Skills Shortages in Canada's Forest Sector

3 January 2007

Farah Huq
Industry and Trade Division
Policy, Economics and Industry Branch
Canadian Forest Service
Natural Resources Canada
Ottawa, ON

CFS CANADIAN FOREST SERVICE
SCF SERVICE CANADIEN DES FORÊTS
cfs-scf.nrcan-rncan.gc.ca

Contents

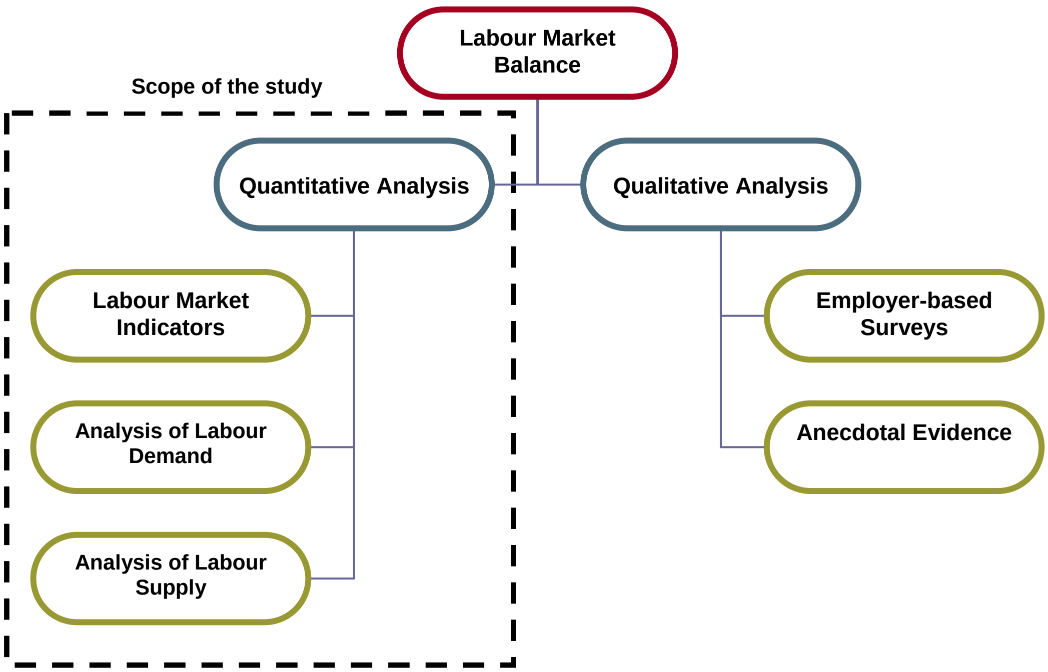
I. Executive Summary

The Study

Skills Shortages in Canada's Forest Sector is an analytical study of the short- and long-term labour market issues and challenges facing the forest sector. Its assessment of current and emerging human resource issues as well as the existing information gaps serves as the basis for recommendations aimed at strengthening the long-term health of the forest sector.

This study assesses the sector's current and future labour market balance through the analysis of three elements: labour market indicators, labour demand, and labour supply (Figure I-1).

Figure I-1: Scope of the Study



Key Findings

- **Weak labour supply:** Enrolment in Canadian forestry schools and colleges has declined dramatically over the last several years, resulting in a declining supply of graduating foresters. This is symptomatic of the general weak labour supply into the forest sector that will likely impact on all forest occupations, not only forestry professionals and forestry technicians & technologists. Weak labour supply into occupations in the forest sector will exacerbate the future skills shortage caused by the outflow of retirees.

- **Insular sector:** The forest sector is very insular. The forest industry in particular does not take advantage of its 'non-traditional' sources of labour - namely women, youth, immigrants and migrants/movers from other regions and industries. The pulp & paper industry is the most insular of the forest sector industries. The representation of women, youth, immigrants, Aboriginal people, and migrants/movers was far below average for all Canadian industries and was consistently the lowest amongst the forest sector industries.

- **Strong Aboriginal representation:** The forest sector employs a larger proportion of Aboriginal workers than average for all Canadian industries; however, Aboriginal workers in the forest sector tend to be concentrated in the lower-skilled, part-time and seasonal positions.

- **Low skill-level and educational attainment:** Relative to average for all Canadian industries, the forest industry has a larger proportion of low-skill occupations and less occupations in management or occupations requiring a university degree. As a result, the education level of workers in the forest industry is lower than average for all industries. In 2001, 60% of workers in the forest industry had a highest level of schooling of a high school diploma or below, compared to an average of 47% across all industries. Low workforce educational attainment and skill levels presents a significant challenge for the forest industry as it has not been immune to the economy-wide shift towards a knowledge-based economy.

- **Aging workforce:** The natural resources industries in general, have an older workforce than average for all Canadian industries. The forest sector industries are no exception; over 41% of employees are over the age of 45.

- **Significant number of retirements anticipated:** Given its comparatively older labour force, the forest sector will experience a significant outflow of older, experienced workers over the next 10 to 15 years. Labour demand in the sector over the next 10 years will be driven almost exclusively by retirements with few *new* jobs being created. Many forest-specific occupations will experience significantly higher than average retirement rates.

- **Impending labour market imbalance:** Forecasts using the currently available information point to a future labour market imbalance in the forest sector. There are early signs of a shortage of higher-skilled occupations requiring a university degree and for management occupations. This shortage is likely to be heightened in the future as the forest industry re-orients itself towards value-added manufacturing and more complex manufacturing processes. Demand for workers with post-secondary education, skilled trades, computer skills or sales and marketing knowledge will be high, while demand for lower skilled, labouring occupations will be weak.

- **Need to identify future skill needs:** A significant information gap exists surrounding the future skill needs of the forest sector. A survey of major forest sector employers is a crucial next step in identifying these future needs.

Summary of Recommendations for Stakeholders:

- Conduct employer-based survey
- Improve public perception of the industry
- Increase awareness of careers in the forest sector
- Promote forest sector careers to non-traditional groups
- Increase post-secondary enrolment in forestry schools & colleges
- Upgrade skills and basic education levels of forest sector workers
- Reinforce partnerships with Aboriginal communities

II. Introduction: Defining the Issue

A. Skills Shortages in the Context of the Canadian Economy

The Canadian population is aging. This is nothing new. Over the last century fertility and mortality rates in Canada, as in many other industrialized countries, have been declining. We are having fewer children, we are living longer and soon, more of us will be retiring.

This inevitable wave of retirements raises unique challenges for employers. As the largest baby boomer cohorts reach retirement age around the 2020s, the growth rate of the working age population[1] is expected to taper off or even decline. During that period, the labour force may shrink by up to 50,000 people (Statistics Canada, 2005). As more people leave the workforce than enter it, many employers may find themselves short of workers thereby increasing competition for employees. New immigrants will become the predominant source of population growth and hence of labour force growth in Canada.

Significant skills shortages can have obvious adverse effects on the economy. Skills shortages can lead to decreased production and excess capacity. Firms competing for scarce labour may bid wages up in such a way that they no longer reflect productivity, placing inflationary pressures on the economy and eventually stifling economic growth.

B. Relevance to the Forest Sector

The forest sector has traditionally had a relatively older work force, making the sector particularly vulnerable to the retirement wave. According to Statistics Canada's *Labour Force Survey*, the forestry industry has a larger proportion of workers over 45 years of age (41%) than average for all Canadian industries (38%). Retirement pressures are also expected to be strong in other industries that commonly employ foresters, such as education and government service, due to the combined effects of lower retirement ages and older average ages of the workforce in these industries (Bergeron *et al.*, 2004). The potential labour shortage created by retirements will be exacerbated by weak labour supply caused by, amongst other things, declining enrolment rates in post-secondary forestry programs and competition from other industries for skilled workers.

Offsetting the effects of a potential skills shortage is the decline in labour demand by forest sector employers. The forest industry has been undergoing major structural changes in response to domestic and international competitive challenges. Firms are streamlining operations, idling machines and closing unprofitable mills. As a result the industry is shedding jobs. Add to this the economy-wide movement towards knowledge-based economy, to which the forest sector has not been immune, and the outlook for labour demand appears to be weak.

C. Objectives of the Study

Though it appears that the forest sector will face labour pressures in the near future, the significance of those pressures remains to be seen as numerous factors on both the labour demand and supply side are at play. The purpose of this study is to examine this

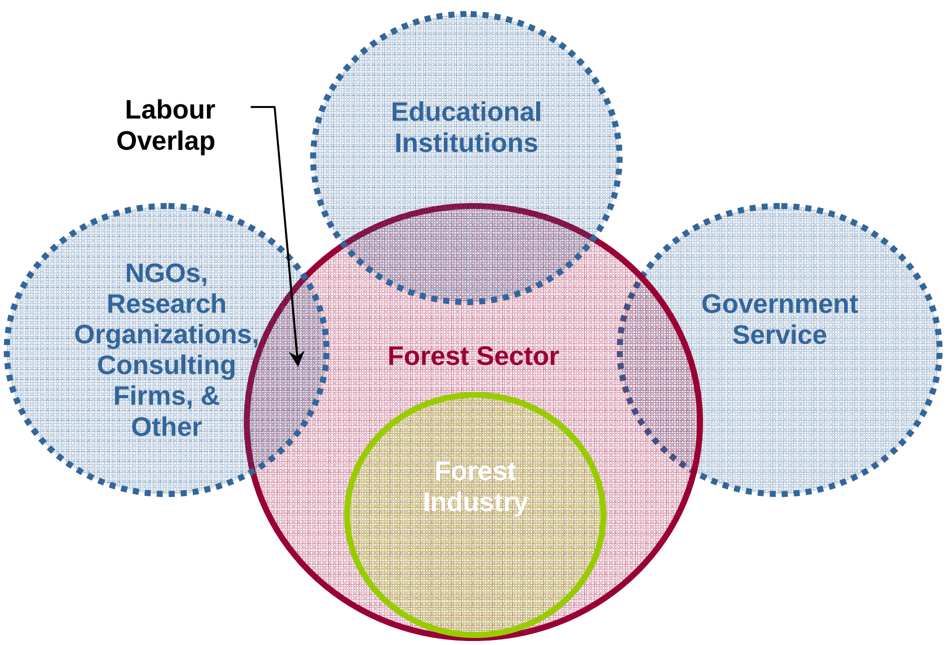
[1] The working age population is defined as persons between 15 and 64 years of age.

potential labour market imbalance and assess its significance for the sector as whole, with emphasis on industry and governments. Section III surveys current and historical labour demand in the sector and forecasts labour demand out 10 years based on different industry scenarios. Similarly, labour supply is examined in Section IV with a 10-year projection also being made. Section V uses commonly relied upon measures to assess the presence and magnitude of skills shortages in the sector. Finally, Section VI brings together the evidence and projections to provide an outlook for the future labour market balance.

Within recent memory, there has not been a comprehensive study of labour market issues in the forest sector. By bringing together quantitative labour and demographic data, and other anecdotal evidence, this study provides an up-to-date overview of the situation in the forest sector labour market. It is hoped that this study will stimulate discussion and co-operation amongst stakeholders concerning what is needed to address the future human resource needs of Canada's forest sector.

D. Definitions

Figure II-1: Illustration of the Forest Sector Labour Pool



Canada's forest sector is made up of a variety of entities including the forest companies, government departments, research institutes, forestry schools & colleges, non-governmental organization, and consulting services firms. Therefore, identifying the labour pool for the sector can be challenging. The forest industry is by far the largest employer in the forest sector. However, a significant number of forest practitioners work outside of industry in other organizations whose work may or may not be exclusively forest-related.

