applied to total direct employment to determine indirect and induced provincial impacts.<sup>70</sup>

While the foregoing employment coefficients have been estimated based on recent average wood volumes, several forces are at work which may change these coefficients over time. These include:

- A further trend toward labour-intensive harvesting practices such as more cable logging, smaller harvest blocks, more partial/selective logging, and more complicated harvesting permit development. This would increase employment per cubic metre of timber harvest.
- More silviculture expenditure per cubic metre of timber harvested. Silviculture expenditures per cubic metre of timber harvest are held constant over the forecast period for this analysis. To the extent that the Province's new Forest Renewal Plan leads to increased silviculture expenditures in the Arrow TSA, employment per cubic metre of harvest will increase.
- More value-added manufacturing. Rising wood costs in BC are encouraging more manufacturers to shift towards value-added manufacturing in order to get the greatest return on wood throughput. The extent of this trend in the Arrow TSA will be determined by markets and the ability of local mills to compete in new markets. More value-added manufacturing would increase processing employment per cubic metre harvested.
- Investment in labour saving processing equipment. This may be done by some mills in order to improve their cost competitiveness, especially in the face of increasing wood input costs. This would have the effect of reducing processing employment per cubic metre harvested.

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<sup>69</sup> There will be a lack of precision due to rounding.

<sup>70</sup> Indirect and induced employment are discussed in more detail in Chapter 5.0 and Appendix D.

- To the extent that the proportion of pulpwood to sawlogs increases at any given AAC, employment per cubic metre of harvest will decline. Close to 100 percent of the Arrow TSA harvest is sawlogs, and interviews with the District Forest Service and with industry revealed no meaningful way of estimating the extent to which this will change in future. The analysis in Chapter 5.0 is based on continuation of the status quo.

The new provincial Forest Renewal Plan which was announced in April 1994 may precipitate a rise in total forest sector employment, both directly as a result of more intensive silviculture and an industry-wide shift towards value-added production, and indirectly as a consequence of higher stumpage fees.

Finally, bear in mind that, if processing operations draw on alternative wood sources, the number of actual PYs of employment at mills will not necessarily be reduced, even though the number of PYs attributable to timber from the TSA is less. As a result, estimates of foregone employment and income may be overstated for those operations which derive their fibre from a number of suppliers. For example, the Celgar pulp mill relies on raw material supplies from both within and outside of the Arrow TSA. Approximately 5-10 percent of its chips originate within the TSA. Therefore, 5-10 percent of employment at the mill is attributed to timber cut within the Arrow TSA. The pulp mill has a capacity to acquire additional but more expensive chips from outside the TSA. In the event that a reduction occurs in the volume of chips available from within the TSA, Celgar will, where possible, substitute chips from elsewhere, including outside the TSA. As a result, the number of actual PYs of employment at the mill may not be reduced although the number of PYs attributable to timber from the TSA will decline.

#### **4.4 Average Employment Income**

In order to calculate total employment impacts related to changes in the Arrow harvest level, a series of representative average incomes by category of activity was developed based on information provided by the major licensees, selected harvesting contractors in the Arrow TSA, and the MoF District office.<sup>71</sup> Adjustments have been made, where necessary, to include cash benefits (e.g., vacation pay and paid statutory holidays). Table 4-7 summarizes the results.

The average incomes for harvesting and processing are calculated as weighted averages based on wood apportionment volumes to major licensees and SBFEP or woodlot operators.

Average pre-tax silviculture income, including cash benefits, is estimated at \$38 500. This is based on 1991 BC Census data for full-year, full-time work, and has been adjusted for inflation with the BC Consumer Price Index.<sup>72</sup>

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<sup>71</sup> This information was provided as either hourly or annual wages, pre-tax.

<sup>72</sup> Source: Statistics Canada (1993), Employment Income by Occupation - The Nation. 1991 Census. Catalogue 93-332.

The average annual pre-tax income for the MoF District and Regional offices is estimated at \$45 000 including cash benefits.

| <b>Table 4-7: AVERAGE ANNUAL PRE-TAX INCOME INCLUDING CASH BENEFITS (1993\$)</b> |          |
|----------------------------------------------------------------------------------|----------|
| Harvesting <sup>73</sup>                                                         | \$48 000 |
| Processing <sup>74</sup>                                                         | \$47 000 |
| Silviculture <sup>75</sup>                                                       | \$38 500 |
| Ministry of Forests <sup>76</sup>                                                | \$45 000 |

#### **4.5 Capital Investment and Other Expenditures in the Arrow Forest District**

The forest industry is a mainstay of the Arrow Forest District economy, and directly accounts for 45 percent of basic income in much of the area. Estimated forestry sector investment within the forest district between 1985 and 1992 was \$748 million, of which \$700 million was related to pulp mill modernization and \$48 million to sawmill upgrading. Although some of this expenditure benefitted equipment and material suppliers outside the forest district, a considerable number of construction jobs and employment income was also injected into the local economy. Not all of this investment can be linked to wood harvested in the TSA. However, to the extent that assurance of overall timber supply influences investment decisions, harvest levels in the TSA are a factor.

The past few years have been difficult for the forest sector (particularly pulp and paper) in BC and worldwide, however the market is now showing signs of improvement, and over the next business cycle more mill upgrades will take place, thereby injecting more capital investment into the study area. While capital investments in the study area of the same magnitude as the Celgar pulp mill expansion are unlikely, the potential for further sawmill or remanufacturing investment does exist.

In addition to direct employment (which includes harvest permit development, road construction, logging, trucking, processing, silviculture, and Forest Service staffing), the forest industry supports a sizeable service sector in the Arrow Forest District and adjacent districts through purchased goods and services (e.g., Nelson in the Kootenay Lake Forest District is a major service centre for the entire Region).

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<sup>73</sup> Source: major licensees, smaller operators

<sup>74</sup> Source: major licensees and smaller operators

<sup>75</sup> Source: selected silviculture contractors, MoF.

<sup>76</sup> Source: Ministry of Forests.



## 5.0 ECONOMIC DEVELOPMENT IMPACTS

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This chapter addresses the economic impacts of changing harvest levels in the Arrow TSA on jobs and employment income, both within the Arrow TSA and at the broader provincial level. Changes in the harvest level will obviously have a direct impact on forest industry employment and income. However, other sectors of the economy, notably tourism and recreation, will also be affected, even though it is difficult to quantify these impacts. Forest industry related impacts in the Arrow TSA and the province are discussed in Sections 5.1 and 5.2, while Section 5.3 discusses the implications of changes in harvest on other sectors of the local economy, tourism and recreation.

The analysis which focuses on the forestry sector is divided into three parts, addressing the following potential harvest forecasts:

- **Base harvest forecast<sup>77</sup>:** Under this scenario, an initial harvest level of 619 000 m<sup>3</sup> is maintained for the next six decades, then decreased by 10 percent in each of years 70, 80, and 90, and by 6.5 percent in year 100 to its long-term sustainable level of 422 000 m<sup>3</sup>. Overall, there is a 32 percent decline in the harvest level between years 0 and 100.
- **Case 1: the immediate impact of 15 percent decrease in the harvest; and**
- **Case 2: the immediate impact of a 15 percent increase in the harvest.**

The purpose of this analysis is to identify the major economic impacts related to future changes in the harvest level, and to estimate their magnitude as accurately as possible. However, bear in mind that the impacts quantified here are based on a set of assumptions and a specific methodological approach, which have limitations. The assumptions and methodology used in the analysis are discussed in more detail in Appendix D, which the reader is encouraged to review.

### 5.1 Base Harvest Forecast - Forestry Sector Economic Impacts

This section presents the results of the economic analysis for the TSA and province. While these estimates are based on the best available information, their precision is limited by the following:

- Quantitative results have been calculated for the forestry sector only. A significant change in the harvest level for the Arrow TSA could also affect the tourism and recreation sector. However, the employment and income effects in this sector are expected to be relatively small compared to those of the forestry sector, and are difficult to estimate. Impacts to tourism and recreation are therefore dealt with qualitatively.

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<sup>77</sup> *Arrow TSA Timber Supply Analysis*, Figure 14. Integrated Resource Branch, BC Ministry of Forests. March 1994 (Draft).

- "Lag effects" are not captured in the model. The presentation of results indicates that any employment impacts occur immediately in response to changes in the harvest level. While the harvesting sector will be affected immediately, repercussions in processing could be delayed as mills continue to operate on inventory. Clearly, delays would also occur in silviculture as replanting activity typically occurs one to two years after an area has been harvested.
- An inherent lag effect also occurs in indirect and induced spending by forestry sector companies and their workers. As spending levels adjust over a longer period of time, businesses respond accordingly, but how long this takes is unknown.
- "Threshold effects"<sup>78</sup> cannot be accounted for quantitatively. A harvest reduction may reduce timber throughput at a mill to the point where it effects a shift being laid off or total shutdown, as opposed to just the proportional loss of several processing jobs.
- Employment coefficients are based on the assumption that the current level of labour-intensity will hold over time, thus will remain constant over the forecast period. However, in light of ongoing technological changes, growth in other employment sectors, and new provincial initiatives (e.g., the Forest Renewal Plan) to add value to BC's wood harvest, these coefficients are unlikely to remain constant in the medium to long term.

The foregoing points are presented to remind the reader that the following results will capture general employment and income trends related to changes in the Arrow TSA harvest, however they should not be regarded as definitive.

### 5.1.1 TSA Employment and Employment Income Impacts

This section of the report evaluates the employment and employment income impacts generated within the Arrow TSA by the base timber harvest forecast. The results are summarized in Table 5-1.

*Direct* impacts refer to jobs and employment income generated by TSA wood within the forestry sector in the Arrow TSA. This includes harvesting, silviculture, processing and MoF jobs. *Indirect* impacts refer to jobs and employment income generated by the purchase of goods and services by forest companies. *Induced* impacts are created through the spending (and re-spending) of earnings by forest company employees. The indirect/induced employment and income estimates are based on a Basic Income Multiplier of 1.58 for the Castlegar-Arrow Lakes Area, as calculated

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<sup>78</sup> Threshold effects refer to the fact that processing mills have stepped levels of operating efficiency which tolerate a range of throughput before requiring reduction or increase in capacity. For example, a two shift operation may be justified based on throughput of 400 000 - 600 000 m<sup>3</sup> of wood with basically the same number of workers. If, however, wood supply drops below the minimum threshold level of 400 000 m<sup>3</sup>, then the whole shift and not just the ratio of workers to wood lost will be impacted. Similarly, if wood supply increases, more jobs will not necessarily result until the maximum threshold is exceeded. In other words, employment in processing is not a linear function related solely to wood supply.

by Horne and Robson (1994).

| <b>Table 5-1: ARROW TSA BASE HARVEST FORECAST</b><br><b>TSA Annual Forestry Related Employment</b><br><b>and Employment Income Impacts in TSA<sup>79</sup></b> |               |               |               |               |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>Years<sup>80</sup></b>                                                                                                                                      | <b>0</b>      | <b>70</b>     | <b>80</b>     | <b>90</b>     | <b>100</b>    |
| Harvest Volume (000s m <sup>3</sup> )                                                                                                                          | 619 000       | 557 100       | 501 390       | 451 257       | 422 000       |
| % Change From Year 0                                                                                                                                           | N/A           | -10           | -19           | -27           | -32           |
| <b>EMPLOYMENT (PYs)</b>                                                                                                                                        |               |               |               |               |               |
| Harvest Dependent:                                                                                                                                             |               |               |               |               |               |
| Harvesting                                                                                                                                                     | 236           | 212           | 191           | 172           | 161           |
| Processing                                                                                                                                                     | 270           | 243           | 219           | 197           | 184           |
| Silviculture                                                                                                                                                   | 94            | 84            | 76            | 69            | 64            |
| <b>Total Direct</b> <sup>81</sup>                                                                                                                              | <b>600</b>    | <b>539</b>    | <b>486</b>    | <b>438</b>    | <b>409</b>    |
| Indirect and Induced <sup>82</sup>                                                                                                                             | 432           | 388           | 350           | 315           | 294           |
| <b>Total Direct, Indirect &amp; Induced</b>                                                                                                                    | <b>1 032</b>  | <b>927</b>    | <b>836</b>    | <b>753</b>    | <b>703</b>    |
| <b>EMPLOYMENT INCOME (\$MILLION, AFTER TAX)</b>                                                                                                                |               |               |               |               |               |
| Direct After-Tax Employment Income                                                                                                                             | \$20.0        | \$18.0        | \$16.2        | \$14.6        | \$13.6        |
| Indirect and Induced <sup>83</sup>                                                                                                                             | \$11.6        | \$10.4        | \$9.4         | \$8.5         | \$7.9         |
| <b>Total</b>                                                                                                                                                   | <b>\$31.6</b> | <b>\$28.4</b> | <b>\$25.6</b> | <b>\$23.1</b> | <b>\$21.5</b> |

Note that employment impacts within the TSA are based on the location of employment as opposed to the residence of employees. These two are not always the same, particularly in the case of timber harvesting, transportation and silviculture where "transient" workers are commonly employed. Data limitations and variations from year to year do not allow workers who reside within the Arrow TSA to be distinguished from workers who migrate to the area for the duration of their work. However, while the estimates of Table 5-1 include both resident and non-resident

<sup>79</sup> See Appendix D for a discussion of the methodology used to calculate employment and income levels.