Figure II-1 provides a simplified illustration of the forest sector's labour pool. The forest industry is wholly encompassed within the forest sector while a number of other entities (dashed-line outer circles) draw upon the forest sector's labour pool; however, this is not their sole source of labour.

In this study the forest industry is defined as the aggregation of four sub-industries classified by either the *Standard Industrial Classification – Establishments* (SIC-E 1980) system or the *North American Industrial Classification System* (NAICS 2002). The components of the forest industry are listed in Table II-1. Census data used in this study defines industries by the SIC-E 1980 system. All other Statistics Canada data used in this study uses the NAICS 2002 system.

Table II-1: Definition of the Forest Industry

SIC-E 1980		NAICS 2002	
C041	Logging Industry	113	Forestry & Logging
C051	Forestry Services Industry	1153	Support Activities for Forestry
E25	Wood Industries	321	Wood Product Manufacturing
E27	Paper and Allied Products Industry	322	Paper manufacturing

Source: Statistics Canada (http://www.statcan.ca/english/concepts/industry.htm).

This study relies upon occupational codes to identify employment in the forest sector outside of the forest industry, illustrated by the area of overlap of the large circle and smaller outer circles in Figure II-1. Nineteen forest-specific occupations were identified through their *National Occupational Classification* (NOC) and *National Occupational Classification for Statistics* (NOC-S) descriptions and are listed in Table II-2 on the following page. Labour classified in these 19 occupations, but working *outside* of the forest industry (defined in Table II-1 above) serves as a proxy for non-industry forest sector employment. This method provides an estimate and does not capture all non-industry forest sector employment. For example, under this methodology a forester working as a *Forestry Professional* (C022) in the government service would be captured while a forester working as a forestry program manager in the government service, which under the NOC system is classified as *Government managers, economic analysis, policy development and program administration* (A332), would not.

Table II-2: List of Forest-Specific Occupations

NOC-S	NOC	Description
C022	2122	Forestry professionals
C123	2223	Forestry technologists and technicians
I111	8211	Supervisors, logging and forestry
I151	8241	Logging machinery operators
I161	8421	Chain-saw and skidder operators
I162	8422	Silviculture and forestry workers
I216	8616	Logging and forestry labourers
J015	9215	Supervisors, forest products processing
J113	9233	Pulping control operators
J114	9234	Papermaking and coating control operators
J141	9431	Sawmill machine operators
J142	9432	Pulp mill machine operators
J143	9433	Papermaking and finishing machine operators
J144	9434	Other wood processing machine operators
J145	9435	Paper converting machine operators
J146	9436	Lumber graders and other wood processing inspectors and graders
J193	9513	Woodworking machine operators
J223	9493	Other wood products assemblers and inspectors
J314	9614	Labourers in wood, pulp and paper processing

Source: Human Resources Development Canada, *National Occupational Classification NOC 2001.*

III.Labour Demand in the Forest Sector

A. Labour Market Profile

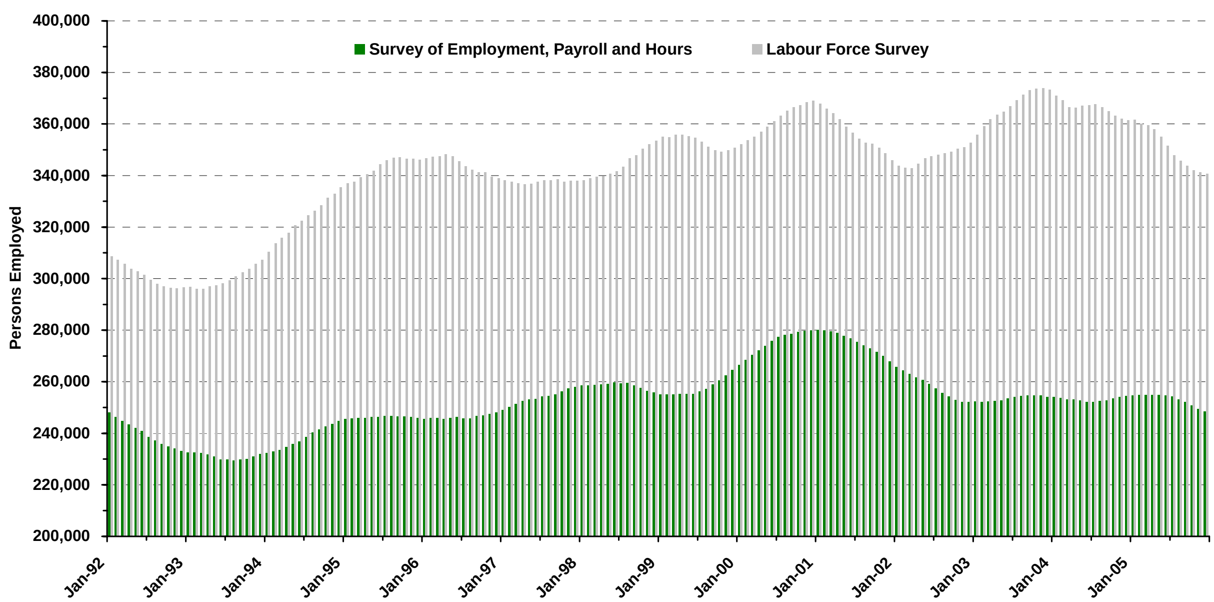
1. Employment Levels

According to Statistics Canada's *Survey of Employment Payroll and Hours* (SEPH) in 2005, over 285,100 people were directly employed in the forest industry in Canada. This represented nearly 2.1% of all employed persons in the country.[2]

Since 1992 employment levels in Canada have been increasing steadily. The forest industry, on the other hand, has experienced employment booms and busts (Figure III-1). Forest industry employed peaked in early 2000 and has since been declining, though has yet to return to the lows witnessed in the early 1990s.

In contrast, the *Labour Force Survey* (LFS) finds nearly 339,000 people directly employed in the forest sector industries in 2005, which also represents approximately 2.1% of all employed persons in Canada, as estimated by the LFS.[3]

Figure III-1: Employment Levels in the Forest Industry



Source: Statistics Canada - Survey of Employment, Payroll and Hours; Labour Force Survey.
Note: Calculated as a 12-month moving average.

The LFS and SEPH data largely illustrate the same employment trends. However, around May 2003, rather than continuing to decline, the LFS data shows employment levels recovering and peaking in late 2003 after which employment begins to decline in line with the SEPH data.

The two data sources differ because they target different populations. SEPH samples employers from the Business Register maintained by Statistics Canada's Business

[2] The Survey of Employment Payroll and Hours estimates that there were 13,730,000 persons employed in Canada on average in 2005.
[3] The Labour Force Survey estimates that there were 16,169,700 persons were employed in Canada on average in 2005.

Register Division. The LFS, on the other hand, samples from the civilian population over 15 years of age.[4] As a consequence, SEPH tends to underestimate employment levels by excluding the self-employed (e.g. contractors) from its estimates. The LFS estimates roughly 50,000 to 100,000 more people employed in the forest industry than the SEPH.

In spite of underestimating employment *levels*, in our opinion SEPH provides a more accurate indication of short-term *changes in employment* within specific industries. This study is primarily concerned with trends and therefore relies on SEPH data. However, both LFS and Census data are used to fill information gaps as needed. LFS and Census data are particularly useful for providing insight into the labour characteristics of specific sub-industries.

The LFS and SEPH allow us to measure employment in the forest *industry*. To estimate employment in the forest sector that is *outside* the forest industry we measure the employment level in the 19 forest-specific occupations listed in Table II-2. In 2001 over 48,000 were employed in a forest-specific occupation outside the forest industry (Table III-1). Employment in this segment of the sector expanded rapidly between 1996 and 2001, growing by 23%. The number of *Forestry Professionals* (C022) employed outside the forest industry grew by 65% during this time period.

Table III-1: Non-Industry Employment by Forest-Specific Occupations

NOC-S	Occupational Description	1996	2001
C022	Forestry professionals	1,930	3,175
C123	Forestry technologists and technicians	3,275	3,505
I111	Supervisors, logging and forestry	620	555
I151	Logging machinery operators	615	945
I161	Chain-saw and skidder operators	1,445	965
I162	Silviculture and forestry workers	1,255	1,450
I216	Logging and forestry labourers	2,790	1,300
J015	Supervisors, forest products processing	1,910	1,955
J113	Pulping control operators	150	140
J114	Papermaking and coating control operators	830	530
J141	Sawmill machine operators	775	905
J142	Pulp mill machine operators	255	720
J143	Papermaking and finishing machine operators	1,565	1,885
J144	Other wood processing machine operators	905	1,465
J145	Paper converting machine operators	7,490	7,320
J146	Lumber graders and other wood processing inspectors and graders	660	745
J193	Woodworking machine operators	5,430	8,165
J223	Other wood products assemblers and inspectors	2,745	5,950
J314	Labourers in wood, pulp and paper processing	4,640	6,675
	Total	**39,285**	**48,350**

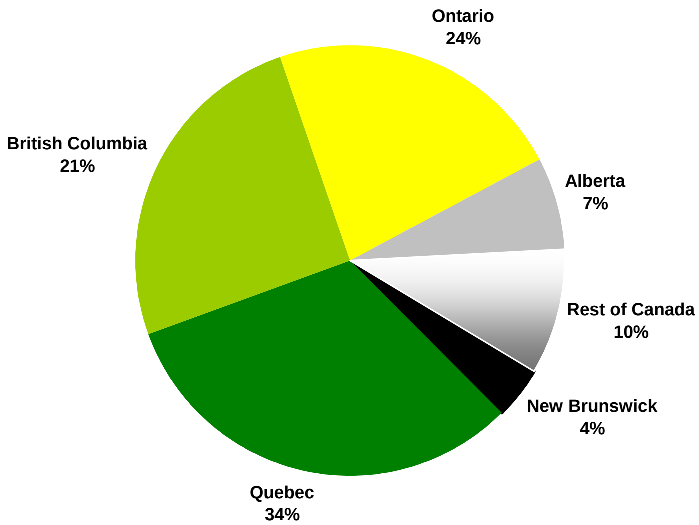
Source: Statistics Canada, *Census 1996 and Census 2001*.
Note: Includes all employed.

[4] For a more detailed explanation of LFS and SEPH see http://www.statcan.ca/english/sdds/indexa.htm#L.

a) <u>By Region</u>

Nearly 80% of all jobs in the forest industry in Canada are found within three provinces: Quebec, Ontario, and British Columbia. On average in 2005, the forest industry employed approximately 91,100, 64,600 and 58,300 people in these provinces respectively (Figure III-2).

Figure III-2: Share of Forest Industry Employment by Region in 2005

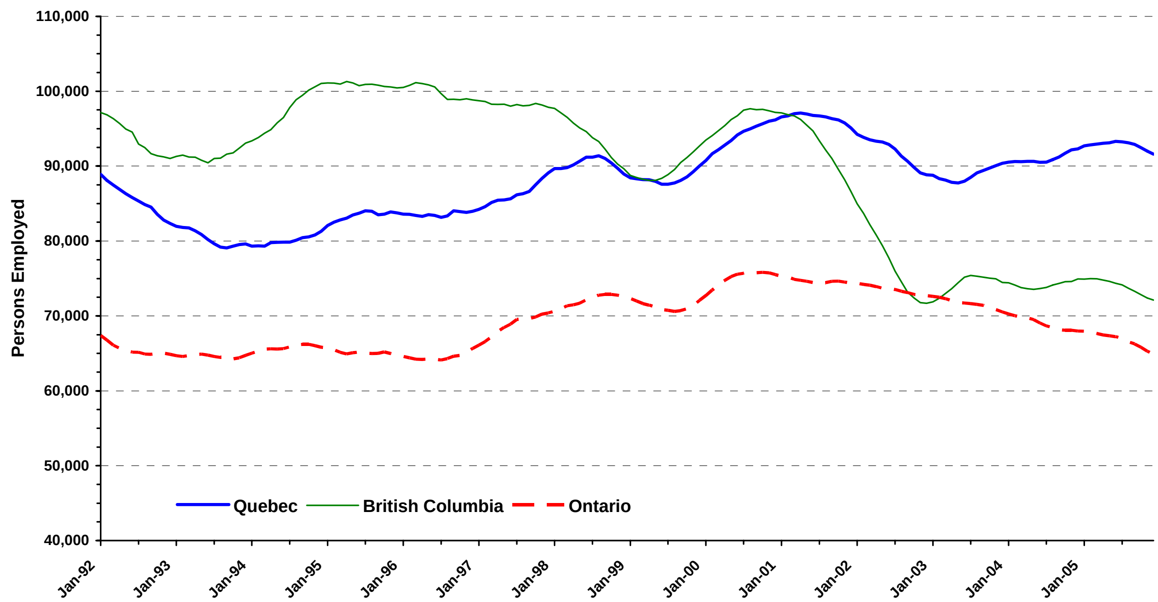


Source: Statistics Canada, *Survey of Employment, Payroll and Hours.*

Quebec and British Columbia are the predominant regions for the forestry & logging, support activities in forestry and wood product manufacturing sub-industries in Canada, while firms in Quebec and Ontario employ the most people in the pulp & paper industry.

In 2000, Quebec surpassed B.C. as the dominant region for employment in the Canadian forest industry (Figure III-3). B.C. has witnessed job losses across all sub-industries, but declines have been particularly dramatic in the forestry & logging industry (including support activities for forestry).

Figure III-3: Forest Industry Employment in Ontario, Quebec and B.C

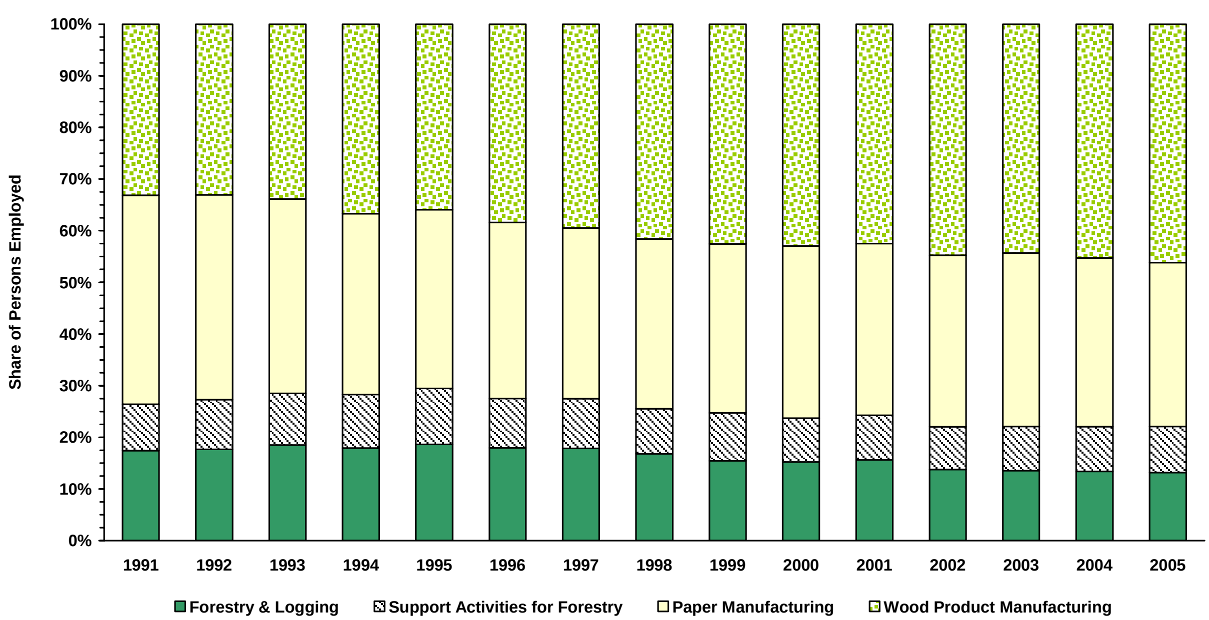


Source: Statistics Canada, *Survey of Employment, Payroll and Hours.*
Note: Calculated as a 12-month moving average.

b) By Industry

Within the forest industry, the wood products manufacturing industry employs the most people, an average of 131,600 in 2005. This sub-industry's share of the total number employed in the forest industry has been steadily increasing – from 33% in 1991 to over 46% in 2005.

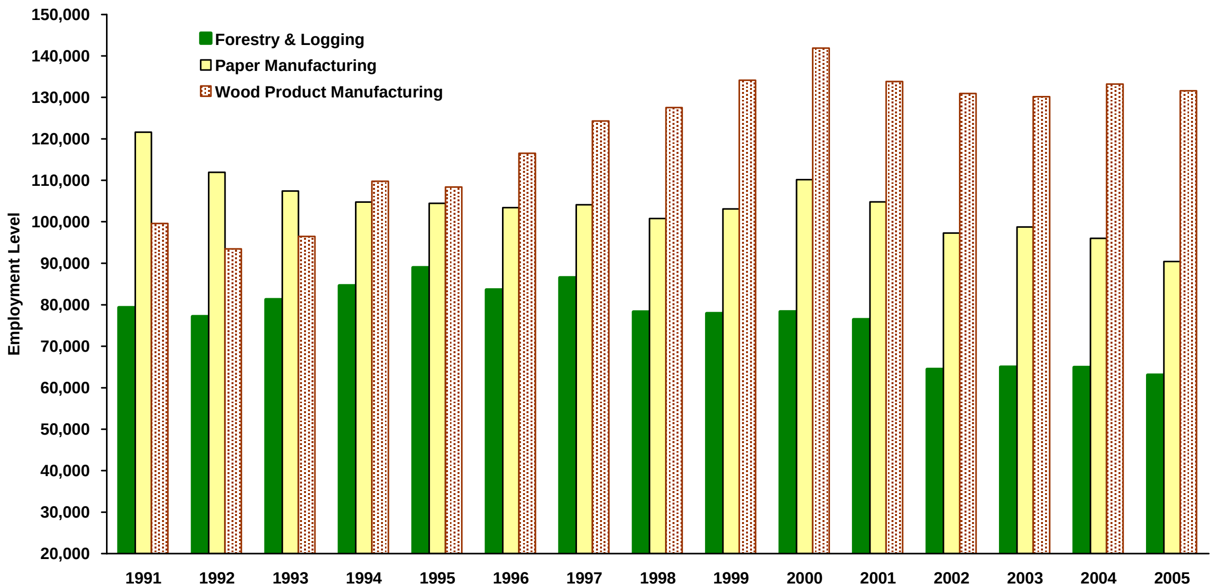
Figure III-4: Share of Forest Industry Employment by Sub-Industry



Source: Statistics Canada, *Survey of Employment Payroll and Hours.*

Throughout the 1990s, employment in the wood products manufacturing industry grew while employment in the pulp & paper industry shrank. Consequently, around the mid-1990s the wood products industry overtook the pulp & paper industry as the largest forest industry employer. Employment levels in the pulp & paper industry showed signs of stabilizing in the late 1990s and early 2000s, but have since been declining. Meanwhile, employment levels in the forestry & logging industry[5] began their steady decline in the mid-1990s.

Figure III-5: Average Annual Employment Level by Sub-Industry



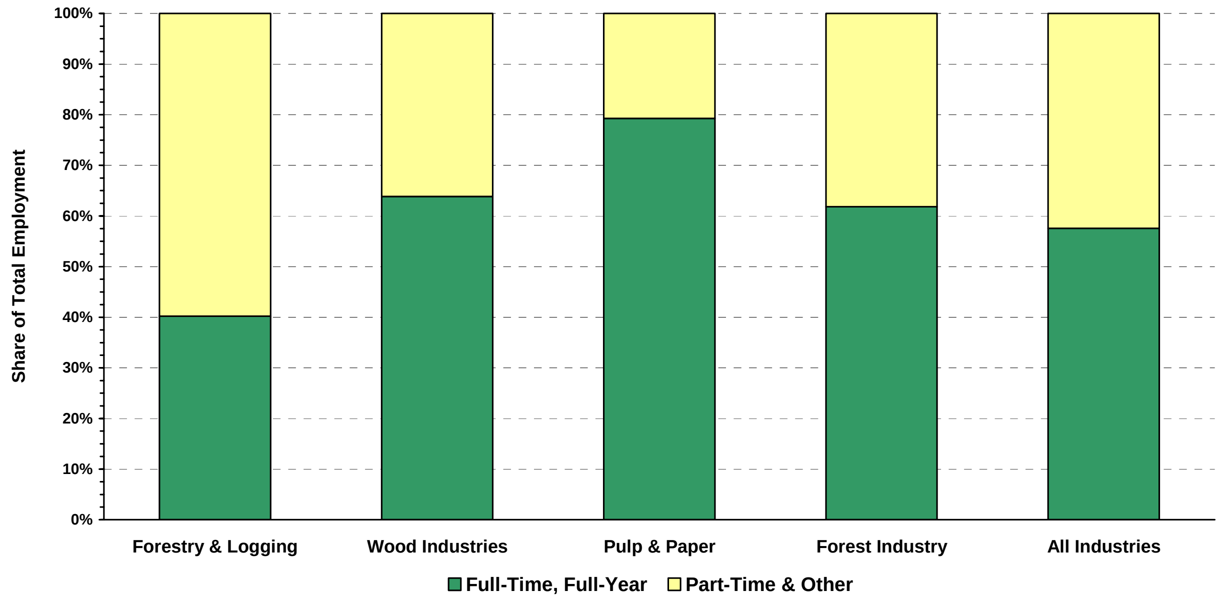
Source: Statistics Canada, *Survey of Employment, Payroll and Hours.*

2. Employment Status

The forest industry has a slightly larger share of full-time, full-year employment[6] relative to part-time & other types of employment compared to the overall Canadian economy (Figure III-6).[7] However, within the forest industry there are stark contrasts; in 2001 almost 80% of employment in the pulp & paper industry was full-time, while the same could be said of only 40% of employment in the forestry & logging industry, which reflects the seasonal nature of the latter.

[5] Forestry & Logging including Support Activities for Forestry.
[6] Hereafter referred to as "full-time employment".
[7] The breakdown between full-time, full-year and part-time & other employment in other forest sector jobs (jobs outside the forest industry) was very similar to that of the forest industry. Therefore, the results are not presented here.

Figure III-6: Employment Status by Sub-Industry, 2001



Source: Statistics Canada, *Census 2001.*

3. Employment Income

Census data on average annual employment income shows that full-time employment in the forest industry paid higher than average for full-time employment in Canada.[8] In 2001, the average annual income of a person employed full-time in the forest industry was $47,560 compared to an average of $43,577 for all industries. Within the forest industry, the highest pay was in the pulp & paper industry at $61,510 on average. The lowest pay was in the wood products manufacturing industry at an average of $40,039, while the forestry & logging industry paid $48,224 on average.

In general, average annual employment income by forest occupation *inside* the forest industry is higher than *outside* according to 2001 Census data. In fact, there were only two occupations that made more outside industry than inside: *Forestry technologists and technicians* (C123) and *Silviculture and forestry workers* (I162).