<sup>80</sup> Each year represents the start of the ensuing decade. (i.e., year 0 is the first year of decade 1)

<sup>81</sup> Processing, harvesting and silviculture employment is estimated by multiplying the coefficients of Table 4-6 by the appropriate harvest level.

<sup>82</sup> Indirect and induced employment is calculated by multiplying total direct income by a regional income multiplier of 1.58, then dividing the product by the appropriate average wage. For source and methodology of multipliers, see Appendix D.

<sup>83</sup> Assumes weighted average after-tax income of \$26 910.

workers, our survey of operators in the Arrow TSA disclosed that most employees reside within the Arrow TSA.

The following conclusions reflect the impact of the base harvest forecast on the TSA.

- Estimated harvest dependent forestry activity related to a harvest level of 619 000 m<sup>3</sup> generates approximately 600 PYs of direct employment, plus an additional 430 PYs of indirect and induced employment, for a total of approximately 1 030 PYs in the Arrow Forest District.
- Associated with the direct and indirect jobs is about \$30-\$35 million of after-tax employment income, of which about \$20 million is direct forest sector income.
- In year 70 of the forecast period, a 10 percent decline in the harvest level would incur a loss of about 60 direct forestry jobs, and \$2 million in related income. Further losses of employment and income would occur in years 80, 90 and 100 of the forecast period. Overall, a cumulative loss of about 190 PYs of direct forest sector employment, and \$6.4 million in employment income between years 0 and 100 can be ascribed to the harvest reductions of the base harvest forecast.
- During the same forecast period, a corresponding decline in total annual direct, indirect and induced employment from 1 079 PYs to 749 PYs would occur, which represents a total loss of 330 PYs. Total income would decline correspondingly by \$10.2 million.

### **5.1.2 Provincial Employment and Employment Income Impacts**

This section evaluates the potential impacts of the base harvest forecast on the provincial economy as a whole (including the TSA), in order to gain an understanding of the full magnitude of the impacts related to the potential harvest reductions.

Table 5-2 summarizes the estimated jobs and employment income associated with the forecast annual harvest levels occurring both inside and outside the Arrow TSA.

The methodology used to derive provincial impacts is essentially the same as that used to evaluate impacts at the TSA level, however indirect and induced employment and income are calculated using a provincial employment multiplier of 2.5 instead of the regional income multiplier discussed in Section 5.1.1.<sup>84</sup>

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<sup>84</sup> Source of multiplier: Ministry of Forests. See Appendix D.

| <b>Table 5-2: ARROW TSA BASE HARVEST FORECAST</b><br><b>Provincial Annual Forestry Related Employment</b><br><b>and Employment Income Impacts<sup>85</sup></b> |               |               |               |               |               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>Years<sup>86</sup></b>                                                                                                                                      | <b>0</b>      | <b>70</b>     | <b>80</b>     | <b>90</b>     | <b>100</b>    |
| Harvest Volume (000 m <sup>3</sup> )                                                                                                                           | 619 000       | 557 100       | 501 390       | 451 257       | 422 000       |
| % Change From Year 0                                                                                                                                           | N/A           | -10           | -19           | -27           | -32           |
| <b>EMPLOYMENT (PYs)</b>                                                                                                                                        |               |               |               |               |               |
| Harvest Dependent:                                                                                                                                             |               |               |               |               |               |
| Harvesting                                                                                                                                                     | 236           | 212           | 191           | 172           | 161           |
| Processing                                                                                                                                                     | 304           | 273           | 246           | 222           | 207           |
| Silviculture                                                                                                                                                   | 94            | 84            | 76            | 69            | 64            |
| <b>Total Direct</b>                                                                                                                                            | <b>634</b>    | <b>569</b>    | <b>513</b>    | <b>463</b>    | <b>432</b>    |
| Indirect and Induced                                                                                                                                           | 951           | 854           | 770           | 695           | 648           |
| <b>Direct, Indirect and Induced</b>                                                                                                                            | <b>1 585</b>  | <b>1 423</b>  | <b>1 283</b>  | <b>1 158</b>  | <b>1 080</b>  |
| <b>EMPLOYMENT INCOME (\$MILLION, AFTER TAX)</b>                                                                                                                |               |               |               |               |               |
| Direct After-Tax Employment Income                                                                                                                             | \$21.1        | \$19.0        | \$17.1        | \$15.3        | \$14.3        |
| Indirect and Induced                                                                                                                                           | \$25.5        | \$23.0        | \$20.7        | \$18.5        | \$17.3        |
| <b>Total</b>                                                                                                                                                   | <b>\$46.6</b> | <b>\$42.0</b> | <b>\$37.8</b> | <b>\$33.8</b> | <b>\$31.6</b> |

The following conclusions reflect the impact of the base harvest forecast on the province as a whole, including the TSA.

- As shown in Table 5-2, a TSA harvest of 619 000 m<sup>3</sup> would support 630 - 640 PYs of harvest dependent employment in the forestry sector, plus roughly an additional 950 PYs of indirect and induced employment in other sectors for a provincial total of 1 575 - 1 600 PYs. The estimated ratio of indirect/induced to direct forestry jobs (PYs) province-wide is 1.5. In other words, for every direct forest sector job, an additional 1.5 jobs are supported province-wide in other sectors.
- Associated with the direct and indirect/induced jobs is about \$47 million of after-tax employment income (including cash benefits), of which \$21 million would be direct forest sector income.
- As done previously at the TSA level, employment and income impacts in Table 5-2 are calculated on the assumption that all forest sector employment and income changes, with the exception of MoF staffing, occur in proportion to harvest changes. On this basis, jobs

<sup>85</sup> See Appendix D for a discussion of the methodology used to calculate employment and income levels.

<sup>86</sup> Each year represents the start of the ensuing decade (i.e., year 0 is the first year of decade 1).

and employment income related to the harvest in the Arrow TSA would remain unchanged over the next 69 years. In years 70, 80, 90 and 100, however, employment losses would occur. Over the entire forecast period, years 0 to 100, a total loss of approximately 200 PY's of direct forest sector employment in the province, and \$6.8 million in direct employment income would result.

- A loss of total direct, indirect and induced employment of approximately 500 PYs would occur during the forecast period, declining from 1 585 in year 0 to 1 080 in year 100.
- Associated with the foregoing decline in employment would be a cumulative loss of provincial after-tax employment income (including cash benefits) of \$15 million.

If the results of Tables 5-1 (TSA impacts) and 5-2 (provincial impacts) are compared, the reader will note that most direct forest sector jobs generated by timber from the Arrow TSA are within the TSA. All harvesting and silviculture jobs occur inside the TSA, as well as most of the processing jobs.<sup>87</sup> Moreover, industry sources confirm that most of the within-TSA jobs accrue to TSA residents.

## **5.2 Case 1 and 2 Harvest Forecasts - Forestry Economic Impacts**

The *Arrow TSA Timber Supply Analysis* report evaluates the sensitivity of the long-term harvest forecast to several variations in the assumptions used in the timber supply model. The objective of the base timber harvest forecast is to maintain the initial harvest of 619 000 for as long as possible, then adjust the harvest to the LTHL as gradually as possible. However, many other harvest flows are possible.

Impacts are evaluated for direct employment and income only, and exclude indirect and induced impacts resulting from Cases 1 and 2. Consequently, the following results may be regarded as conservative.

### **5.2.1 Comparison of Case 1 with Base Harvest Forecast**

At present, District Forest Service staff are having difficulty finding areas to harvest for a variety of reasons, the most important of which are discussed in Critical Factors (Chapter 3.0). Consequently, the initial harvest level of the Arrow base harvest forecast may not be achievable.

The timber supply analysis indicates that the base harvest forecast with an initial harvest level of 619 000 m<sup>3</sup> per year can be maintained for seven decades before declining by 10 percent per

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<sup>87</sup> As discussed earlier, about 85% of timber harvested in the Arrow TSA remains inside the TSA for processing.

decade to a sustainable long-term level.<sup>88</sup> One of the sensitivities modeled in the *Arrow TSA Timber Supply Analysis* is that of a 15 percent lower initial harvest level. Under this scenario, Case 1, an initial harvest of 526 150 m<sup>3</sup> could be sustained for 16 decades before declining to the long-term level of 422 000 m<sup>3</sup>.

The following conclusions reflect the impact of Case 1 on the TSA and the province as a whole.

### TSA

- In year 0 of the forecast period, 510 PYs of employment and \$17.0 million in income would be generated under Case 1, compared to 600 PYs and \$20.0 million in the base harvest forecast. An initial loss of 90 PYs of direct employment and \$3 million in employment income results in Case 1 as compared to the base harvest forecast .
- The lower initial harvest level of Case 1 would generate less annual TSA employment and employment income in the forest sector until year 80 of the forecast period. Starting in year 80, however, a reversal would occur. Specifically, more annual jobs and income would be associated with Case 1 than the base harvest forecast, continuing until decade 16 when the harvest forecast of Case 1 would decline to the long term level of 422 000 m<sup>3</sup>.
- To summarize, a 15 percent lower initial harvest rate than the base harvest forecast would incur more dramatic job losses up front. However, this level of employment and income could be sustained for a longer time before a harvest level decline to the long-term sustainable level.

### Provincial

- At the provincial level, a lower level of employment and income associated with Case 1 would also result initially. In year 0, 539 PYs and \$17.9 million respectively of employment and income would be generated under Case 1, compared to 634 PYs and \$21.1 million under the base harvest forecast. Overall, an initial annual loss of 95 PYs and \$3.2 million would result.
- As in the case of TSA-level employment and income, the greatest losses in Case 1 would be incurred in year 0 of the forecast period, after which employment and income levels would be sustained until year 80. After year 80, employment and income under Case 1 would exceed that supported by the base harvest forecast.

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<sup>88</sup> *Arrow TSA Timber Supply Analysis*, Integrated Resources Branch, Ministry of Forests, March 1994 (Draft).

### 5.2.2 Comparison of Case 2 with Base Harvest Forecast

Based on sensitivity analyses in the Ministry of Forest's *Arrow TSA Timber Supply Analysis*, it may be possible to maintain an initial rate 15 percent higher than the base harvest forecast rate of 619 000 m<sup>3</sup> per year. The case 2 harvest then could be maintained for four decades before beginning its decline to the long-term sustainable level of 422 000 m<sup>3</sup>.<sup>89</sup> The key economic results, compared to those of the base harvest forecast, are as follows:

#### TSA

- In year 0, Case 2 would generate 690 PYs of annual direct forest sector employment, and \$23.9 million in employment income, representing an increase of 90 PYs of annual employment and \$3.1 million as compared to the base harvest forecast in year 0.
- Unlike Case 1, the harvest level of Case 2 could not be sustained for more than 3 decades. By the fourth decade, the harvest rate would have to begin to decline, and would reach the long term level of 422 000 m<sup>3</sup> by year 80. Consequently, forest sector employment and income would drop off correspondingly.
- Comparing Case 2 with the base harvest forecast, the initial employment and income gain associated with a 15 percent initial increase in harvest would be eroded starting in decade 4. By year 70, the employment and income generated by the base harvest forecast, however, would exceed that of Case 2.

#### Province

- At the provincial level, a 15 percent initial increase in the harvest level would generate 729 PYs and \$24.4 million, compared to 634 and \$21.1 million in the base harvest forecast, representing an initial gain of 95 PYs and \$3.3 million under Case 2.
- The trend at the provincial level would match that of the TSA level results: employment and income gains in year 0 of the forecast period, sustained for three decades, and a subsequent relatively rapid decline until year 70 when the base harvest forecast results exceed those of Case 2.

### 5.3 Other Economic Sectors

The economic development implications in non-forestry sectors arising from different Arrow TSA harvest levels would be limited in most cases, with the exceptions of tourism related to outdoor recreation and agroforestry and wildcrafts. The following section briefly assesses the possible

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<sup>89</sup> Op.cit.

effect the base harvest forecast and variations on this forecast (i.e., Case 1 and 2) may have on these other sectors.