[8] See Table V-5 for detail.

Table III-2: Average Annual Employment Income by Forest-Specific Occupation, 2001

NOC-S	Occupational Description	Inside Industry	Outside Industry
C022	Forestry professionals	$ 58,886	$ 56,121
C123	**Forestry technologists and technicians**	**44,789**	**46,722**
I111	Supervisors, logging and forestry	58,752	49,691
I151	Logging machinery operators	44,949	42,518
I161	Chain-saw and skidder operators	35,017	20,598
I162	**Silviculture and forestry workers**	**34,871**	**36,462**
I216	Logging and forestry labourers	36,530	34,811
J015	Supervisors, forest products processing	61,807	46,762
J113	Pulping control operators	63,114	38,909
J114	Papermaking and coating control operators	62,729	39,734
J141	Sawmill machine operators	37,066	32,445
J142	Pulp mill machine operators	57,814	39,429
J143	Papermaking and finishing machine operators	56,402	38,519
J144	Other wood processing machine operators	37,463	32,253
J145	Paper converting machine operators	47,660	35,743
J146	Lumber graders and other wood processing inspectors and graders	38,845	31,643
J193	Woodworking machine operators	28,214	26,353
J223	Other wood products assemblers and inspectors	27,910	26,490
J314	Labourers in wood, pulp and paper processing	40,718	30,963

Source: Statistics Canada, *1996 and 2001 Censuses*.
Notes: Includes full-time, full-year employed only

B. Educational Requirements by Occupation

1. Job Descriptions

Service Canada's *Job Futures* and *Labour Market Information* websites provide detailed job descriptions for some of the occupations directly related to the forest sector. These descriptions include typical employment and skill requirements, including educational requirements, and are summarized in Table III-3.

Table III-3: Minimum Educational Requirements of Forest-Specific Occupations

Bachelor's Degree	College Diploma	High School Diploma	Some High School
• Forestry Professionals	• Forestry Technicians and Technologists	• Supervisors, Logging and Forestry • Supervisors, Forest Products Processing • Papermaking and Coating Control Operators • Sawmill Machine Operators • Pulp Mill Machine Operators • Papermaking and Finishing Machine Operators • Other Wood Processing Machine Operators • Paper Converting Machine Operators • Lumber Graders and Other Wood Processing Inspectors and Graders • Woodworking Machine Operators • Labourers in Wood, Pulp and Paper Processing	• Logging Machine Operators • Silviculture and Forestry Workers • Logging and Forestry Labourers • Other Wood Products Assemblers and Inspectors

Source: Service Canada (www.labourmarketinformation.ca).

The majority of forest occupations require a high school diploma or less. Only two of the forest-specific occupations require a post-secondary diploma or degree.

2. Evidence from Census Data

Census data confirm the occupational information provided by Service Canada. Table III-4 breaks down the forest-specific occupations by the highest level of education attained. *Forestry professionals* (C022) are more likely to have a bachelor's degree while *Forestry technologists and technicians* (C123) are more likely to hold a college certificate or diploma. Workers in the other forest-specific occupations are more likely to hold a high school diploma or less.

Table III-4: Education Level by Forest-Specific Occupation, 2001

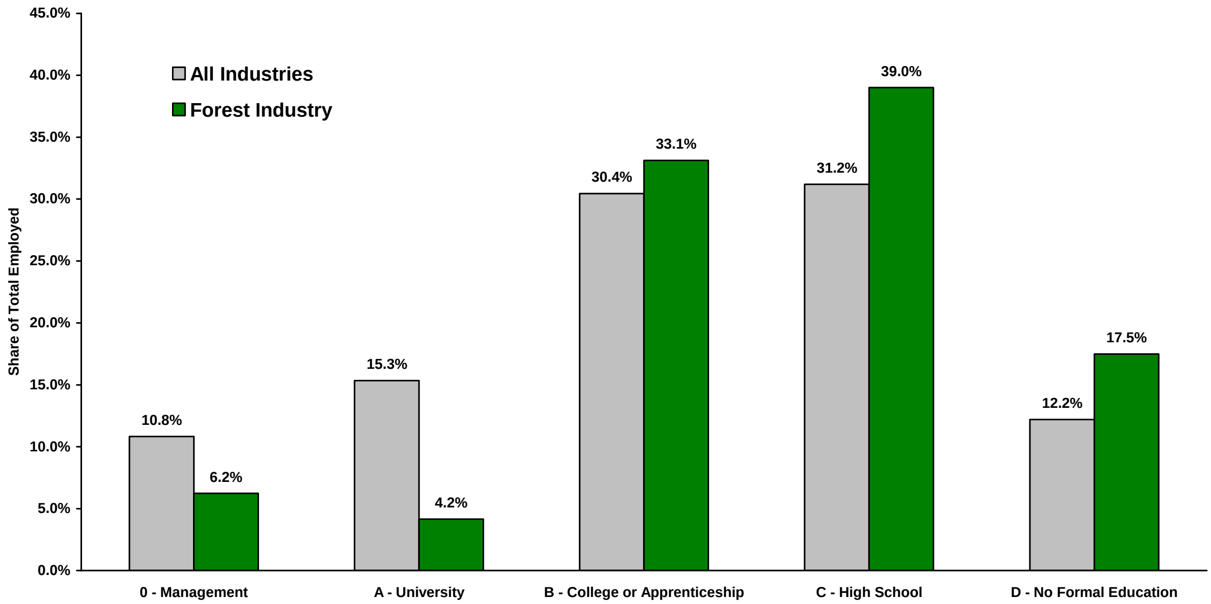
NOC-S	Occupation	High School Diploma or Below	Trade Certificate	College Diploma	Bachelor's Degree	Graduate Degree
C022	Forestry professionals	7.8%	4.2%	17.2%	**54.8%**	16.1%
C123	Forestry technologists and technicians	18.6%	13.6%	**55.0%**	8.2%	4.5%
I111	Supervisors, logging and forestry	**50.4%**	12.7%	26.2%	8.9%	1.8%
I151	Logging machinery operators	**78.0%**	16.9%	4.2%	1.0%	0.3%
I161	Chain-saw and skidder operators	**79.2%**	13.8%	5.6%	0.7%	0.8%
I162	Silviculture and forestry workers	**50.8%**	17.8%	18.6%	8.9%	3.8%
I216	Logging and forestry labourers	**72.6%**	12.8%	11.8%	2.4%	0.0%
J015	Supervisors, forest products processing	**54.5%**	19.3%	17.8%	6.8%	1.6%
J113	Pulping control operators	**63.7%**	15.2%	16.7%	3.9%	0.0%
J114	Papermaking and coating control operators	**73.6%**	15.2%	7.9%	2.4%	0.7%
J141	Sawmill machine operators	**80.6%**	13.1%	5.4%	0.8%	0.1%
J142	Pulp mill machine operators	**68.3%**	17.0%	12.6%	1.8%	0.2%
J143	Papermaking and finishing machine operators	**76.6%**	13.7%	7.3%	2.1%	0.3%
J144	Other wood processing machine operators	**76.9%**	14.2%	8.0%	0.9%	0.0%
J145	Paper converting machine operators	**78.5%**	10.4%	9.2%	0.9%	1.0%
J146	Lumber graders and other wood processing inspectors and graders	**62.6%**	24.3%	10.2%	2.0%	0.9%
J193	Woodworking machine operators	**75.5%**	13.7%	8.9%	1.4%	0.4%
J223	Other wood products assemblers and inspectors	**79.5%**	10.1%	7.3%	2.5%	0.6%
J314	Labourers in wood, pulp and paper processing	**78.3%**	12.1%	8.1%	1.4%	0.1%

Source: Statistics Canada, *2001 Census*.

Note: Includes full-time, full-year employed across all industries.

Relative to average for all Canadian industries, the forest industry has a larger proportion of low-skill occupations and fewer occupations in management or occupations requiring a university degree. This applies not only to forest-specific occupations, but all occupations in the industry including general occupations such as engineers, accountants, and electricians (Figure III-7).

Figure III-7: Forest Industry Employees by Skill Level, 2001



Source: Statistics Canada, *Census 2001.*
Note: Includes all employed.

C. 10-Year Outlook for Labour Demand

1. Trends and Labour Demand

Over the last few years, Canada's forest industry has been faced with a number of long-term international and domestic structural challenges:

- **Competition from offshore producers**: The rapid growth in capacity of low-cost offshore producers presents a challenge to North American pulp, paper and wood product manufacturers. Maturing North American and Western European pulp and paper markets have shifted global demand for pulp and paper towards Asia and Latin America. Low-cost producers, in regions such as China and Latin America, have responded to this shift with huge investments in new mill capacity and are now in direct competition with Canadian suppliers due to advances in technology that have reduced the quality advantage of Canadian softwood pulp. At the same time Canadian lumber producers face challenges in both domestic and international markets from intensively managed timber plantations and suppliers from Eastern and Western Europe, Russia, South America and Asia.

- **Advent of online media and the Internet:** Pulp and paper producers have also had to adjust to reduced demand for their products due to the rise of online media and the Internet. Newsprint in particular has suffered. Newspaper publishers have been losing both customers and advertising revenues to online media sites. Printing and writing papers have also lost market share to electronic media and the Internet; however demand for certain grades will tend to increase with increasing incomes. Paper board and tissue producers are also expected to fair well as incomes rise because there are few substitutes for these types of products.

- **Aging and inefficient capital stock:** The pulp industry has been characterized by a lack of investment in capital stock contributing to poor returns, weak production growth and aging capital stock in need of refurbishment or replacement. Canadian wood pulp and paper mills are significantly older than their Chinese counterparts, most of which have been built since 1996.
- **Production Costs:** Producers in Eastern Canada, Ontario and Quebec in particular, are facing reduced timber and hence fibre supplies. In 2005, the government of Quebec lowered the annual allowable cut following the recommendations of the Coulombe Commission. In British Columbia the annual allowable cut has been temporarily increased in response to the Mountain Pine Beetle epidemic. However, after all the beetle-infested timber has been cut, the annual harvest will be lowered *below* its pre-beetle level creating a significant shortage of fibre. In addition to high fibre costs, Ontario pulp and paper producers also face high electricity costs, an important consideration given that energy costs represent 25-35% of manufacturing costs in the pulp and paper industry (CSF-NRCan, 2006: 29).

These trends are not likely to be reversed in the short-term and therefore will continue to adversely impact the profitability of Canadian producers and dampen the forest industry's demand for labour.