### **5.3.1 Mining**

Activities in mining are relatively unrelated to forestry activities. The only exception is in the mineral exploration stage, when access provided by logging roads into remote areas, can reduce the cost and facilitate prospecting. In the case of the Arrow TSA, an extensive network of logging roads already exists, thus any extra benefit is minimized. Furthermore, forestry activities do not generally preclude mineral exploration and production. For these reasons, no costs or benefits to mining are perceived to result from the base harvest forecast, Case 1, or Case 2.

### **5.3.2 Outdoor Recreation/Tourism**

In assessing the implications of harvest changes in the outdoor recreation/tourism sector, several governing factors are important, namely:

- estimated current and future usage and the activities affected;
- winter versus summer impacts; and,
- distinction between backcountry and forecountry areas.

Depending on the activity affected and time of year, the potential for conflict with logging activities varies. For example, local operators report that winter-based activities, such as snowmobiling and heli-skiing, are much less sensitive to logging and derive some benefits from forestry-related activities. Logging roads provide access into various areas for snowmobilers, and logging can provide open areas for skiing.

The majority of summer activities, including touring, sightseeing and boating, are also relatively unaffected by harvesting, much of which tends to be remote from these activities. As well, the Ministry of Forests' Visual Quality Objectives (VQO) guidelines are designed to protect view corridors in forecountry areas. This conclusion is supported by local tourism/recreation providers who report no major problems resulting from current activities.

Only a small portion of the total tourism market in the TSA is directly affected by harvest levels. The most sensitive outdoor activities are backcountry hiking and wilderness excursions that rely on pristine nature experiences. Although impacts on these activities depend more on location than harvest level, the rate of harvest does have a potential effect in that undisturbed areas will face greater harvesting pressures, as a result of adjacency regulations in previously harvested watersheds. Unfortunately, many of these areas are also the most desirable for wilderness excursions.

Although the number of summer wilderness tourists (which is the most directly affected group) is relatively small compared to other tourism sectors, the economic return, in terms of jobs,

employment income and expenditures that they bring is quite large. This group is almost exclusively made up of foreigners who are willing to pay large sums to partake in guided wilderness experiences. In contrast, tourists and recreational users who are only marginally affected (i.e., some visual impact) or who derive benefit from logging road access (i.e., snowmobilers, casual hikers) constitute the majority of users but contribute little financially in terms of their expenditures, and generally do not use the services of tourism operators.

Outdoor recreation activities infuse both direct and indirect employment and income into the local economy. However, due to a lack of empirical data and detailed research, the precise linkages between forestry activity and the tourism/recreation sector are unknown. Consequently, a detailed quantitative assessment is not possible given the scope of this study. Nevertheless, it is still possible to make some useful qualitative observations.

Under the base harvest forecast, the annual harvest level would be approximately the same as today for the first six decades. A number of tourism operators reported no major problems resulting from current activities, others, especially in the Slokan Valley and involved in promoting ecotourism, perceive both the rate of harvest and current management practices as detrimental to their business. Furthermore, the potential for future conflict exists as areas that were previously undisturbed start to be logged. One such example, if it is not designated as a PAS study area, may be the Hamling-Poplar area, which has moderate to high recreation values and supports all-season recreation use for heli-skiing, hiking, hunting and fishing.

As a result, the base harvest forecast is likely to disrupt some outdoor recreation tourism within the TSA. Whether this activity is lost to the TSA (and possibly the province) depends on the availability of alternative areas nearby. Some of this potential loss may be offset by benefits to other outdoor recreation tourists as a result of improved access afforded by new logging roads. However, as the TSA already has an extensive network of logging roads, this benefit is likely minimal.

Therefore, on the whole, the base harvest forecast would likely have a neutral to a somewhat negative impact on the tourism sector. A lower initial harvest as illustrated by Case 1 would likely have a more positive impact, whereas a higher initial harvest as shown with Case 2 would probably have a negative impact.

### **5.3.3 Construction**

As discussed in Chapter 4, construction related to investment and upgrading of timber processing facilities cannot be directly linked with TSA harvest levels, and has more to do with government policy changes, market forces, and investment climate. Indirectly, assurance of timber supply undoubtedly influences investment decisions, but the degree to which it does varies by licensee. Therefore, quantifying the impact of changes in timber supply from the TSA is meaningless unless put in context of the overall provincial, and possibly world-wide timber supply situation.

Knowing that timber is in short supply throughout the Pacific Northwest might suggest that a higher harvest level would be beneficial. However, this conclusion does not take two important factors into account. First, mills in the TSA or other parts of the province may not be operating at full capacity and could absorb additional wood volume without the need to expand or upgrade their physical infrastructure. Second, large investment decisions, such as expanding and upgrading the Celgar pulp mill, are based on long-term industry prospects so that the investment can be amortized over many years. Predicting how many years of steady production are needed to justify major investments will vary by company, thus cannot be estimated.

#### **5.3.4 Agriculture**

The only agricultural activity with direct links to the forest sector is livestock grazing. As described in Chapter 2, grazing activities in the TSA are not as extensive as other TSAs because the terrain is less suitable (i.e., the Arrow has fewer sub-alpine areas) for these activities. Nevertheless, the Ministry of Forests presently grants six range permits within the TSA.

Based on current management practices, grazing activities can be assumed to continue at a similar level as today. Therefore, the base harvest forecast should have no effect either positive or negative on livestock grazing.

If harvest levels initially were lower as in Case 1, grazing opportunities may be reduced, depending on where harvest reductions took place. However, ensuing implications in terms of jobs and employment income cannot be assumed as many other factors could intervene. For example, more grazing could be focused on privately-owned lands. Alternatively, ranchers could supplement grazing fodder with feed.

Conversely, a higher initial harvest as illustrated by Case 2 may result in some additional grazing opportunities, depending on where increased harvesting occurs. However, job and employment income gains again cannot be assumed. For example, the number of additional livestock supported may not justify more ranch hands.

Regardless, given that the amount of grazing activity supported in the TSA is small, the effect of changes in timber harvest levels on the agriculture sector is likely minimal.

#### **5.3.5 Agroforestry and Wildcrafts**

Agroforestry and wildcrafts are highly sensitive to forestry activities given that they rely directly on the same resource base. As an emerging sector, many of the opportunities within this sector and data in terms of jobs and employment income and resource requirements are as yet unknown.

The most developed commercial activity to date is pine mushroom harvesting. As described in Chapter 2, mushroom harvesting relies heavily on access to lands in the TSA, with 85 percent of the 1993 harvest attributed to this area. Current management practices do not include integrated

resource management requirements for mushroom growing, thus leaving this resource unprotected.

Given that areas of undisturbed old growth best suited for mushroom growing may have fewer restrictions for logging, such as adjacency constraints, these areas may be the focus of more immediate and extensive logging under the base harvest forecast and even more so with Case 2. As a result, both harvest forecasts, but especially Case 2, would likely be detrimental to the mushroom industry. However, the extent of this impact cannot be estimated as the potential for substitute areas to mitigate impacts, for example, is unknown. Conversely, a lower initial harvest level, in so far as it may better preserve old growth, would be more positive. As this agro-forestry industry is in its infancy, estimates of jobs and employment income impacts are impossible because of insufficient information.

The reader should note that the implications of harvest changes on mushroom harvesting may or may not reflect impacts on other agroforestry and wildcraft activities.

## **6.0 GOVERNMENT REVENUE IMPACTS**

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Government revenues are another important economic impact resulting from forestry activity. This chapter focuses on the provincial and federal government revenue impacts related to the base harvest forecast of the Arrow TSA.

### **6.1 Forest Sector**

Changes in the Arrow TSA harvest level will directly affect government revenues through impacts on resource use and resource-related tax revenues, as well as through changes in personal income tax revenue. The principal resource-related impacts would be on the forestry sector, since tourism impacts (e.g. user and license fees) would be relatively small, and no significant change to the mining industry is anticipated.

Government revenue attributable to timber harvested from the Arrow TSA has both a provincial and a federal component, as Table 6-1 illustrates. Forest industry taxes at the provincial level include stumpage and rents, as well as corporate income tax, logging, sales, property and electricity taxes. At the federal level they include corporate income tax, and excise and withholding taxes.

| <b>Table 6-1: PROVINCIAL AND FEDERAL GOVERNMENT REVENUE<br/>FROM ARROW TSA (Million 1993 \$)<sup>1</sup></b>                                    |               |               |               |               |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>Years<sup>2</sup></b>                                                                                                                        | <b>0</b>      | <b>70</b>     | <b>80</b>     | <b>90</b>     | <b>100</b>    |
| Harvest Volume ('000 m <sup>3</sup> )                                                                                                           | 619 000       | 557 100       | 501 390       | 451 257       | 422 000       |
| % Change From Year 0                                                                                                                            | N/A           | -10           | -19           | -27           | -32           |
| <b>PROVINCIAL REVENUE</b>                                                                                                                       |               |               |               |               |               |
| Forest Industry tax                                                                                                                             |               |               |               |               |               |
| - Stumpage and rent                                                                                                                             | \$5.5         | \$5.0         | \$4.5         | \$4.0         | \$3.8         |
| - Other <sup>3</sup>                                                                                                                            | \$3.8         | \$3.4         | \$3.1         | \$2.8         | \$2.6         |
| <b>Total</b>                                                                                                                                    | <b>\$9.3</b>  | <b>\$8.4</b>  | <b>\$7.6</b>  | <b>\$6.8</b>  | <b>\$6.3</b>  |
| Personal income tax <sup>4</sup>                                                                                                                |               |               |               |               |               |
| - Direct                                                                                                                                        | \$2.5         | \$2.3         | \$2.0         | \$1.8         | \$1.7         |
| - Indirect                                                                                                                                      | \$2.7         | \$2.4         | \$2.2         | \$2.0         | \$1.8         |
| <b>Total</b>                                                                                                                                    | <b>\$5.2</b>  | <b>\$4.7</b>  | <b>\$4.2</b>  | <b>\$3.8</b>  | <b>\$3.5</b>  |
| <b>TOTAL PROVINCIAL</b>                                                                                                                         | <b>\$14.5</b> | <b>\$13.1</b> | <b>\$11.8</b> | <b>\$10.6</b> | <b>\$9.8</b>  |
| <b>FEDERAL GOVERNMENT REVENUE</b>                                                                                                               |               |               |               |               |               |
| Forest Industry tax <sup>5</sup>                                                                                                                | \$1.1         | \$1.0         | \$0.9         | \$0.8         | \$0.7         |
| Personal income tax                                                                                                                             |               |               |               |               |               |
| - Direct                                                                                                                                        | \$5.1         | \$4.6         | \$4.1         | \$3.7         | \$3.5         |
| - Indirect                                                                                                                                      | \$5.5         | \$5.0         | \$4.5         | \$4.1         | \$3.8         |
| <b>Total</b>                                                                                                                                    | <b>\$10.6</b> | <b>\$9.6</b>  | <b>\$8.6</b>  | <b>\$7.8</b>  | <b>\$7.3</b>  |
| <b>TOTAL FEDERAL</b>                                                                                                                            | <b>\$11.7</b> | <b>\$10.6</b> | <b>\$9.5</b>  | <b>\$9.0</b>  | <b>\$8.0</b>  |
| <b>TOTAL PROVINCIAL &amp;<br/>FEDERAL REVENUE</b>                                                                                               | <b>\$26.2</b> | <b>\$24.2</b> | <b>\$21.3</b> | <b>\$19.8</b> | <b>\$17.8</b> |
| <b>Notes:</b>                                                                                                                                   |               |               |               |               |               |
| 1. Totals may not add up due to rounding. The figures do not include Forest Service contributions to provincial and federal income tax revenue. |               |               |               |               |               |
| 2. Each year represents the first in the ensuing decade (i.e., year 0 is the first year of decade 1).                                           |               |               |               |               |               |
| 3. Includes corporate income tax, logging, sales, property, and electricity taxes.                                                              |               |               |               |               |               |
| 4. From direct and indirect forest sector employment as shown in Table 5-2.                                                                     |               |               |               |               |               |
| 5. Includes corporate income tax, excise & withholding taxes.                                                                                   |               |               |               |               |               |

### 6.1.1 Forest Industry Taxes

The forest industry tax revenues in Table 6-1 are calculated by applying tax coefficients, in dollars per cubic metre of harvest, to the different harvest levels of the forecast period.<sup>90</sup> The tax

<sup>90</sup> Source: *The Economic Impacts of Timber Harvesting in BC*, Economics and Trade Branch, Ministry of Forests, 1994. Also, unpublished information from Ministry of Forests.

coefficients, which are averages derived from provincial revenue and harvest information, are provided in Table 6-2.<sup>91</sup>

| <b>Table 6-2: BC AVERAGE FOREST INDUSTRY TAX REVENUES<sup>92</sup> (1993\$/m<sup>3</sup>)</b> |              |
|-----------------------------------------------------------------------------------------------|--------------|
| <b>Provincial Revenue</b>                                                                     |              |
| Stumpage                                                                                      | \$8.7        |
| Rents                                                                                         | \$0.5        |
| <b>Subtotal</b>                                                                               | <b>\$9.2</b> |
| Provincial corporate income tax, logging, sales, property, & electricity taxes                | \$6.1        |
| <b>Federal Revenue</b>                                                                        |              |
| Federal corporate income tax plus excise and withholding taxes                                | \$1.7        |

The methodology used to calculate these tax coefficients is discussed in Appendix D.

On average over the period 1989/90 to 1993/94, approximately \$9.2 per m<sup>3</sup> was generated annually in stumpage and rent revenues in BC. Stumpage clearly made up the largest share of this. "Other" provincial taxes amounted to \$6.1 per m<sup>3</sup> during the same period, while federal government tax revenues were \$1.7 per m<sup>3</sup>.

Referring back to Table 6-1, forest sector activity in the Arrow TSA related to the base harvest forecast would generate \$9.3 million annually in forest industry tax revenue starting in year 0. This would decline to \$8.4 million annually starting in year 70, with further losses of revenue taking place in years 80, 90 and 100. Overall, a total loss of forest industry tax revenue amounting to \$3.0 million annually would occur under the base harvest forecast between years 0 and 100.

Federal forest industry taxes are relatively small compared to provincial taxes, by forest activity related to the base harvest level. In year 0 of the forecast period, \$1.1 million in annual federal taxes would be generated, declining to \$1.0 million in year 70, and to \$700 000 by year 100.

It should be noted that the coefficient for stumpage revenue in Table 6-2 does not include ramifications of the Forest Renewal Plan. As a result of the Plan, a significant province-wide increase in stumpage revenue is expected. The increase in any particular TSA will be determined by the grades of timber harvested there. Based on information obtained from the Council Of Forest Industries (COFI), the Interior base rate will increase by 87 percent from \$17.19/m<sup>3</sup> to \$32.19/m<sup>3</sup> while stumpage rates for minimums and Grades 3,4, 5, and 6 will remain at \$0.25/m<sup>3</sup> in the Interior. Assuming that stumpage on 80 percent of harvested volumes in the Arrow TSA will

<sup>91</sup> See Appendix D for methodology.

<sup>92</sup> Assumptions in Appendix D.

increase by 87 percent and that stumpage on the remaining 20 percent will remain unchanged, this means an average increase in stumpage for the TSA of 70 percent (i.e., 80 percent of 87 percent).

### **6.1.2 Personal Income Tax**

Provincial and federal personal income tax is another important component of government revenue induced by the forest sector in the Arrow TSA. For this analysis, the personal income tax component of direct and indirect/induced provincial employment income related to Arrow TSA forest activity was estimated. This was based on estimated total pre-tax employment income by sector (i.e., harvesting, processing, silviculture, Min. of Forests, and indirect/induced), and the following tax rates:

- Forest sector personal income tax rate: 26 percent
- Other sectors personal income tax rate: 24 percent

The provincial share of personal income tax revenue is estimated to be 33 percent, with the residual accruing to federal tax revenue.

The results of Tables 6-1 indicate that total provincial income tax generated directly and indirectly by harvesting in the Arrow TSA would be \$5.2 million in year 0 of the forecast period, declining to \$3.5 million by year 100. Federal income tax would be significantly more, starting out at \$10.6 million, and declining to \$7.3 million by year 100. Overall, there would be a loss of \$1.7 million annually in provincial income tax revenue between years 0 and 100, and \$3.3 million in federal government revenue. The reader should note that these estimates may be somewhat high, as labour freed up in the Arrow TSA would, to some degree (albeit unknown), be employed in other sectors, thereby generating some offsetting tax revenue.

### **6.1.3 Total Government Revenues**

At a harvest level of 619 000 m<sup>3</sup> per year, the forest sector would generate total tax revenues of about \$26.2 million per year, of which \$14.5 million would be provincial and the remaining \$11.7 million federal. Of the provincial revenue, stumpage accounts for the largest share at \$5.5 million. Other provincial forest industry taxes contribute almost \$4 million per year, while provincial income tax contributes \$5.2 million per year. Just under half of this comes from direct forest sector employment.

Of the total \$11.7 million in federal revenue, \$10.6 million comes from personal income tax and only about \$1 million comes from forest industry taxes. Again, just under half of the federal personal income tax comes from direct forest sector employment.

Over the forecast period from year 0 to year 100, provincial tax revenue would decline by \$4.7 million annually while federal taxes would decrease by \$3.7 million. In total, it is predicted that the reduction in harvest levels in the Arrow TSA associated with the base harvest forecast would

incur a loss of \$8.4 million annually over the period from year 0 to 100.

| <b>Table 6-3: TOTAL GOVERNMENT REVENUE FROM THE ARROW TSA</b><br>(million 1993\$) |               |               |               |               |               |
|-----------------------------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|
| <b>Years</b>                                                                      | <b>0</b>      | <b>70</b>     | <b>80</b>     | <b>90</b>     | <b>100</b>    |
| Harvest Volume ('000 m <sup>3</sup> )                                             | 619 000       | 557 100       | 501 390       | 451 257       | 422 000       |
| % Change From Year 0                                                              | N/A           | -10           | -19           | -27           | -32           |
| Provincial                                                                        | \$14.5        | \$13.1        | \$11.8        | \$10.6        | \$9.8         |
| Federal                                                                           | \$11.7        | \$10.6        | \$9.5         | \$8.6         | \$8.0         |
| <b>Total</b>                                                                      | <b>\$26.2</b> | <b>\$23.7</b> | <b>\$21.3</b> | <b>\$19.2</b> | <b>\$17.8</b> |



This chapter addresses the community and First Nations concerns associated with potential future harvest levels.

### 7.1 Implications for Communities

From a community perspective, only the short term social and economic implications of timber harvest forecasts can be meaningfully assessed. In the longer term, community character is likely to be quite different as a result of technological change, economic restructuring and population change. As a result, predicting longer term implications associated with forestry job losses or gains, for example fifty years from now, would be conjecture. Consequently, discussion in this section is short as a result of the base harvest forecast's maintenance of the current harvest level over the medium term. Only Case 1 presents a situation in which immediate impacts would affect the community.

#### 7.1.1 Base Harvest Forecast

Assuming that employment coefficients remain constant, or that changes in coefficients by category are at least offsetting, the base harvest forecast would provide job stability and continued employment at approximately the same level as today over the next 69 years. This stability would be welcome from a community standpoint given the local economy's dependence on the forestry sector (except for Rossland and Trail), present uncertainty in the mining sector, and the already high proportion of the working age population who are unemployed.

Stable forestry sector employment would provide a much needed base for future economic development, including increased value-added manufacturing of forest products and economic diversification. The long duration of this stable base is also important as time will be required to identify and develop another economic activity that can drive the local economy, and generate economic benefits and community prosperity comparable to those derived from forestry.

By maintaining a stable forest sector job base, the community may also avoid, or at least mitigate, a new wave of population loss as well as economic and social stress attendant with job losses. Although the benefits of stable employment would be felt most by workers in the forest industry and their families, communities as a whole would also benefit. Businesses and services who depend on the forest industry or expenditures from forestry worker families would profit from this stability. A stable population would also help maintain property values and a solid tax base.

At the same time, the base harvest forecast could have negative implications, both in terms of current management practices and continuing the rate of harvest at the present level, for the development of the emerging mushroom industry, and possibly other agroforestry/ wildcrafts, as

well as subsistence activities which are an important income supplement for many residents. Some areas used for outdoor recreation by local residents are also likely to be affected, although alternative locations within the TSA should be available. In addition, if more harvesting than in the past is focused on VQO and Class 1 and 2 watershed zones, more public concerns and conflicts would also likely arise.

### 7.1.2 Alternative Initial Harvest Forecasts

Section 5-2 estimated 90 direct job losses in the forest sector as a result of a 15 percent lower initial TSA harvest. This loss represents about 5 percent of total forest sector employment<sup>93</sup> in the forest district. As families of those affected would also be impacted, the number of people affected may total about 225 persons<sup>94</sup>, or 0.5 percent of the total area population.<sup>95</sup>

Although this percentage may seem low, it must be seen in the context of the already high proportion of unemployment/social assistance and potential further job losses in the mining sector. Moreover, the loss of forestry sector jobs represents a loss of relatively high paying, full time jobs that are unlikely to be replaced with comparable paying positions in other sectors. These factors combined could result in population loss and additional economic stress. Social stress associated with job loss may also become a factor as displaced workers attempt to cope with job loss and find new sources of livelihood. These social stresses, such as diminished self-esteem, depression, the potential of increased substance abuse, and stress related diseases may also affect the remainder of the family, thus broadening the social implications of employment loss.

Positive implications of an initially lower harvest could include benefits for agroforestry/wildcrafts and subsistence activities, recreation, visual aesthetics and water quality.

Conversely, if the initial TSA harvest level was 15 percent higher, the community would immediately gain some additional employment or increased income for existing workers, depending on whether the increase in harvest levels translated into new job positions or merely overtime work. As estimated in section 5-2, 90 potential direct jobs would be created. About 225 persons in the community could be positively affected, when families of those affected are taken in to account, which represents less than one percent of the total area population.

Notwithstanding the small percentage of the population positively affected, the advantage of this short term gain would be the potential relief brought to those currently unemployed, as well as a significant period (40 years) of stable forestry employment on which to base economic

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<sup>93</sup> Includes employment attributable to TSA, TFL#3, TFL#23, private sources and wood derived from outside the district.

<sup>94</sup> Based on an average household size of 2.5 persons in the Arrow District according to the 1991 census.

<sup>95</sup> Refer to Table 2-1.

diversification efforts. This economic gain would also help ensure population stability in the TSA. These immediate benefits, however, would be at the expense of an earlier reduction in harvest to reach the long term level, together with associated job losses at that time. Negative implications of an initially higher harvest could include impacts on agroforestry/wildcrafts and subsistence activities, recreation, visual aesthetics and water quality.

### **7.3 First Nation Concerns**

As noted in Chapter 2, no First Nation Reserves are situated in the Arrow TSA. Moreover, no direct activity by a tribal council or band in the forest sector has been identified. The only known issue, therefore, is that of the land claim.



## **8.0 ENVIRONMENTAL IMPLICATIONS**

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### **8.1 Environmental Implications**

Although current management practices already include provisions to protect critical environmental features of the TSA, specifically deer and caribou winter range, riparian habitats, visually sensitive areas and Class 1 and 2 watersheds, a number of concerns, as outlined in Section 2.8 and 3.3, have not been fully addressed. These concerns include additional protection for old growth values, cavity trees and coarse woody debris, ecosystems networks, riparian areas, wildlife winter range as well as unique or limited habitats. Although these concerns are common to all of the harvest forecasts, the rate of harvest may accentuate or diminish these concerns, as well as affect both the age distribution of the forest and harvest distribution, that in turn could affect forest attribute dependent species.

### **8.2 Implications of Timber Harvest Forecasts**

In addition to the above concerns, the officials at the Ministry of Environment have expressed concern that the base harvest forecast could negatively affect both early and old growth stages of seral distribution, in effect narrowing the forest age class distribution. The location and intensity of harvesting activities in specific areas is also a concern. Other concerns include the possible liquidation of low elevation old growth, harvesting in high elevation special habitats, and possible greater focus on special management zones, particularly watersheds, as a result of constraints on other areas.

The cumulative effect of forest harvesting in combination with expanding settlement areas and outdoor recreation demand will also undoubtedly place increasing pressure on the TSA's natural resources. On this basis, the base harvest forecast could have negative implications in terms of biodiversity, wildlife and fisheries values as well as water quality, and result in increasing environmental conflicts.

A lower initial harvest forecast, as illustrated by Case 1, could have positive benefits by reducing harvesting pressure on the remaining mature forest stands within the TSA. A reduced harvest level may result in a broader range of forest stand ages being maintained, and reduced concerns over water quality. This would particularly benefit species dependent on old growth values, riparian areas, cavity trees and coarse woody debris.