2. Scenarios and Labour Demand

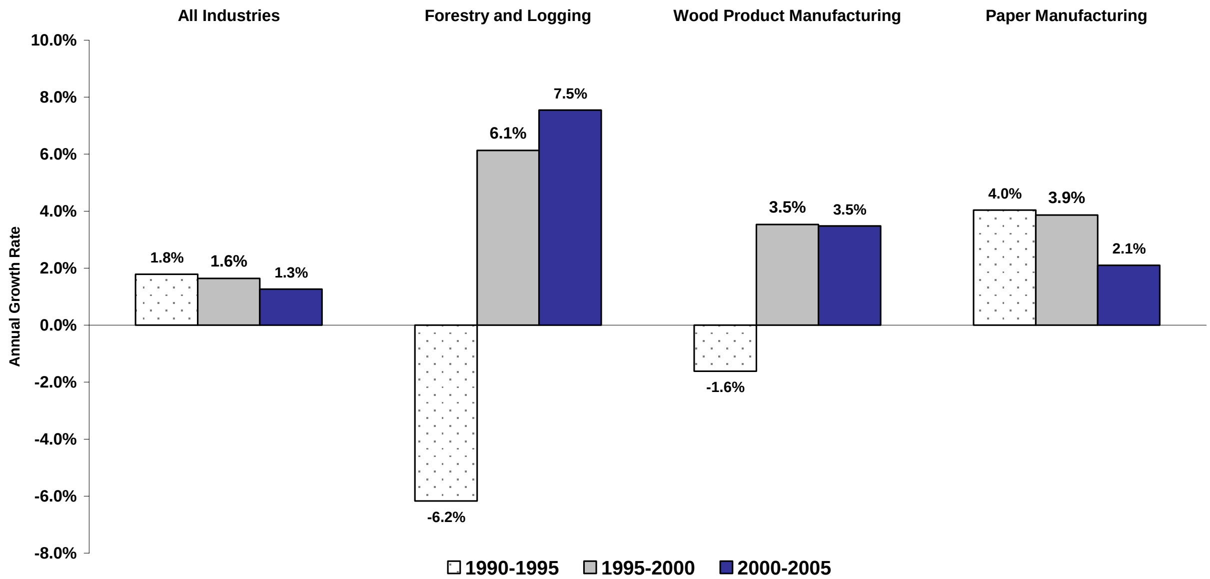
Methodology

Future labour demand can be roughly estimated using forecasted production and labour productivity for the forest sector industries. Productivity measures the amount of output produced per unit of input. Long term productivity growth is driven by capital investment, human capital accumulation and technological change.[9] Labour productivity is one of the most common measures of productivity. It can be calculated as the average output in dollar or physical terms per unit of labour input (e.g. real GDP per hour worked).

Historically, the forest sector industries have been highly productive relative to other Canadian industries. Within the forest sector industries, labour productivity has varied dramatically (Figure III-8) Labour productivity, which was decreasing in the early 1990s in the forestry & logging and wood products manufacturing industries, has since recovered. In the pulp and paper industry the growth rate of labour productivity has been strong over the last 15 years, but is showing signs of slowing.[10]

[9] Technological change shall be used here to signify total factor productivity, which includes all factors that impact on labour productivity that are not embodied in labour and capital. It includes only technological change that is not embodied in new capital goods.
[10] A more detailed breakdown of labour productivity growth within the paper manufacturing sub-industries and the wood product manufacturing sub-industries is available in the appendix in Figure VIII-1 and Figure VIII-2

Figure III-8: Labour Productivity in the Forest Sector Industries



Source: Centre for the Study of Living Standards.
Note: Labour productivity is measured as Real GDP per Hour Worked.

Trends in productivity impact labour in a couple of ways. First, productivity is correlated with wages. According to classical economic theory a worker's wage is equal to what that worker produces. Therefore, highly productive workers will be highly paid and less productive workers will be paid less. When labour productivity is declining, wages in that industry should also be declining and vice-versa. Why then did real wages fall in the wood products manufacturing and forestry & logging industries between 1996 and 2001 even though productivity increased by 3.9% and 7.1% respectively?[11] One explanation is that wages are "sticky," meaning they are slow to adjust to changes in supply, demand or productivity. A variety of factors can cause wages to stick, but one of the most common is labour contacts because they typically set wages and benefits for multiple years. Changes to a labour contract can only be made through negotiations and as a result, wages adjust with a time lag. For example, sticky wages may shed some light on wage behaviour in the wood products manufacturing and forestry & logging industries. The decrease in real wages over the 1996-2001 period could have been the lagged result of negative productivity growth in the preceding period (1990-1995).[12] Secondly, labour productivity affects labour demand. When labour productivity is rising, each worker is producing more output and therefore, fewer workers are needed to produce the same amount of output. When a firm's production is constant or decreasing, the firm would shed workers.

Any outlook for labour demand is subject to factors that place that forecast at risk.

[11] Data on real wages in presented in Section V.B.4
[12] Sticky wages is one *hypothetical* explanation for changes in real wages. An analysis of this specific situation is needed to make a robust identification of all determinants of real wages. For example, other factors such as layoffs and decreasing rates of unionization in the forest industry may have also had an impact on real wages during this time period.

Table III-5 presents three outlooks for labour demand - baseline, high and low - based on different production scenarios for the forest industry over the next 10 years.

Demand Scenarios

a) Baseline Scenario

Production forecasts from industry information provider RISI are used as the baseline production scenario. Between 2005 and 2015 annual production growth is expected to be weak for pulp, paper and paperboard (-0.1%) and softwood lumber (0.3%) while RISI anticipates strong annual growth in other wood products manufacturing production (2.1%).[13]

Forecasted growth in the national wood supply[14] is used to approximate "production" in the forestry and logging industry. Between 2000 and 2010 the wood supply is expected to decrease by 0.2% annually. However, this forecast does not fully take into account the impacts of the Mountain Pine Beetle epidemic in B.C., which is resulting in a temporary increase in the annual allowable cut in that province followed by a longer-term reduction.

Finance Canada is expecting Canadian productivity growth to average 1.7% annually from 2005 to 2029, which is consistent with other sources that foresee annual productivity growth remaining below 2% over the same period. Historically, the forest industry has outperformed the Canadian economy in terms of productivity growth;[15] therefore, forecasted productivity growth has been adjusted to reflect this. However, given that historical productivity growth in the forestry & logging industry has fluctuated dramatically, productivity in that industry is forecasted to grow at its 15-year historical annual average rate of 2.3%.

[13] In the context of the production forecast, "other wood products" includes panels, particle board and medium density fiberboard. This figure serves as a proxy for forecasted production growth in Veneer, Plywood and Engineered Wood Product Manufacturing (NAICS 3212) and Other Wood Product Manufacturing (NAICS 3219).
[14] Data on Canada's wood supply is sourced from the *Wood Supply in Canada 2005 Report* by the Canadian Council of Forest Ministers (CCFM).
[15] As a simplifying assumption forecasted labour productivity growth is held constant regardless of the production scenario.

Table III-5: Forecasted Annualized Labour Demand Growth, 2005 - 2015

	Annualized Growth, 2005 - 2015		
	Production	Labour Productivity	Labour Demand
Paper and Paperboard			
Low Demand Scenario	-1.0%	3.0%	-4.0%
Baseline Scenario	**-0.1%**	**3.0%**	**-3.1%**
High Demand Scenario	2.0%	3.0%	-1.0%
Pulp			
Low Demand Scenario	-0.7%	2.0%	-2.7%
Baseline Scenario	**-0.1%**	**2.0%**	**-2.1%**
High Demand Scenario	1.0%	2.0%	-1.0%
Panels, Particle Board & Other Wood Products			
Low Demand Scenario	1.0%	3.5%	-2.5%
Baseline Scenario	**2.1%**	**3.5%**	**-1.4%**
High Demand Scenario	4.0%	3.5%	0.5%
Lumber			
Low Demand Scenario	-1.0%	2.5%	-3.5%
Baseline Scenario	**0.3%**	**2.5%**	**-2.2%**
High Demand Scenario	1.1%	2.5%	-1.4%
Forestry, Logging & Support Activities			
Low Demand Scenario	-0.3%	2.3%	-2.6%
Baseline Scenario	**-0.2%**	**2.3%**	**-2.5%**
High Demand Scenario	1.0%	2.3%	-1.3%

Source: RISI; Centre for the Study of Living Standards; Statistics Canada, *Labour Force Survey;* Canadian Council of Forest Ministers.

Under this simplified forecast, the outlook for labour demand in the forest sector industries over the next 10 years is poor. None of the forest sector industries are expected to experience positive annual average growth in labour demand under the baseline scenario and only the panels, particleboard and other wood products manufacturing industries will see positive labour demand under the high demand scenario. Using the forecasted annual average growth rates, employment in the forest sector industries will decline over the next 10 years under all three scenarios. The decrease in employment will range between 24,000 and 88,400 (Table III-6).

Table III-6: Forecasted Employment Levels in 2015

	Paper & Paperboard	Pulp	Other Wood Products	Lumber	Forestry, Logging & Support Activities	Total
Current Employment Level (LFS 2005):						
2005 Annual Average	47,100	54,200	92,100	77,200	69,500	339,900
Forecasted Employment Level (2015):						
Low Demand Scenario	31,300	41,200	71,500	54,000	53,500	251,500
Baseline Scenario	34,000	44,000	80,000	62,000	54,000	274,000
High Demand Scenario	43,000	49,000	97,000	67,000	61,000	316,000

Along with weak overall demand for labour, the type of labour demanded by the forest industry will also likely change significantly. A report by the Centre for the Study of Living Standards (2004) on labour productivity in Canada's natural resource industries from 1961 to 2000, found that technological change and capital deepening were the primary forces behind productivity gains in the forest industry during that time period. Human capital accumulation, in term of educational attainment, made a significant contribution, but its contribution was less than that of physical capital investment. In the 1990s the contribution of technological change increased significantly in all three of the forest sector industries due to innovations in the production process such as computerization.

Historically, firms in the forest industry have made larger productivity gains through investing in R&D and capital equipment than they have through skills and labour. Given the competitive challenges confronting the industry, this trend is expected to continue assuming that sufficient capital remains available to Canadian forest product companies. The increased use of sophisticated machinery and technologies together with a shift in product focus towards innovative, value-added products will alter labour demand. Demand for low-skilled workers is expected to be weak, while demand for high-skilled, computer savvy workers is expected to be strong.

b) Low Demand Scenario

Under a low demand scenario, exit from the forest sector industries will remain high or even accelerate. There are multiple factors that would contribute to such a scenario; three of the most salient are highlighted here.

Energy prices remain high as does the value of the Canadian dollar

The unprecedented appreciation of the Canadian dollar since 2002 has had an adverse effect on the country's manufacturing industries, including the forestry sector. Since January 21, 2001 when the Canadian dollar hit an all-time low of $0.62 US, it has appreciated by over 45% and now hovers close to the $.90 US mark. The rapid appreciation of the loonie is mainly attributed to high global demand for commodities – crude oil in particular. This upsurge in demand by rapidly developing countries such as

India and China combined with political instability in some oil-producing nations has lead to skyrocketing oil prices. In the first half of 2006 the price of crude oil traded at record levels, surpassing $70 US per barrel on a number of occasions (EAI, 2006). At the time of writing, the price per barrel was close to $60 US up by almost $30 US per barrel from the same time in 2002. The strong correlation between the value of the Canadian dollar and commodity prices has led some to begin referring to the loonie as a petrocurrency.

The rising Canadian dollar impacts the bottom lines of Canadian manufacturers by reducing Canadian dollar-revenue for Canadian firms (as most forest products are prices in US dollars) while also increasing the relative costs of producing in Canada. As long as the Canadian dollar remains high, export-oriented manufacturing industries, like the forest sector industries, will continue to suffer.

Moreover, the booming oil and gas sector attracts investment and labour away from other sectors of the economy. Anecdotal evidence indicates that some employers in the forest industry, particularly those in regions close to Alberta's oil and gas sector such as the B.C. interior, are experiencing retention and recruitment difficulties owing to the skilled labour shortage in the extractive industries.

Housing market-led recession in the American economy

Housing market indicators are some of the key indicators of demand for the forest industry as residential construction[16] is one of the primary end-uses of wood products. Most of Canada's softwood lumber and panels are destined for export, with the largest share going to the US. Over the last few years both the US and Canadian housing market have been booming thanks to record low interest rates and strong labour markets. While the Canadian housing market remains fairly strong, the US market has weakened significantly in 2006. Though initial forecasts called for a 'soft landing', recent data indicate that the downturn in the housing market may be sharper than previously forecasted. Housing starts, existing home sales, mortgage applications, building permit and even consumer confidence have declined in 2006. Should the US housing market crash, Canadian wood producers would be faced with a sharp and potentially extended decline in demand and product prices.

Early termination of the Softwood Lumber Agreement

The softwood lumber agreement between Canada and the United States went into effect on October 12, 2006. The term of the agreement is for seven years with an option to extend the agreement for an additional two years. Either party can pull out of the deal after 18 months provided 6-months' notice is given. After the deal has expired, the U.S. faces a 12-month moratorium on initiating new trade remedies. This moratorium also applies in the case of early termination.

Termination of the softwood lumber agreement would bring greater uncertainty to the forest sector.

[16] Residential construction includes the construction of new homes as well as the repair and remodeling of existing homes.

c) <u>High Demand Scenario</u>

The following factors would contribute to high labour demand by the forest sector:

Downturn in US housing market is 'soft' and isolated to specific markets

The housing boom has been uneven across the US. Growth has been lead by 'hot' markets – California, Nevada, Florida, the East Coast and the condominium market. If price corrections are mainly isolated to these once-hot markets, the impact on the forest industry would be minimized. Condominiums and other large multi-residential building construction is not as important an end-use of wood products as single-family residential construction. Also, while prices have doubled since 2003 in "superstar cities" such as Las Vegas, Los Angeles and Miami, and increased by 50% in New York and San Francisco, it is unlikely that these cities will lose their allure anytime soon (Leonhardt and Bajaj, 2006). Price corrections in these locations would therefore be mitigated.

Canadian producers realign themselves towards value-added manufacturing

It is difficult for Canadian producers to compete on a cost-basis with offshore producers in China, Russia and South America. Movement into value-added manufacturing and niche markets may be the only solution for many Canadian producers to remain competitive.

The scope for value-added manufacturing in wood products is enormous. The strength of the North American housing market has supported tremendous growth in a range of wood products from lumber for building to hardwood flooring, window and door frames. The wood products manufacturing industry employs the most people within the forest industry. Canadian producers must continue to introduce product and process innovations; offshore producers are also recognizing the higher profit margins available in value-added production and beginning to invest in this area (Moazzami, 2006: 106).

Pulp and paper producers can benefit from targeting niche product markets or non-traditional end-use markets. Forecasters see continued strong growth in the hygiene paper products and container board markets as incomes rise (RISI, 2005c: 5). Cellulose producers, such as Neucel, are targeting the high-quality end of the specialty cellulose market – pharmaceuticals, vision wear, electronics and agri-chemicals.[17]

A shift in production towards value-added and specialty products will consequently shift labour demand. In the value-added market, producers compete on the basis of quality and service (Moazzami, 2006). New quality control systems and measures may require new machinery and equipment or specially trained workers. In light of the long-term productivity trends described in section III.C.1, firms in the forest industry are more likely to invest in machinery and equipment than human capital. Therefore, demand for skilled labour, experienced in the use of sophisticated machinery will be high while demand for low-skilled workers will be weak. Moreover, to effectively produce and sell a specialty product, producers will need people trained or experienced in sales and marketing.

[17] See company website, www.neucel.com.

Canadian producers leverage Canada's status as global leader in certification

As environmental issues continue to hold public attention, forest certification has become a marketplace reality, especially in Europe and the United States, two of Canada's key forest products markets. Both the wood products manufacturing and paper industries can take advantage of Canada's position as global leader in forest certification.[18]

Canada currently has approximately 120 million hectares of forest certified to one of the three third-party certification programs available in Canada: Canadian Standards Association (CSA), Sustainable Forestry Initiative (SFI) or Forest Stewardship Council (FSC).[19] Global demand for forest certified products is likely to grow as retailers respond to consumer concerns regarding corporate social responsibility and as governments implement green procurement policies. Ensuring Canadian certification systems are globally recognized is integral to allowing Canadian producers to take advantage of these global trends.

3. Canadian Occupational Projection System

Human Resources and Social Development Canada has developed a family of economic models called the *Canadian Occupational Projection System* (COPS) to forecast Canada's labour market outlook on an industrial and occupational basis. The system takes into account both the supply and demand for workers broken down by industry and occupation.

On the labour demand side, the analysis examines two sources of job openings – new job creation (expansion demand) and openings from workers leaving the workforce (replacement demand). The latter comes mainly through retirements, but also includes attrition through death.

According to the COPS model, labour demand in the forest sector will be weak and driven almost exclusively by retirements with few *new* jobs being created. Between 2006 and 2014, COPS predicts that the average employment level in Canada will increase by 9.0%. Within the forest-specific occupations however, only *Woodworking machine operators* (J193) are forecast to experience higher than average employment growth. Most forest occupations are expected to see employment growth rates far below average (Table III-7). The model also predicts that between 2006 and 2014 the average rate of retirement for all occupations will be 2.4%.[20] The rate of retirement varies by forest-specific occupation; however, many occupations are anticipated to have rates of retirement that are above average.

[18] To learn more about Canada's global standing in forest certification visit the Canadian Sustainable Forestry Coalition website www. Certificationcanada.org.

[19] While in Canada, there are three standards available for use to organizations wishing to have their forest areas certified, at the international level, there are two main umbrella recognition programs: FSC and the Programme for the Endorsement of Forest Certification schemes (PEFC).

[20] The rate of retirement is the proportion of persons retiring relative to total persons employed.

Table III-7: COPS Forecasted Employment Growth and Rate of Retirement by Forest-Specific Occupation, 2006 - 2014

NOC-S	Occupation	Employment Growth Rate (%)	Average Retirement Rate (%)
C022	Forestry professionals	-3.7	2.0
C123	Forestry technologists and technicians	5.0	2.3
I111	Supervisors, logging and forestry	-3.8	2.7
I151	Logging machinery operators	-4.4	2.8
I161	Chain-saw and skidder operators	-5.8	3.4
I162	Silviculture and forestry workers	-5.6	3.4
I216	Logging and forestry labourers	-2.8	1.4
J015	Supervisors, forest products processing	-0.5	4.3
J113	Pulping control operators	1.7	3.7
J114	Papermaking and coating control operators	2.3	3.7
J141	Sawmill machine operators	4.6	1.9
J142	Pulp mill machine operators	6.3	1.9
J143	Papermaking and finishing machine operators	6.3	1.9
J144	Other wood processing machine operators	4.7	1.9
J145	Paper converting machine operators	6.4	1.9
J146	Lumber graders and other wood processing inspectors and graders	4.7	1.9
J223	Other wood products assemblers and inspectors	5.8	1.4
J193	**Woodworking machine operators**	**10.0**	**1.4**
J314	Labourers in wood, pulp and paper processing	-0.9	2.2
	Average for all occupations in all industries	**9.0**	**2.4**

Source: Human Resources Social Development, *Canadian Occupational Projection System*

Table III-8 breaks down net job openings into its two components to illustrate how retirements are expected to drive labour demand in the forest-specific occupations. For example in 2006, COPS predicts that there will be approximately 11,842 employed as *Forestry technologists and technicians* (C123). By 2014 the employment level is expected be 12,429 – an increase of 587 or 5.0%. Over the same time period a total of 2,783 positions will open up due to retirements and deaths while only 587 *new* jobs will be created for a total of 3,369 net job openings. Anticipated weak job creation in the forest occupations is a reflection of the structural changes and the poor economic outlook in the forest sector.

Table III-8: Forecasted Labour Demand by Forest-Specific Occupation, 2006 - 2014

NOC-S	Occupation	Expansion Demand	Replacement Demand	Net Job Openings
C022	Forestry professionals	-231	1,178	947
C123	Forestry technologists and technicians	587	2,783	3,369
I111	Supervisors, logging and forestry	-344	2,816	2,472
I151	Logging machinery operators	-622	4,600	3,978
I161	Chain-saw and skidder operators	-689	3,917	3,228
I162	Silviculture and forestry workers	-365	2,152	1,787
I216	Logging and forestry labourers	-208	1,065	857
J015	Supervisors, forest products processing	-102	8,206	8,104
J113	Pulping control operators	18	398	416
J114	Papermaking and coating control operators	50	808	858
J141	Sawmill machine operators	884	3,718	4,602
J142	Pulp mill machine operators	533	1,692	2,225
J143	Papermaking and finishing machine operators	340	1,066	1,406
J144	Other wood processing machine operators	452	1,862	2,314
J145	Paper converting machine operators	619	1,924	2,542
J146	Lumber graders and other wood processing inspectors and graders	518	2,133	2,651
J223	Other wood products assemblers and inspectors	1,205	3,054	4,259
J193	Woodworking machine operators	2,128	3,295	5,423
J314	Labourers in wood, pulp and paper processing	-319	7,674	7,355

Source: Human Resources Social Development, *Canadian Occupational Projection System*

In line with the occupational forecasts above, overall employment growth in the forest sector industries is also expected to be below average for goods producing industries. In a study by Bergeron *et al.* (2004), the authors use the COPS model to predict Canada's future labour market outlook by industry. They find that the outlook for the forestry & logging industry is especially bleak; the industry will continue to shed jobs over the next ten years. Employment in the wood products and pulp & paper industries will fair slightly better. However, neither industry is expected to experience particularly strong employment growth.

Unlike Bergeron *et al.* our analysis predicts that overall employment demand across the forest sector industries will be weak resulting in decreased employment in all of the forest sector industries including the pulp & paper and wood products industries. However, the wood products industry (excluding lumber) is the sole sub-industry that would experience employment growth under a high demand scenario.

IV. Labour Supply Issues

A. Demographic Profile of Labour Force

1. Gender

In 2001, women made up 41% of full-time and 55% of part-time workers in the Canadian economy. The forest sector, however, remains predominantly male (Table IV-1). In the forest industry women made up less than 13% of full-time workers and less than 18% of part-time workers in 2001. Forestry & logging, the industry which had the highest share of part-time employment also had the highest share of women employed. Conversely, the pulp & paper industry, which has the lowest proportion of part-time employment (see previous Figure III-6), had the lowest share of women in its workforce.

Table IV-1: Workforce Diversity in the Forest Industry, 2001

	Share of Total Employees	
Industry	**Female**	**Aboriginal**
Full-time Full-year Employed:		
Forestry and Logging	14.8%	5.8%
Wood Industries	13.3%	3.5%
Pulp and paper industries	10.7%	2.5%
Forest Industry	**12.8%**	**3.5%**
Other Forest Sector(1)	**18.3%**	**2.1%**
Canadian Average	**41.2%**	**1.8%**
Part-Time & Other Employed:		
Forestry and Logging	18.7%	9.5%
Wood Industries	17.7%	4.9%
Pulp and paper industries	16.1%	3.2%
Forest Industry	**17.8%**	**6.4%**
Other Forest Sector(1)	**22.5%**	**5.9%**
Canadian Average	**54.5%**	**2.7%**

Source: Statistics Canada, *2001 Census.*
(1) Estimated as employment in forest-specific occupations (by NOC-S) outside forest industry.

In the rest of the forest sector women were better represented, but still well below national averages; women held over 18% of full-time jobs and nearly 23% of part-time jobs.

The distribution of women by forest-specific occupation was very similar to that of men. Both genders were heavily concentrated in the lower skilled occupations where the greatest numbers of jobs are found. The most common forest occupation for both men and women in 2001 was *Labourer in wood, pulp and paper processing*, not surprising since this occupation employs the most workers. However, certain physically demanding occupations, like *Chain-saw and skidder operator* and *Logging machine operator*, were less common occupations for women.