Conversely, Case 2, which illustrates a higher initial harvest, would result in greater concern about seral and harvest distribution and its affect on old growth dependent species, cavity nesters and riparian dependent species. Additional harvesting in watershed areas would also result in water quality concerns and increased potential for environmental conflict. On the other hand, wildlife species that can better adapt to a wide range of forest types, and species that prefer early

successional forest types, may increase. However, most of these species are not of significant management concern.

## 9.0 SUMMARY OF RESULTS

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The purpose of this study was to assess the impacts of harvest volume changes in the Arrow TSA in terms of forestry related jobs, employment income, government revenue, economic impacts in other sectors (e.g., tourism and recreation), and community, environmental and First Nations concerns.

The assessment was done by analyzing the impacts of maintaining the harvest at its current level of 619 000 cubic metres for the next 69 years, and then gradually scaling the harvest down to a long term harvest level of 422 000 cubic metres. In addition, the implications of an immediate 15 percent decrease and increase in the initial harvest level were also evaluated. These levels were obtained from the Ministry of Forests *Arrow TSA Timber Supply Analysis* and were intended to illustrate sensitivities to changes in harvesting levels. None of the forecasts, however, are intended to represent preferred harvest levels.

### 9.1 TSA Impacts

Table 9-1 summarizes the TSA impacts of the forecasts. By continuing the harvest levels at 619 000 m<sup>3</sup> per year, the base harvest level would initially maintain employment at current levels. Direct forest sector employment attributable to timber harvested in the Arrow TSA totals approximately 600 PY's per annum, resulting in approximately \$20 million in direct after tax employment income. It also supports another 430-450 PY's of employment and \$12 million in after tax employment income from other sectors.

In the long term (i.e., 70 to 100 years), harvest levels in the base harvest forecast would decline to reach a long term level of 422 000 m<sup>3</sup>, with corresponding losses in jobs and employment income. Over the period between years 0 and 100, a total of approximately 330 PY's would be lost, of which 190-200 PY's would be direct forest sector jobs. Associated with this is a cumulative total loss of \$10.2 million in after tax employment income (\$6.4 million in the forest sector).

These losses have been estimated based on the assumption that all forest sector employment changes, with the exception of MoF staffing, occur in fixed proportion to harvest changes, and that the economic multiplier remains constant over the forecast period. However, it is important to observe that in the processing sector certain unforeseeable threshold effects may occur which are not captured in the assumption of a linear relationship between harvest and employment. In addition, the employment coefficients themselves may change over time. Consequently, any future change in harvest levels may not necessarily result in proportional changes in jobs and employment income.

A 15 percent decline in the initial harvest level from 619 000 m<sup>3</sup> to 526 150 m<sup>3</sup> would result in the loss of approximately 90 PY's annually of direct forestry employment and \$3 million in direct

employment income. Under Case 1, an initial harvest of 526 150 m<sup>3</sup> could be sustained for 16 decades before declining to the long-term harvest level of 422 000 m<sup>3</sup>. Thus, while job losses would occur in the initial decade, the forecast does provide stability for the remainder of the forecast period.

A 15 percent increase in the initial harvest level from 619 000 m<sup>3</sup> to 711 850 m<sup>3</sup> could only be sustained for four decades before beginning its decline to the long-term harvest level of 422 000 m<sup>3</sup>. There would be a corresponding initial increase of 90 PY's of direct employment and \$3 million in direct employment income. However, this gain in employment would begin to disappear in decade 4, and would be less than supported by the base harvest by year 70.

Other sectors of the economy, with the exception of tourism, would not likely be severely affected by the change in the level of harvest. Tourism/recreation use for certain activities and in specific locations may be negatively impacted, but the number of affected participants would be relatively small, compared to the total tourism market.<sup>96</sup> In addition, any losses are expected to be offset by increases in other activities that benefit from accessibility provided by logging roads. Therefore, jobs and employment income related to tourism/recreation are expected to remain at their current levels with modest increases resulting from tourism and population growth. Slightly higher harvest levels, depending on location, could negatively affect wilderness sensitive tourism/recreation use, resulting in some job and employment income losses, but these are expected to be small. Similarly, slightly lower harvest levels may result in small job and employment income gains in the wilderness tourism sector.

From a community perspective, the stable forestry sector employment implicit in the base harvest forecast would be beneficial to TSA communities, as it provides a secure base for future economic diversification. It would also deter population loss as well as potential economic and social problems resulting from job losses. Stable employment would benefit forestry workers and their families, as well as those businesses and services that depend on forest industry or employer expenditures. By helping to maintain a steady population, stable forest sector employment would also ensure the "critical mass" required to maintain property values and a solid tax base. However, there may be some negative implications for non-timber forestry uses, such as agroforestry/wildcrafts and subsistence activities. Fifteen percent higher initial harvest levels would result in the further benefit of a small number of additional jobs. Fifteen percent lower harvest levels would compound the current jobless rate and could contribute to population loss and social problems.

There are no known issues of specific native concern other than land claims, and it is unclear how this might be affected by the harvest forecasts.

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<sup>96</sup> Interviews with local tourism/recreation providers revealed that current harvesting activities are not considered to be a major problem.

## 9.2 Provincial Impacts

Table 9-2 summarizes the provincial impacts of the base harvest as well as the implications of 15 percent lower and higher initial harvest levels. As indicated in Section 9.1, the base harvest forecast would initially maintain employment at current levels. Direct forest sector employment attributable to timber harvested in the Arrow TSA totals 630-640 PY's per annum, resulting in approximately \$21 million in direct after tax employment income. It also supports another 950 PY's of employment and \$25-26 million in after tax employment income from other sectors. The base harvest generates \$15 million in provincial revenues and \$12 million in federal revenues annually.

In the long term, the base harvest would result in a cumulative total job loss of about 500 PY's, of which 200 PY's are directly in the forest sector. Associated with this is a cumulative total loss of \$15 million in after tax employment income (\$6-7 million in the forest sector). There would also be a loss of \$5 million in provincial revenues and \$3-4 million in federal revenues.

At the provincial level, a 15 percent decrease in the initial harvest level would result in the immediate loss of 95 PY's of direct employment and \$3.3 million in direct employment income, compared with the base harvest forecast. As in the case of the TSA impacts, the greatest losses would be incurred in year 0, after which employment and income levels would be sustained for the long term.

Increasing the initial harvest level by 15 percent would generate an additional 95 PY's of employment and \$3.3 million in employment income in year 0, vis a vis the base harvest. However, these gains would only be sustained in the medium-term, as the harvest level would begin to decline to the long-term level of 422 000 m<sup>3</sup> in decade 4.

Impacts related to tourism/recreation and environmental concerns are the same as those for the TSA.



| Table 9-1: TIMBER SUPPLY AREA ACCOUNTS — ARROW TSA  |                                                                                                                                                                                                               |               |               |               |                                |                                                                                                                                                                             |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Years                                               | Base Case                                                                                                                                                                                                     |               |               |               | Increase Harvest<br>15 Percent | Decrease Harvest<br>15 Percent                                                                                                                                              |
|                                                     | 0                                                                                                                                                                                                             | 70            | 80            | 90            | 100+                           |                                                                                                                                                                             |
| Harvest Dependent (PY/yr)                           | 600                                                                                                                                                                                                           | 539           | 486           | 438           | 409                            | <ul style="list-style-type: none"> <li>initial gain of 90 PY's in direct employment and \$3 million in direct employment income in year 0 vis a vis base harvest</li> </ul> |
| Indirect and Induced (PY/yr)                        | 432                                                                                                                                                                                                           | 388           | 350           | 315           | 294                            |                                                                                                                                                                             |
| <b>Total Direct, Indirect &amp; Induced (PY/yr)</b> | <b>1 032</b>                                                                                                                                                                                                  | <b>927</b>    | <b>836</b>    | <b>753</b>    | <b>703</b>                     |                                                                                                                                                                             |
| Direct After-Tax Employment Income (\$M/yr)         | \$20.0                                                                                                                                                                                                        | \$18.0        | \$16.2        | \$14.6        | \$13.6                         |                                                                                                                                                                             |
| Indirect and Induced (\$M/yr)                       | \$11.6                                                                                                                                                                                                        | \$10.4        | \$9.4         | \$8.5         | \$7.9                          |                                                                                                                                                                             |
| <b>Total (\$M/yr)</b>                               | <b>\$31.6</b>                                                                                                                                                                                                 | <b>\$28.4</b> | <b>\$25.6</b> | <b>\$23.1</b> | <b>\$21.5</b>                  |                                                                                                                                                                             |
| <b>Tourism/Recreation Implications</b>              | <ul style="list-style-type: none"> <li>no net effect in short term</li> </ul>                                                                                                                                 |               |               |               |                                |                                                                                                                                                                             |
| <b>Community Implications</b>                       | <ul style="list-style-type: none"> <li>population stable in TSA study area</li> <li>provides basis for future economic diversification</li> </ul>                                                             |               |               |               |                                |                                                                                                                                                                             |
| <b>Environmental Implications</b>                   | <ul style="list-style-type: none"> <li>some protection of environmental values</li> <li>still leaves concerns about watersheds, old growth values and unique habitats</li> </ul>                              |               |               |               |                                |                                                                                                                                                                             |
| <b>Specific Native Concerns</b>                     | <ul style="list-style-type: none"> <li>specific impacts unknown</li> </ul>                                                                                                                                    |               |               |               |                                |                                                                                                                                                                             |
|                                                     | <ul style="list-style-type: none"> <li>small job/income gains</li> <li>slight job loss</li> <li>potential population loss &amp; social problems</li> <li>less concerns as compared to base harvest</li> </ul> |               |               |               |                                |                                                                                                                                                                             |
|                                                     | <ul style="list-style-type: none"> <li>small job/income losses</li> <li>slight gain in jobs</li> <li>improved population stability</li> <li>more concerns as compared to base harvest</li> </ul>              |               |               |               |                                |                                                                                                                                                                             |
|                                                     | <ul style="list-style-type: none"> <li>specific impacts unknown</li> </ul>                                                                                                                                    |               |               |               |                                |                                                                                                                                                                             |
|                                                     | <ul style="list-style-type: none"> <li>specific impacts unknown</li> </ul>                                                                                                                                    |               |               |               |                                |                                                                                                                                                                             |



| Table 9-2: PROVINCIAL ACCOUNTS — ARROW TSA  |                               |        |        |        |                                |                                                                                                                                                                                         |
|---------------------------------------------|-------------------------------|--------|--------|--------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Years                                       | Base Case                     |        |        |        | Increase Harvest<br>15 Percent | Decrease Harvest<br>15 Percent                                                                                                                                                          |
|                                             | 0                             | 70     | 80     | 90     | 100+                           |                                                                                                                                                                                         |
| Harvest Dependent (PY/yr)                   | 634                           | 569    | 513    | 463    | 432                            | <ul style="list-style-type: none"> <li>potential initial gain of 95 PY's in direct employment and \$3.2 million in direct employment income in year 0 vis a vis base harvest</li> </ul> |
| Indirect and Induced (PY/yr)                | 951                           | 854    | 770    | 695    | 648                            |                                                                                                                                                                                         |
| Total Direct, Indirect & Induced (PY/yr)    | 1 585                         | 1 423  | 1 283  | 1 158  | 1 080                          |                                                                                                                                                                                         |
| Direct After-Tax Employment Income (\$M/yr) | \$21.1                        | \$19.0 | \$17.1 | \$15.3 | \$14.3                         |                                                                                                                                                                                         |
| Indirect and Induced (\$M/yr)               | \$25.5                        | \$23.0 | \$20.7 | \$18.5 | \$17.3                         |                                                                                                                                                                                         |
| Total (\$M/yr)                              | \$46.6                        | \$42.0 | \$37.8 | \$33.8 | \$31.6                         |                                                                                                                                                                                         |
| Tourism/Recreation Implications             | • no net effect in short term |        |        |        | • small job/income losses      | • small job/income gains                                                                                                                                                                |
| Government Revenues                         |                               |        |        |        |                                |                                                                                                                                                                                         |
| Provincial Government                       | \$14.5                        | \$13.1 | \$11.8 | \$10.6 | \$9.8                          | <ul style="list-style-type: none"> <li>Potential increase in personal tax and stumpage revenues.</li> </ul>                                                                             |
| Federal Government                          | \$11.7                        | \$10.6 | \$9.5  | \$8.6  | \$8.0                          | <ul style="list-style-type: none"> <li>Immediate decrease in personal tax and stumpage revenues.</li> </ul>                                                                             |
| Total                                       | \$26.2                        | \$23.7 | \$21.3 | \$19.2 | \$17.8                         |                                                                                                                                                                                         |