Table IV-2: Most and Least Common Forest Occupations by Gender, 2001

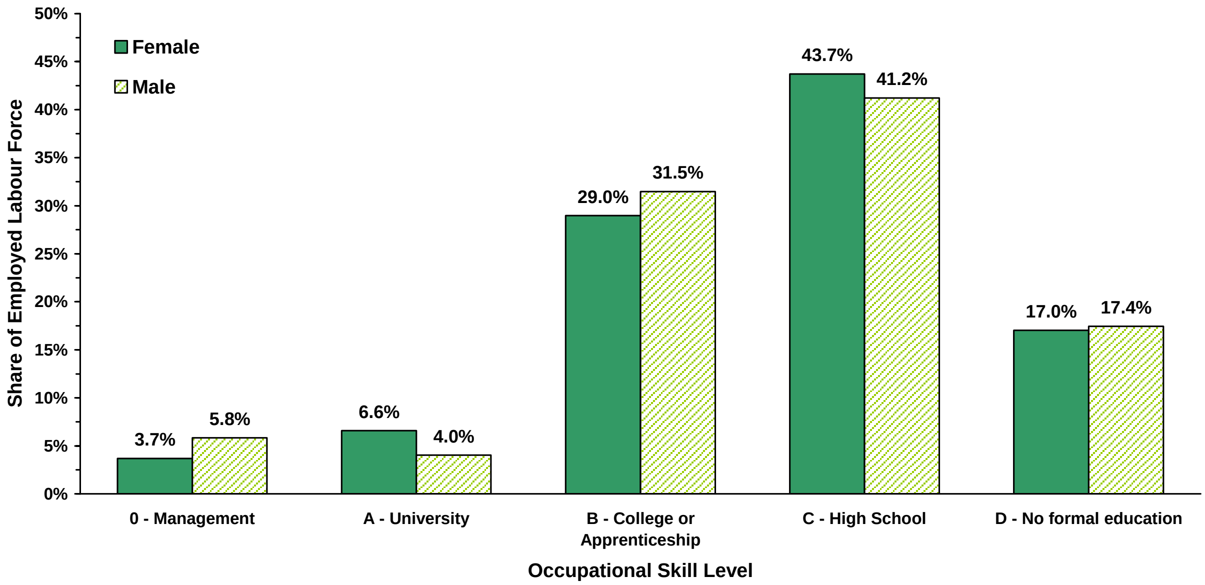
Most Common Occupations	
Women	***Men***
• Labourers in wood, pulp and paper processing (J314) • Logging and forestry labourers (I216) • Woodworking machine operators (J193)	• Labourers in wood, pulp and paper processing (J314) • Chain-saw and skidder operators (I161) • Sawmill machine operators (J141)
Least Common Occupations	
Women	***Men***
• Pulping control operators (J113) • Papermaking and coating control operators (J114) • Pulp mill machine operators (J141)	• Pulping control operators (J113) • Papermaking and coating control operators (J114) • Papermaking and finishing machine operators (J143)

Source: Statistics Canada, *2001 Census*.
Note: Includes employees in all industries.

Women employed in the forest sector tended to be concentrated either in the higher skilled occupations that require a university education (level A) or the lower skilled occupations requiring completion of a high school diploma (level C). Relative to men, women were less likely to be employed in management (level 0), occupations requiring college or apprenticeship training (level B), and labouring occupations with no formal educational requirement (level D).[21]

[21] See Table V-9 for a description of skills levels in the NOC system.

Figure IV-1: Forest Sector Employees by Gender and Skill Level, 2001



Source: Statistics Canada, *2001 Census.*
Note: Includes all employed in forest industry and forest-specific occupation outside of the forest industry.

2. Aboriginal Status

The forest sector employs a higher proportion of Aboriginal workers than average. In 2001, 3.5% of full-time workers and 6.4% of part-time workers in the forest-sector industries were Aboriginal (Table IV-1) compared to an average of 1.8% and 2.7%, respectively, for all Canadian industries. Within the forest industries, forestry & logging had the highest proportion of Aboriginal workers while pulp & paper had the lowest. As with female workers, forestry & logging, which has more part-time positions, also has the highest share of Aboriginal workers. Pulp and paper has the smallest share of Aboriginal employees and less part-time and seasonal employment.

Though Aboriginal workers were less represented outside the forest industry than inside, the proportion of Aboriginal workers in the rest of the forest sector was still higher than average for all Canadian industries.

The distribution of Aboriginal workers by forest occupation did not differ significantly from that of non-Aboriginal workers. For both groups the most common occupation was *Labourer in wood, pulp and paper processing*. However, certain occupations that were common for non-Aboriginal workers were less common for Aboriginal workers (e.g. *Woodworking machine operators*).

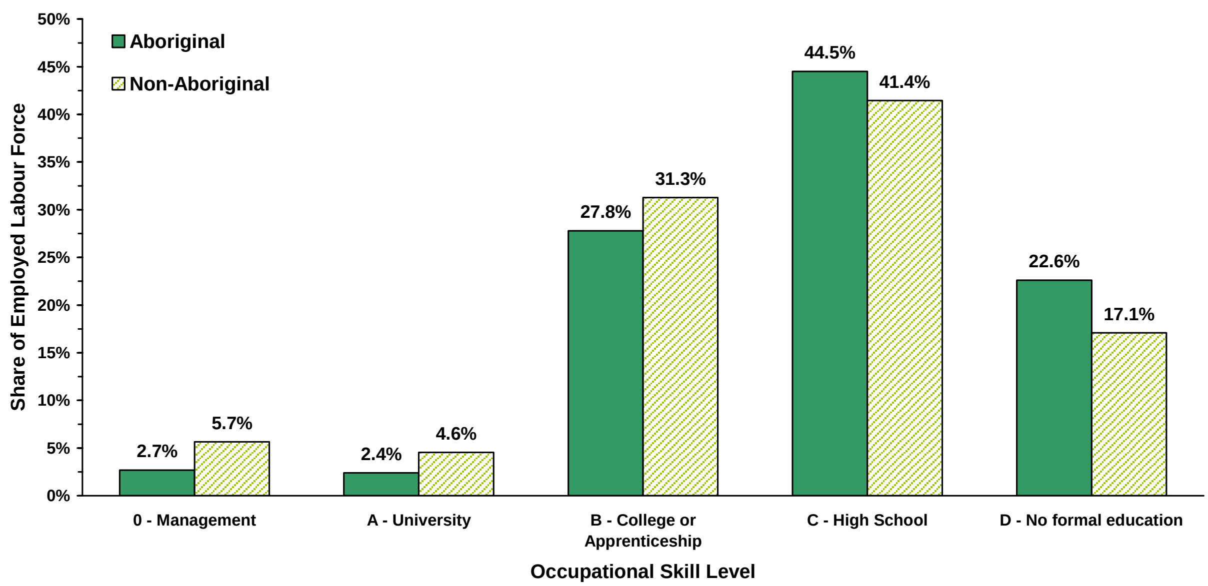
Table IV-3: Most and Least Common Forest Occupations by Aboriginal Status, 2001

Most Common Occupations	
Aboriginal	***Non-Aboriginal***
• Labourers in wood, pulp and paper processing (J314) • Silviculture and forestry workers (I162) • Logging and forestry labourers (I216)	• Labourers in wood, pulp and paper processing (J314) • Woodworking machine operators (J193) • Other wood products assemblers and inspectors (J223)
Least Common Occupations	
Aboriginal	***Non-Aboriginal***
• Pulping control operators (J113) • Papermaking and coating control operators (J114) • Papermaking and finishing machine operators (J143)	• Pulping control operators (J113) • Papermaking and coating control operators (J114) • Papermaking and finishing machine operators (J143)

Source: Statistics Canada, *2001 Census*.
Note: Includes employees in all industries.

However, Aboriginal persons employed in the forest sector tend to be concentrated in the lower skilled occupations. They are less likely to be employed in management or professional occupations relative to non-Aboriginal employees. In 2001, only 2.7% of Aboriginal persons employed in the forest sector were employed in occupations at Skill Level 0 (management occupations) compared to 5.7% of non-Aboriginal persons (Figure IV-2). Conversely 22.6% of Aboriginal persons in the forest sector were employed in Skill Level D occupations (jobs with no formal education requirement) compared to 17.1% of non-Aboriginal workers.

Figure IV-2: Forest Sector Employees by Aboriginal Status and Skill Level, 2001

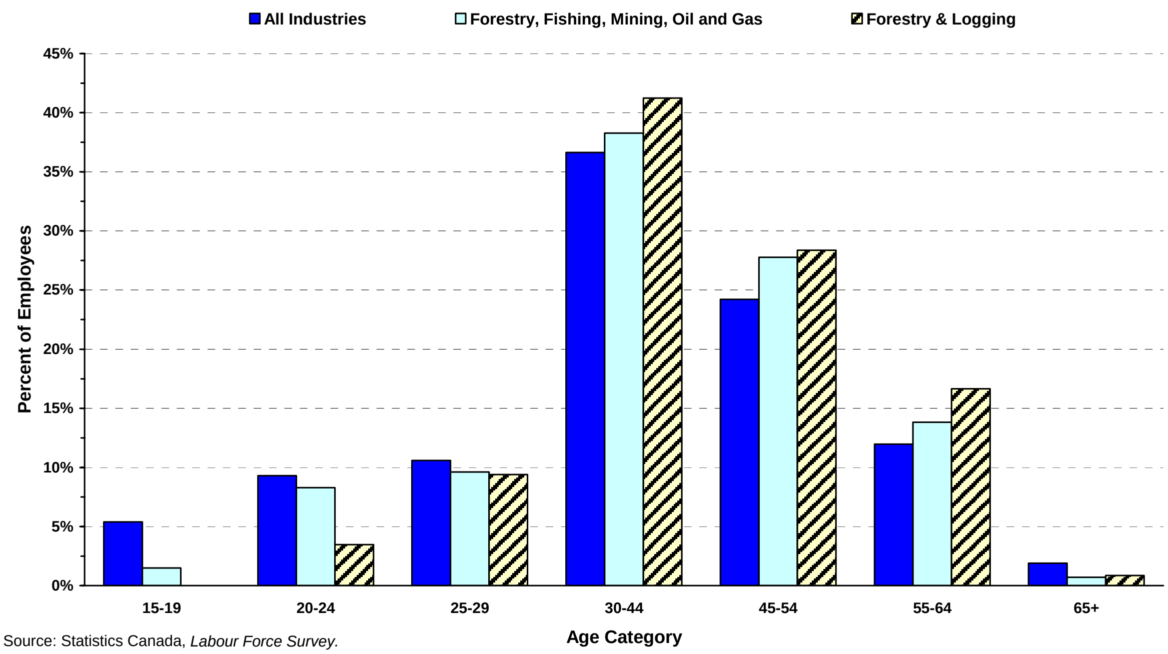


Source: Statistics Canada, 2001 Census.
Note: Includes all employed in forest industry and forest-specific occupation outside of the forest industry.

3. Age

The natural resource industries have a larger proportion of older workers relative to the overall Canadian economy; over 42% of workers are over the age of 45 compared to 38% of workers in all industries. The forestry and logging industry (including support activities) has an even larger proportion of older workers; 46% of employees are over 45.