| <b>LIST OF CONTACTS</b>    |                                                                      |
|----------------------------|----------------------------------------------------------------------|
| <b>Ministry of Forests</b> |                                                                      |
| Reiner Augustin            | Operations Manager, Arrow Forest District                            |
| Dave Coffey                | Economics and Trade Branch, Victoria                                 |
| Alison Coyne               | Economics and Trade Branch, Victoria                                 |
| Gary Darychuk              | Regional Planning/Inventory Officer, Nelson Forest Region            |
| Nelly de Geus              | Research Officer, Integrated Resources                               |
| Barb Etherington           | Export Support Clerk, Economics and Trade Branch, Victoria           |
| Dave Fitchett              | Recreation Officer, Arrow Forest District                            |
| Peter Fowler               | Major Licensee Silviculture Information System, Nelson Forest Region |
| Hal McLean                 | Nelson Forest Region                                                 |
| Cassandra Mann             | TSA Forest Analyst, Integrated Resources Branch, Victoria            |
| Dave Oswald                | Regional Staff Manager, Nelson Forest Region                         |
| Harry Quesnel              | Assistant Regional Research Ecologist, Forest Sciences, Nelson       |
| Greg Rowe                  | Research Officer, Arrow Forest District                              |
| Al Skakun                  | SBFEP Program, Arrow Forest District                                 |
| <b>Forest Companies</b>    |                                                                      |
| Paul Barabonoff            | Logging Contractor, Nelson                                           |
| Nick Boulton               | Logging Contractor, Crescent Valley                                  |
| Dave Burge                 | Riverside Forest Products Ltd, Lumby                                 |
| Bob Coutts                 | Plant Manager, Pope & Talbot Ltd., Castlegar                         |
| Ted Dergousoff             | Manager, Goose Creek Lumber, Crescent Valley                         |
| John Fleming               | Controller, Bell Pole Co. Ltd, Lumby                                 |
| Ian Fraser                 | Slocan Forest Products Ltd., Slocan Division, Slocan                 |
| Norm Gretchen              | Uphill Wood Supply, Castlegar                                        |
| Rick Hlookoff              | Logging Contractor, Crescent Valley                                  |
| Peter Kalesnikoff          | President, Kalesnikoff Lumber Co. Ltd., Thrums                       |
| B. Kofinoff                | Assistant to Woodlands Manager, Atco Lumber Ltd., Fruitvale          |
| Doug Lang                  | Forestry Manager, Pope & Talbot Ltd, Arrow Lakes Timber Division     |
| Hans Louwe                 | Woodlands Manager, Atco Lumber Ltd, Fruitvale                        |
| Blair MacLeod              | Forest Technician, Kalesnikoff Lumber, Thrums                        |
| Bob Massey                 | Logging Mgr., Riverside Forest Products, Lumby                       |
| Mike Meeker                | Forest Fibre Co., Salmo                                              |
| Fred Parker                | Castlegar Pulp Mill, Castlegar                                       |
| Murray St. John            | Production Manager, Celgar Pulp Co.                                  |
| Rene Tabouriaux            | Logging Contractor, Winlaw                                           |
| James L. Zwick             | Manager, Goose Creek Lumber, Crescent Valley                         |

| Local Representatives     |                                                                                           |
|---------------------------|-------------------------------------------------------------------------------------------|
| Benjamin Legebokoff       | Fishing Guide Operator                                                                    |
| Howard Dirks              | Nelson & District Chamber of Commerce, Nelson                                             |
| Alan Drury                | Selkirk Wilderness Skiing                                                                 |
| Corky Evans               | MLA Nelson Region                                                                         |
| Maureen Gardner           | Economic Development Officer, Nelson & District Economic Development Commission, Nelson   |
| Gordon Gaskell            | Mayor, Village of Kaslo                                                                   |
| Wayne Germaine            | Nelson & District Chamber of Commerce, Nelson                                             |
| Dennis Holden             | Forestry Instructor, Selkirk College                                                      |
| Laurie Langford           | Lake City Holidays                                                                        |
| Wayne Louie               | Chief, Lower Kutenai Band, Creston                                                        |
| Pierre Louie              | Lower Kutenai Band, Creston                                                               |
| Ron Louie                 | Lower Kutenai Band, Creston                                                               |
| Richard Maddocks          | Executive Director, Castlegar & District Development Board, Castlegar                     |
| William Ramsden           | Mayor, City of Nelson                                                                     |
| Renee Read                | Manager, Castlegar & District Chamber of Commerce                                         |
| Gary Williams             | Former Municipal Manager, City of Castlegar                                               |
| Other Government Agencies |                                                                                           |
| Martha Burd               | Ministry of Small Business, Tourism and Culture, Victoria                                 |
| John Dyck                 | Regional Manager, Water Management, Nelson                                                |
| Barry Farynuk             | Conservation Officer, Ministry of Environment, Lands, & Parks, Castlegar                  |
| Gerry Fox                 | Habitat Biologist, BC Ministry of Environment, Lands & Parks, Nelson Region               |
| Susan Lewis               | Water Management Branch, Ministry of Environment, Lands & Parks                           |
| Gord McAdams              | Visitor Services Coordinator<br>Ministry of Environment, Lands and Parks, Nelson          |
| Rob McArthur              | Regional Hydrology Technician, BC Ministry of Environment, Lands & Parks, Nelson Region.  |
| Judy McCanlish            | Canada Employment and Immigration Centre, Nelson                                          |
| Carrie Morita             | Hydrology Technician, BC Ministry of Environment, Lands & Parks, Nelson Region            |
| Roger Pratt               | Regional Planning and Program Engineer<br>Ministry of Transportation and Highways, Nelson |
| Roger Reid                | Economist, Wildlife Branch, MELP, Victoria                                                |
| Al Soobotin               | Habitat Section Head, Fish and Wildlife, Nelson                                           |
| Jim Turner                | Mineral Title Inspector, Ministry of Energy, Mines and Petroleum Resources, Nelson        |
| Cory Waters               | Ministry of Small Business, Tourism and Culture, Victoria                                 |
| Guy Woods                 | Head, Wildlife Section, Fish and Wildlife, Nelson                                         |

| Other           |                                                              |
|-----------------|--------------------------------------------------------------|
| Bill Horswill   | Consultant, Aspect Consultants Inc., Winlaw                  |
| Les Kiss        | Council of Forest Industries, Vancouver                      |
| Silvie LeFebvre | Manager, Management Consultants, Price Waterhouse, Vancouver |
| Bob Matters     | IWA, Cranbrook Local                                         |
| Gregory Utzig   | Consultant, Kutenai Nature Investigations Ltd., Nelson       |



**GLOSSARY OF TERMS**

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Allowable Annual Cut (AAC):</b>     | The allowable rate of timber harvest from a specified area of land per year.                                                                                                                                                                                                                                                                                                                                  |
| <b>Biodiversity:</b>                   | Diversity of life in all its forms and levels of organization, including genes, species, ecosystems and the evolutionary and functional processes that link them.                                                                                                                                                                                                                                             |
| <b>Biogeoclimatic zones:</b>           | Areas which are defined by biological, physical and atmospheric characteristics.                                                                                                                                                                                                                                                                                                                              |
| <b>Blue-listed species:</b>            | Sensitive or vulnerable and of management concern.                                                                                                                                                                                                                                                                                                                                                            |
| <b>Environmentally sensitive area:</b> | An area with significant non-timber values, fragile or unstable soils, problems in establishing a new tree crop or where timber harvesting may cause avalanches.                                                                                                                                                                                                                                              |
| <b>Green-up period:</b>                | The time needed for a stand of trees to reach a desired condition (e.g., height) to ensure maintenance of water quality, wildlife habitat, soil stability or aesthetics.                                                                                                                                                                                                                                      |
| <b>Harvest forecast:</b>               | The flow of potential timer harvests over time. A harvest forecast is usually a measure of the maximum timber supply that can be realized, over time, for a specific land base and set of management assumptions. It is an output of forest planning models and is affected by the size and productivity of the land base, the current growing stock, and management objectives, constraints and assumptions. |
| <b>Indirect Income or Employment:</b>  | Additional economic activity created by forestry companies through the purchase of goods and services.                                                                                                                                                                                                                                                                                                        |
| <b>Induced income and employment:</b>  | Additional economic activity created by the re-spending of income earned by employees of those businesses involved with the forest industry.                                                                                                                                                                                                                                                                  |
| <b>Integrated Resource Guidelines:</b> | Guidelines requiring that forest management activities be conducted in a special way to protect or enhance timber and non-timber forest resource values.                                                                                                                                                                                                                                                      |
| <b>Long-Run Harvest:</b>               | Refers to timber harvesting levels whereby the volume of timber harvested in any given period can be replaced by a similar volume of regenerated stands within the same period.                                                                                                                                                                                                                               |

|                                        |                                                                                                                                                                                                                                                        |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Not satisfactorily restocked:</b>   | An area not covered by a sufficient number of tree stems of desirable species.                                                                                                                                                                         |
| <b>Protected Area:</b>                 | Areas designated under the BC Protected Areas Strategy for protection in its current state, based on special physical and environmental qualities it may possess.                                                                                      |
| <b>Red-listed species:</b>             | Threatened or endangered species.                                                                                                                                                                                                                      |
| <b>Riparian Zone:</b>                  | The stream bank and flood plain adjacent to streams or water bodies, with particular reference to vegetation.                                                                                                                                          |
| <b>Stock rupture:</b>                  | Harvest shortfalls less than Long Run Sustained Yield, attributable to insufficient numbers of second-growth stands achieving minimum harvest age to maintain the timber harvest target.                                                               |
| <b>Timber Supply Area (TSA):</b>       | An integrated resource management unit established in accordance with Section 6 of the Forest Act.                                                                                                                                                     |
| <b>Timber harvesting land base:</b>    | The portion of the total land area of a management unit considered to contribute to, and be available for, long-term timber supply. The harvesting land base is defined by reducing the total land base according to specified management assumptions. |
| <b>Visual quality objective (VQO):</b> | Defines a level of acceptable landscape alteration resulting from timber harvesting.                                                                                                                                                                   |
| <b>Watershed:</b>                      | An area drained by a stream or river. A large watershed may contain several smaller watersheds.                                                                                                                                                        |
| <b>Yellow-listed species:</b>          | Managed species.                                                                                                                                                                                                                                       |

**BIBLIOGRAPHY AND ACKNOWLEDGEMENTS**

- Braumandl, T.F. and Curran, M.P. A Field Guide for Site Identification and Interpretation for the Nelson Forest Region, BC Ministry of Forest, Nelson Region, May 1992.
- BC Ministry of Forests. Annual Report 1991-1992.
- BC Ministry of Forests, Arrow Forest District. Arrow Forest District. Copy of Presentation. April 1993.
- BC Ministry of Forests, Integrated Resources Branch. Arrow TSA Timber Supply Analysis. Victoria, BC. March 1994 (Draft).
- BC Ministry of Forests, Economics and Trade Branch. The Economic Impacts of Timber Harvesting in British Columbia. June 29, 1993.
- BC Research, Campbell Goodell and Associates, and The Tourism Research Group. Visitor '89: A Travel Survey of Visitors to British Columbia. Prepared for BC Ministry of Tourism; Industry, Science and Technology Canada; and Ministry of regional and Economic Development. August 1990.
- Canada Employment Centre, Nelson. Labour Market Review - Nelson, Trail, Castlegar and Gran Forks. March, April and May 1993.
- Guiding Hands Recreation Society. Outdoor Recreation: A Kootenay Industry. Prepared for the Kootenay Lake Chamber of Commerce. 1989.
- Holman, G., Cooke, K and Roessler, C., Social and Economic Trends in the Slocan Valley. Prepared for the Commission on Resources and Environment, June 1994.
- Horne, G. and Robson, L., Quantitative Analysis Branch, Ministry of Finance and Corporate Relations. Recommended Procedure for Estimating Regional Economic Impacts Resulting From Direct Changes in the Forest Sector - An Interim Procedure. March 1994.
- Horne, G. and Penner, C., Planning and Statistics Division, Ministry of Finance and Corporate Relations. British Columbia Community Employment Dependencies. Prepared for the BC Forest Resources Commission. February 1992.
- Kiss, Les, Council of Forest Industries. The Forest Renewal Plan - Its Impact on Stumpage and Royalty Rates. (Summary release). Apr.18, 1994.
- Kootenay Regional Protected Areas Team. Assessment of the Impacts of Study Area Designation of the Best PAS Areas and Development of Alternative Areas within the Kootenay Region. (Alternatives Report). January 1994.

- Kootenay Regional Protected Areas Team - Conservation, Recreation and Cultural Heritage Subgroup. Identification, Evaluation and Ranking of Areas within the Kootenay Region that meet the Protected Areas Strategy Goals and Criteria. (Best PAS Report). November 1993.
- Pandion Ecological Research Ltd. Status and Habitat Relationships of Selected Red- and Blue-listed Species of the Kootenay Region. For BC Ministry of Environment, Lands & Parks, Wildlife Branch, Nelson, BC. March 1993.
- Phelps, D.E., Jamieson, R. and Demarchi, R.A. The History of Mountain Goat Management in the Kootenay Region of British Columbia. Wildlife Bulletin No. B-20. BC Ministry of Environment and Parks. April 1983
- Price Waterhouse. The Forest Industry In British Columbia. 1992.
- Quesnel, H.J. Forests Greater than 140 Years Old in the Kootenay Region - Status Report (First Draft). BC Ministry of Forests, Nelson Region. July 1993.
- Quesnel, H.J. and Theissen, F.N. Eco-Section Summaries For The Kootenay-Boundary Region. BC Ministry of Forests, Nelson Region. November 1993.
- Quesnel, Harry. Assistant Research Ecologist, Forest Sciences. BC Ministry of Forests, Nelson Forest Region.
- Simpson, K. and Woods, G.P. Movements and Habitats of Caribou in the Mountains of Southern British Columbia. Wildlife Bulletin No. B-57. BC Ministry of Environment and Parks. May 1987.
- Statistics Canada. Employment Income by Occupation - The Nation. 1991 Census. Catalogue #93-332. 1993.
- Thomson, T.S. & Associates Ltd. Intensive Forest Management Plan for the Regional District of Central Kootenay. Prepared for the Central Kootenay Community Adjustment Committee, Nelson, BC. September 1986.
- Woods, Guy. Head, Wildlife Section. Fish and Wildlife Branch, BC Ministry of Environment, Lands and Parks.

## **NOTES ON METHODOLOGY**

The economic impact analysis is divided into two sections: employment and income effects, and government revenues. Evaluating the employment and income impacts for the Arrow forestry sector involved the following steps:

- identifying the direct impacts,
- calculating employment coefficients, and,
- estimating the indirect and induced effects of the forestry sector.

Section 4.6 of this report describes briefly how the employment coefficients are derived, and Chapter 5.0 provides the results of the analysis. The following Appendix describes in more detail the methodology and assumptions behind the analysis.

### **D1.0 CALCULATING EMPLOYMENT AND INCOME IMPACTS**

The results presented in Chapter 5.0 of this report are the estimates of employment and income changes that would occur in response to changes in the long-term harvest level. For the reasons cited in Section 5.1, the results should be regarded as illustrative of long-term trends, rather than definitive.

Changes in the timber harvest level would invoke both direct and indirect/induced economic responses. Direct activity is comprised of all forestry related activity involved with harvesting, processing, government and silviculture. Indirect impacts results from the purchase of goods and services by direct forestry businesses. Induced impacts arise as a result of employees spending their wages and salaries on consumer goods and services.

#### **D1.1 Direct Employment and Income Impacts**

The information used to evaluate the direct and indirect impacts related to timber harvest changes was acquired directly from industry operators within the Arrow Forest District, as well as from the Ministry of Forests, and published sources such as Statistics Canada. The key direct "harvest-dependent" sectors in the Arrow TSA are harvesting, processing and silviculture. Employment with the Ministry of Forests is another important direct sector related to forestry within the TSA (as well as the Forest Region), however it is not regarded as "harvest-dependent". As a result, it has been treated as a constant, and not modelled as a function of harvest levels.

The employment and income estimates of this report are the best which could be derived from available information. In order to provide relatively constant estimates, at least three years of data was used wherever possible.

Employment throughout this report is quoted in terms of person years (PYs). A PY is based on a full-time equivalent (FTE) position where an FTE is defined as the hours per person-year (PY) regarded by employers as full time for a particular occupation.

The definition of Full-Time Equivalent (FTE) varies depending both on the type of occupation and

on individual operators. We chose the approach of accepting the number of FTEs reported by the operators rather than basing FTE on a specific number of hours per person-year (PY), such as 1 800, in order that our estimates of FTE jobs closely approximate the actual number of people who consider themselves fully employed.<sup>1</sup> The FTE estimates of current employment are based on information provided by TSA licensees, SBFEP registrants, and the Arrow Forest District office.

Harvesting jobs tend to be either contracted jobs or staff positions of the major licensees. Information on staff positions was given on an FTE basis. Information on contracted employees was given in terms of the number of months worked by employees in a year. Typically, FTE contracted harvesting employees work 10-11 months of the year. This translates into 1 950 to 2 275 hours per year, which takes into account seasonal restrictions on the hours worked and that employees often work 10 hours or more per day, and in some seasons work more than 5 days per week.

An FTE position in processing normally ranges from 1 950 to 2 000 hours per year. A typical employee at a large sawmill works 8 hours/day, 5 days/week, 48 weeks/yr (i.e., 10 statutory holidays and 2 weeks paid vacation), which translates into 1 960 hours. For this analysis, those processing positions that are part time are converted into FTE positions by multiplying the number of part time jobs by the ratio of total average annual hours for a part time job to total average annual hours for a full time job (1 960 hours). This will result in fewer FTEs than actual part time jobs.

In silviculture, much employment is seasonal. Length of working seasons and hours of work per week vary widely, depending on types of activities. For this analysis, we adopted the definition of person-year (PY) used by Statistics Canada in the 1991 Census publication, Employment Income by Occupation - The Nation. PY in this publication is defined as generating a full-year (49-52 week) income, including paid vacation and statutory holidays) of \$30 000-\$40 000 per annum in 1990 dollars.

Direct income was calculated using information provided by the major licensees and selected operators in the Arrow Forest District, as well as from published sources (Horne, 1994). Wages and salaries used in the analysis are after-tax, and include cash benefits.<sup>2</sup>

#### D1.1.1 Employment Coefficients

The employment coefficients of Table 4-6 represent the aggregated results for all harvesting and processing licensees within the Arrow TSA, as well as for silviculture contractors. However, in order to arrive at these results, information for the major licensees, SBFEP, and woodlot operators was analyzed in order to construct a weighted average coefficient for each of the harvesting, processing and silviculture sectors based on relative timber apportionment shares.

Once developed, the employment coefficients were used to evaluate forest sector employment associated with given harvest levels. They reflect the linkage between the number of workers and the harvest level, and are presented as PY's/000 m<sup>3</sup> harvested. When the coefficients are multiplied

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<sup>1</sup> 1 800 hours per PY as a standard were suggested at the Timber Supply Review Workshop held by the Ministry of Forests in Vancouver on February 1-2, 1994. 1 800 hours/PY = 7.5 hrs/day \* 5 days/wk \* 48 wks/yr.

<sup>2</sup> Cash benefits include holiday pay, statutory holiday pay where applicable, and other cash benefits.

by harvest forecast levels, they provide a forecast of the number of workers that would be employed in each forest sector at a particular time. Limitations to the use of these coefficients are enumerated in Section 4.3 of the report.

### **Harvesting**

Each of the five major licensees provided estimates of total FTE employment in harvesting and the associated volume of timber harvested.

The harvesting coefficient for SBFEP and woodlot timber is the sum of three separately estimated coefficients. These are first logging and trucking, planning (or cutting permit development), and road building and maintenance.

SBFEP employment in logging and trucking is based on a sample of contractors from the MoF District office. This was compared as a cross-check to information obtained through interviews with a sample of registrants. Employment estimates from these sources were given in terms of either person-days or person-months per volume of timber harvested. This information was converted to FTE jobs using 10.5 months/year or 227.5 person-days/year.<sup>3</sup>

Planning and road building employment associated with the program is estimated using MoF data on costs per m<sup>3</sup> of timber harvested under the SBFEP program, adjusted by the estimated labour component and average pre-tax income per PY, including benefits.

To arrive at a total harvest coefficient for the TSA, total estimated employment for the major, SBFEP and woodlot operators (236 PY's) was divided by the current AAC (619 000 m<sup>3</sup>) to arrive at 0.38 PY/000 m<sup>3</sup>. Because all harvesting employees reside within the TSA, the coefficient is the same at the provincial level as it is within the TSA.

### **Processing**

Processing is comprised of activity, both within and outside the TSA, in wood products milling, and pulp and paper manufacture. For the purposes of this analysis, we have included chip transport to pulp mills as direct employment related to forestry.

#### **Major Licensees**

Each of the five major licensees provided estimates of total FTE employment in processing and the associated volume of timber processed. A processing employment coefficient was calculated for major licensees inside the TSA using total FTE processing employment for Atco Lumber, Kalesnikoff Lumber, and Slocan Forest Products and dividing by their total associated timber throughput. Similarly, for outside the TSA, a coefficient was derived using total FTE processing employment for Bell Pole (provincial jobs only) and Riverside Forest Products divided by total associated timber throughput. TSA harvested timber supports approximately 210 - 215 PYs, which results in a processing coefficient of about 0.35 per 1000 m<sup>3</sup> harvested.

#### **SBFEP and Woodlot**

The MoF District office provided employment data for a sample of Category 2 mills in the Arrow

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<sup>3</sup> At 5 days/week, 227.5 days is equivalent to 10.5 months.

TSA as well as estimates of the share of SBFEP timber processed by major licensees. The processing coefficient for SBFEP timber is an average of employment coefficients for Category 2 mills and processing operations of major licensees inside the TSA, weighted by the share of SBFEP timber processed by each. Based on information from the MoF district office, we estimate that 70% of SBFEP wood is processed by major licensees and 30% is processed by SBFEP operators. TSA timber supports approximately 12 - 13 PYs of employment at smaller TSA mills. A coefficient of 0.02 per 1000 m<sup>3</sup> harvested results from this total.

### **Pulp Mill**

Processing activity at Celgar Pulp supports 549 PYs in hourly mill employment, salaried workers, and chip transport. The mill processes approximately 2.2 million cubic metres of chips annually, of which 150 000 m<sup>3</sup> - 170 000 m<sup>3</sup>, or 7-8%, originates from the Arrow TSA. Employment dependent on Arrow TSA timber is estimated to be approximately 7-8% of the mill's total employment, or approximately 40 PYs. An employment coefficient per 1000 cubic metres of timber harvested in the Arrow TSA is found by dividing the TSA dependent employment of 40 PYs by the Arrow AAC of 619 000 m<sup>3</sup>/1000. The resulting coefficient equals 0.065 per 1000 m<sup>3</sup>.

### **Total Processing**

In order to simplify the analysis for the reader, aggregate processing coefficients are presented in Table 4-6 which have been calculated as a function of all processing employment divided by total harvest volume. The resulting aggregate processing coefficients are as follows:

Inside TSA processing coefficient:  $270 \text{ PY's} / 619\,000 \text{ m}^3 = .44 \text{ PY}/1000 \text{ m}^3$ ,  
i.e.,  $0.35 + 0.02 + 0.65 = 0.435$ , or about 0.44.

Arrow TSA timber supports a further 33 - 34 PYs of employment at mills located outside the TSA. These include Riverside, Bell Pole, and some small processors.

Total provincial processing coefficient:  $304 \text{ PY's} / 619\,000 \text{ m}^3 = 0.49 \text{ PY}/1000 \text{ m}^3$

### **Silviculture**

A silviculture employment coefficient was estimated by converting silviculture expenditures to PY/1000 m<sup>3</sup>. Silviculture expenditures include spending by the Ministry of Forests and by major licensees. Ministry of Forests expenditures include jobs contracted out, but does not include expenditures on MoF staff dedicated to administering silviculture programs. It also nets out silviculture expenditures in NSR (Not Satisfactorily Restocked) areas. Major Licensees expenditures include silviculture in the Arrow TSA as reported under the MoF Major Licensee Silviculture Information System (MLSIS).

Between 1989 and 1993, the Ministry of Forests and Major Licensees spent an average of \$5.4 million per year on silviculture in the Arrow TSA, for an average AAC of 619 000 cubic metres. Assuming an average labour content of 80 percent<sup>4</sup>, and an average pre-tax annual income of

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<sup>4</sup> Ministry of Forests and Forestry Canada (1989), A Socio-Economic Impact Analysis of Silvicultural Employment Under the 1985-1990 Canada-BC Forest Resource Development Agreement, FRDA Report 067.

\$46 000 per PY (including all benefits)<sup>5</sup>, an average silviculture coefficient of 0.15 PY/000 m<sup>3</sup> of wood was estimated for this five year period.

#### **D1.1.2 Direct Forest Sector Jobs and Employment Income**

The following method was used to estimate direct forest sector jobs and employment income generated by timber harvested in the Arrow TSA.

- The timber distribution from the Arrow TSA is assumed to remain constant throughout the forecast period. Thus, as wood volumes decline in the forecast years, losses are prorated as they are currently based on:
  - current wood flows to major licensees, SBFEP registrants and the Forest Service Reserve;
  - current wood flows outside and inside the TSA; and
  - current wood chip flows from different sources to the Celgar pulp mill.
- Employment coefficients (Table 4-6) were multiplied by the appropriate TSA wood volume for each representative year (i.e., years 0, 70, 80, 90 and 100) to estimate employment in harvesting, processing and silviculture inside and outside the Arrow Forest District.
- Ministry of Forests' employment is assumed to remain constant over the forecast period and was estimated by prorating employment on the basis of AAC in the Arrow TSA relative to total AAC for the District. We estimate that an annual harvest rate of 600 000-619 000 m<sup>3</sup> generates 25-30 FTE positions in the District Office and 10-15 FTE positions in the Regional Office. On this basis of prorating, MoF employment in Victoria that can be directly attributed to the Arrow TSA is insignificant.
- Forest sector employment in harvesting, processing, silviculture and the MoF was multiplied by the following average annual after-tax incomes (\$1993 - includes cash benefits) in order to calculate total after-tax employment income:
  - Harvesting: \$35 520
  - Processing: \$34 780
  - Silviculture: \$26 185
  - Ministry of Forests (within TSA): \$33 300
  - Ministry of Forests (provincial): \$26 640

An effective personal tax rate of 26 percent was used to calculate after-tax forest sector income. Employment income is reported in constant, 1993, dollars over the forecast period.

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Average pre-tax annual income, including cash benefits is \$38,500 (Source: Statistics Canada (1993), Employment Income by Occupation - The Nation, 1991 Census. Cat. # 93-332). (\$46 200 = \$38 500 plus 20% loading for non-cash benefits; rounded to \$46 000).

## **D1.2 Indirect and Induced Economic Impact Methodology**

### **TSA**

The indirect/induced employment and income effects that occur within the study area were estimated using a regional income multiplier of 1.58, developed by the Ministry of Finance using the economic base method.<sup>6</sup> Economic base analysis is predicated on the assumption that a regional economy has basic (or export) and non-basic (service) sectors. The basic sector is assumed to be the driver of the local economy. It follows that economic growth results from growth in the basic sector, as goods and services are exported out of the region. All activity producing and providing inputs to the production process is included in the base sector, while the non-basic sector encompasses all activity associated with the sales of goods and services for final consumer demand (induced).

The regional income multiplier was applied to the total direct after-tax income (including cash benefits) generated by the various timber harvest levels, to arrive at total direct, indirect and induced after-tax employment income.<sup>7</sup> The estimated indirect/induced component of this income was then divided by the non-forestry sector wage of \$26 910 to calculate indirect and induced TSA employment. Based on information provided by Statistics Canada, the average after-tax employment income per PY in BC is \$26 910 (including cash benefits).<sup>8</sup> Because indirect/induced income is generated in a wide variety of sectors, the provincial average is probably the most suitable approximation to use for estimated average employment income, rather than an average for any particular industry.

### **Provincial**

To estimate total indirect and induced employment and income at the provincial level, direct forest sector employment was multiplied by a provincial employment multiplier of 2.5 to arrive at total direct, indirect and induced income. Specific to the forest industry, this value is provided by the Economics and Trade Branch of the Ministry of Forests. The estimated indirect/induced component of employment was then multiplied by an after-tax non-forestry wage of \$26 910 to arrive at total indirect/induced after-tax income.

## **D2.0 GOVERNMENT REVENUES**

Government revenues from forestry activity accrue to both the provincial and federal governments and include provincial and federal income tax, provincial stumpage, other provincial revenues including income tax, logging, sales, property and electricity taxes, and other federal revenues comprised of corporate income tax, excise tax, and withholding tax. Approximately 33 percent of

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<sup>6</sup> Horne, G. and Robson, L. B.C. Community Economic Dependencies. Prepared for the BC Round Table on the Environment and Economy. Ministry of Finance and Corporate Relations, March 1993.

<sup>7</sup> Economic base multipliers estimate induced impacts only. However, the Ministry of Finance has slightly overestimated the regional multipliers, and are presently in the process of revising them downwards in order to better reflect regional economic activity. Until such time as the revised multipliers are available, it is appropriate to use the regional multipliers to estimate indirect and induced effects. Source: Ministry of Finance.

<sup>8</sup> Source: Statistics Canada (1993), Employment Income by Occupation - The Nation. 1991 Census. Catalogue 93-332.

personal income tax accrues to the province, and 67 percent to the federal government.

The forest industry tax rates used in Chapter 6.0 were calculated as follows:

- Stumpage and rent: total billed provincial revenue (\$739.9 million) divided by total billed provincial harvest volume (78.9 million m<sup>3</sup>), averaged over the years 1989/90-1993/94.<sup>9</sup> This results in an average of \$9.2 per m<sup>3</sup>.
- Other provincial tax revenues (corporate income tax, logging, sales, property, and electricity taxes): total billed provincial revenue (\$502 million) divided by total billed provincial harvest volume (82 million m<sup>3</sup>), averaged over the years 1987-1992.<sup>10</sup> This results in an average of \$6.1 per m<sup>3</sup>.
- Federal tax revenue (corporate income tax, excise and withholding taxes): total federal revenue from BC forest industry (\$141 million) divided by total provincial harvest volume (82 million m<sup>3</sup>), averaged over the years 1987-1992.<sup>11</sup> This results in \$1.7 per m<sup>3</sup>.
- Revenues are converted to constant 1993 dollars using the BC Consumer Price Index.

### D3.0 TOURISM

Tourism is defined here as wilderness-sensitive<sup>12</sup> activities and expenditures undertaken by residents based outside the province of BC.<sup>13</sup> Wilderness-sensitive tourism and recreation activity in the Arrow TSA is oriented towards activities such as hiking, skiing, camping and snowmobiling. These sectors are the most sensitive to changes in land use associated with timber harvesting, while other sectors such as touring, sightseeing and boating are less impacted by forestry operations in the remote areas of the TSA. The application of the Ministry of Forests' Visual Quality Objectives (VQO) strives to ensure that sensitive view corridors, including those from water and highways, are properly considered when developing logging plans.<sup>14</sup>

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<sup>9</sup> Ministry of Forests, Economics and Trade Branch. The Economic Impacts of Timber Harvesting in BC. June 1993. Estimates for 1992/93 and 1993/94 were provided verbally by Economics and Trade Branch, Ministry of Forests.

<sup>10</sup> Op. cit.

<sup>11</sup> Price Waterhouse. The Forest Industry in British Columbia. 1992.

<sup>12</sup> Wilderness-sensitive tourism is defined as 50 percent of the overall outdoor recreation and adventure tourism market. The 50 percent is determined based on the relative proportion of activity which is not covered by the Ministry of Forests' Visual Quality Objectives (VQO) and within areas where logging activity occurs.

<sup>13</sup> While tourism expenditures by BC residents are a net inflow to the local economy, land use decisions which affect the pattern of recreational use and expenditure are assumed to only impact the location of spending within the province, not whether the expenditure occurs at all. Therefore, land use decisions have no net effect on provincial revenue related to use by residents of BC.

<sup>14</sup> It has been assumed that any tourism activity occurring in areas covered by the VQO categories "retention" or "partial retention" will not be affected by activities associated with timber harvesting. Therefore, a future reduction in the harvest level would not have any impact on the perception of visitors within these zones and the level of tourism would not be affected by land use decisions.

### Estimate of User Days

In terms of user days, data obtained from the Visitor '89 and Resident Travel in British Columbia<sup>15</sup> surveys provide an indication of the level of tourism activity<sup>16</sup> in the forest district, as well as a basis for estimating recreation use by local residents. These surveys indicate 2.8 million tourist days (by people from within and outside B.C.) were spent in the Kootenays in 1989. Based on the provincial average growth rate for tourism of 2 percent per year, the adjusted figure for 1993 is 3 million tourist days. Assuming the Arrow Forest District represents one-third<sup>17</sup> of overall Kootenay visits, about 1 million tourist days per year would have been spent in the Arrow region.

Visitor surveys indicate that approximately 11 percent of non-resident visitors to the Kootenays reported that outdoor recreation was the main purpose of their trip.<sup>18</sup> Applying this percentage to the Arrow results in approximately 110 000 tourist user days per year being ascribed to outdoor recreation or adventure tourism activities. About half or 55 000 tourist days are related to backcountry experiences. The seasonal split between summer and winter, according to local tourism/recreation providers, is 70 percent and 30 percent respectively, resulting in 38 500 tourist user days in summer and 16 500 in winter.

Interviews with BC Parks and local tourism/recreation providers reveal that the ratio of local recreation participants to tourists is 4:1. Based on this proportion and the previous estimate of tourist user days, local residents engage in another 440 000 user days per year, of which 308 000 are in summer and 132 000 in winter. See table 2-5.

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15 BC Ministry of Tourism.

16 These studies were undertaken in 1989 but are the most recent, comprehensive surveys available.

17 Visitor '89 includes the Arrow District within the larger Kootenay Country region which had 932 400 non-resident tourist days. Given the lack of data on tourism visits specifically within the Arrow, we have assumed a total visitation of 140 000 days. This estimation is based on the proportion of land area, tourist attractions, highway infrastructure and parks/campgrounds in the Arrow.

18 Ministry of Tourism, Visitor '89.

# Appendix E: Incremental Economic Impacts of the Arrow TSA Base Timber Harvest Forecast<sup>1</sup>

## Employment (PYs) and Income (\$millions) Impacts

| Year         | Change in Harvest <sup>2</sup> | TSA           |                   |              |               | Province      |                   |              |             |
|--------------|--------------------------------|---------------|-------------------|--------------|---------------|---------------|-------------------|--------------|-------------|
|              |                                | Direct Labour | Indirect/ Induced | Total Labour | Total Y       | Direct Labour | Indirect/ Induced | Total Labour | Total Y     |
| 0            | 0                              | 0             | 0                 | 0            | 0             | 0             | 0                 | 0            | 0           |
| 70           | 61.9                           | 61            | 44                | 105          | 3.2           | 65            | 97                | 162          | 2.1         |
| 80           | 55.7                           | 53            | 38                | 91           | 2.8           | 56            | 84                | 140          | 1.9         |
| 90           | 50.1                           | 48            | 35                | 83           | 2.5           | 50            | 75                | 125          | 1.8         |
| 100          | 29.3                           | 29            | 21                | 50           | 1.6           | 31            | 47                | 78           | 1.0         |
| <i>Total</i> | <i>197</i>                     | <i>191</i>    | <i>138</i>        | <i>229</i>   | <i>\$6.4</i>  | <i>202</i>    | <i>303</i>        | <i>505</i>   | <i>8.2</i>  |
|              |                                |               |                   |              | <i>\$10.1</i> |               |                   |              | <i>15.0</i> |

## Government Revenues (\$millions)

| Year         | Change in Harvest <sup>2</sup> | Provincial |                       |                               |                  | Federal            |                                     |                        |
|--------------|--------------------------------|------------|-----------------------|-------------------------------|------------------|--------------------|-------------------------------------|------------------------|
|              |                                | Stumpage   | Provincial income tax | Other Provincial <sup>3</sup> | Total Provincial | Federal Income tax | Other federal revenues <sup>4</sup> | Total federal revenues |
| 0            | 0                              | 0          | 0                     | 0                             | 0                | 0                  | 0                                   | 0                      |
| 70           | 61.9                           | 0.5        | 0.5                   | 0.4                           | 1.4              | 1.0                | 0.1                                 | 1.1                    |
| 80           | 55.7                           | 0.5        | 0.5                   | 0.3                           | 1.3              | 1.0                | 0.1                                 | 1.1                    |
| 90           | 50.1                           | 0.5        | 0.4                   | 0.3                           | 1.2              | 0.8                | 0.1                                 | 0.9                    |
| 100          | 29.3                           | 0.2        | 0.3                   | 0.2                           | 0.8              | 0.5                | 0.1                                 | 0.6                    |
| <i>Total</i> | <i>197</i>                     | <i>1.5</i> | <i>1.7</i>            | <i>1.2</i>                    | <i>4.7</i>       | <i>3.3</i>         | <i>0.4</i>                          | <i>3.7</i>             |

<sup>1</sup> Numbers represent negative changes unless specified.

<sup>2</sup> Thousand cubic meters.

<sup>3</sup> Includes corporate income tax, logging, sales, property, and electricity taxes.

<sup>4</sup> Includes corporate income tax, excise and withholding taxes.