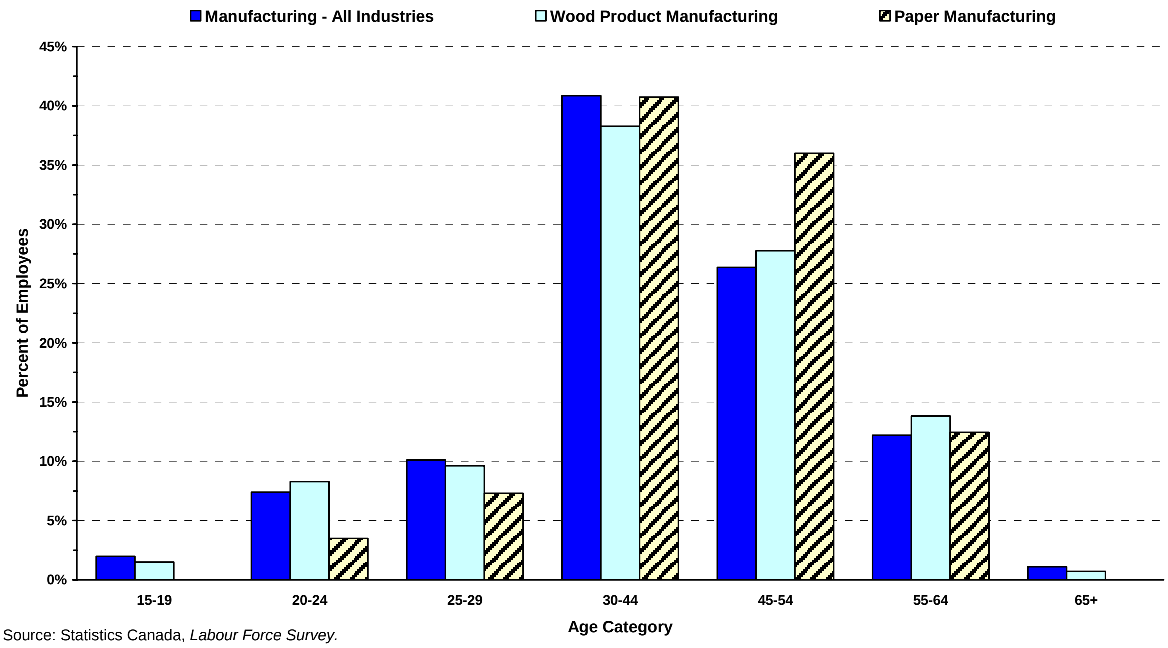
Figure IV-3: Age Groups in the Natural Resources Industries, September 2005



Source: Statistics Canada, *Labour Force Survey.*

Relative to the manufacturing sector, wood product manufacturing has a relatively young workforce; 27% of workers are under 30 and 35% are over 45. Paper manufacturing, on the other hand, has an older workforce – over 48% are over the age of 45 and fewer than 11% are under 30.

Figure IV-4: Age Groups in the Manufacturing Industries, September 2005



Source: Statistics Canada, *Labour Force Survey.*

The workers' average age of retirement affects the age profile of an industry's workforce. The average retirement age in the forest industry varies by sub-industry (Table IV-4). In general, the average age of retirement in the wood products and paper manufacturing industries has been higher than average. In forestry & logging, the average age has fluctuated dramatically – from as low as 40 years to as high as 71 years. This variation may be a reflection of the high flows of leavers and entrants from that industry.

Table IV-4: Average Retirement Age in the Forest Sector Industries, 1991 - 2002

Year	All Industries	Forestry & Logging	Wood Product Manufacturing	Paper Manufacturing
1991	59.9	63.0	59.5	60.5
1992	59.9	65.0	60.2	59.3
1993	59.5	53.0	62.2	59.7
1994	59.5	40.0	62.8	61.0
1995	59.7	71.0	62.4	60.6
1996	59.6	43.0	61.8	60.0
1997	58.8	64.7	59.7	61.2
1998	59.5	60.0	60.5	60.4
1999	59.4	55.7	62.6	59.5
2000	59.3	58.3	60.4	60.4
2001	59.2	62.2	60.6	61.1
2002	59.5	58.8	63.0	59.6
Average	**59.5**	**57.9**	**61.3**	**60.3**

Source: Statistics Canada, *Longitudinal Worker File.*

More recent data on retirement age by sub-industry is needed given the large number of job losses across the forest industry within the last couple of years. Moreover, insufficient data exists on retirement age by forest-specific occupation. In the absence of such data, we rely upon historical data by broad occupational category from the *Labour Force Survey.* The average retirement ages in 1987 and 2005 for broad occupational categories, that encompass forest-specific occupations[22] are found in Table IV-5.

Table IV-5: Average Retirement Age by Major Occupational Group, 1987 & 2005

	Average Retirement Age	
Occupational Category	**1987**	**2005**
Natural & Applied Sciences & Related Occupations	60.9	62.8
Occupations in Social Science, Education, Government Service and Religion	60.7	58.4
Occupations Unique to Primary Industry	64.7	65.3
Occupations Unique to Processing, Manufacturing and Utilities	64.6	60.6
All Occupations	64.3	61.0

Source: Statistics Canada, *Labour Force Survey.*

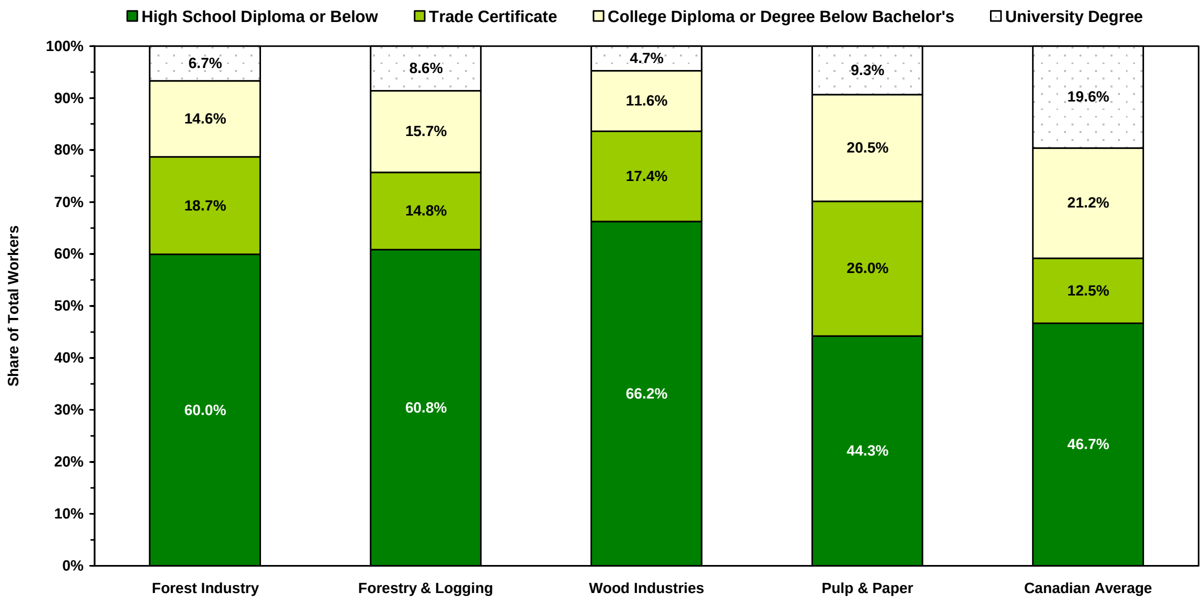
The average retirement age for all occupations decreased between 1987 and 2005, dropping from 64.3 to 61 years of age. A similar decrease was experienced for occupations in social science, education, government service and religion; and occupations unique to processing, manufacturing and utilities. The first category would include foresters working in government service and educational institutions while the second category covers forest occupations in pulp & paper and wood product manufacturing. Conversely, the average retirement ages for both occupations in the natural and applied sciences and occupations unique to primary industry increased over the time period. The former category includes the occupations of *Forestry Professionals* and *Forest Technicians and Technologists* while the latter category includes occupations related to forestry and harvesting.

4. Educational Attainment

According to 2001 Census data, the forest industry has a larger proportion of employees who have a high school education or less (60%) compared to average (47%). Also, a smaller proportion of workers in the forest industry are college or university educated (21% compared to 41%). However, a larger proportion has obtained a trade diploma or certificate. This is especially true in the pulp & paper industry, where 26% of employees have completed trades school compared to 13% for all industries.

[22] For more information on the classification of occupations see http://www.statcan.ca/english/Subjects/Standard/soc/2001/nocs01-menu.htm.

Figure IV-5: Educational Attainment by Forest Sector Industry, 2001



Source: Statistics Canada, *2001 Census* .
Note: Includes all employed.

Educational attainment has serious implications for training, productivity and hence competitiveness. With such a large proportion of workers with a high school education or less, basic numeric and literacy skills will require upgrading to keep pace with changing technology.

B. Sources of Labour

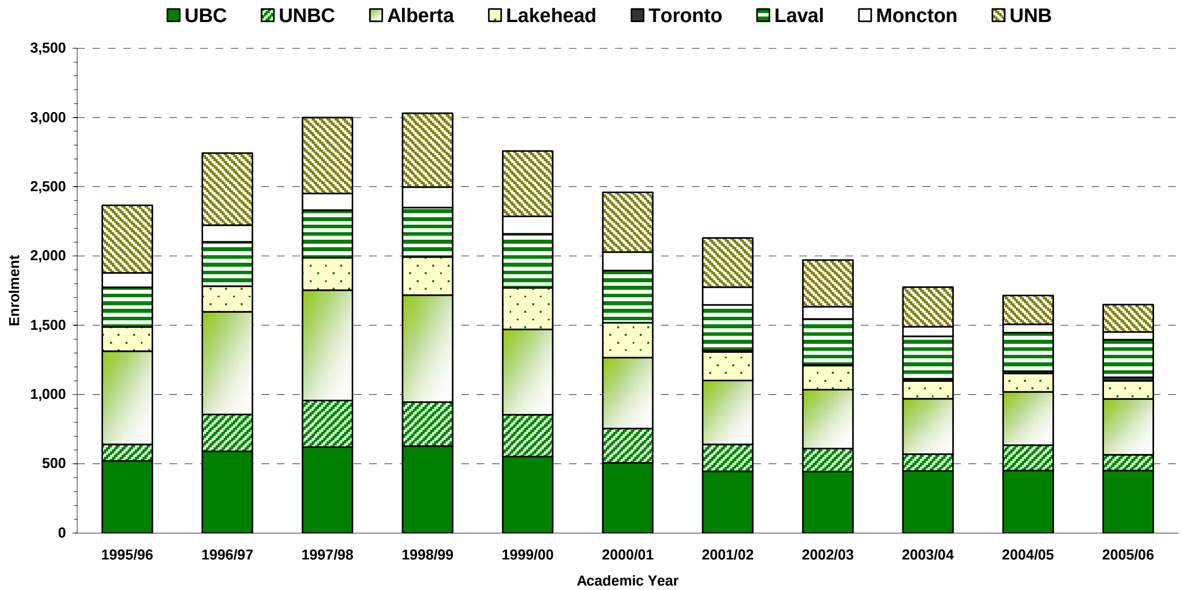
1. Forestry Schools and Colleges

One of the main constraints on the supply of labour is the length of time it takes to train new workers. Typically the higher the skill level of the occupation, the longer a worker must train to meet the minimum requirements. Completing a post-secondary forestry program is often just the first step in becoming a forest practitioner.

a) Enrolment Trends

Since peaking at over 3,000 in the 1998/99 academic year, undergraduate enrolment in Canadian university forest programs has declined by nearly 46% (Figure IV-6). A similar downward trend appears to exist in college-level forest programs. In a survey conducted in the Fall/Winter of 2005 by the National Forest Strategy Coalition, 11 out of 12 responding colleges reported drops in enrolment. Since 2000 these 12 colleges have witnessed a combined decrease in enrolments of 28% (NFSC, 2005).

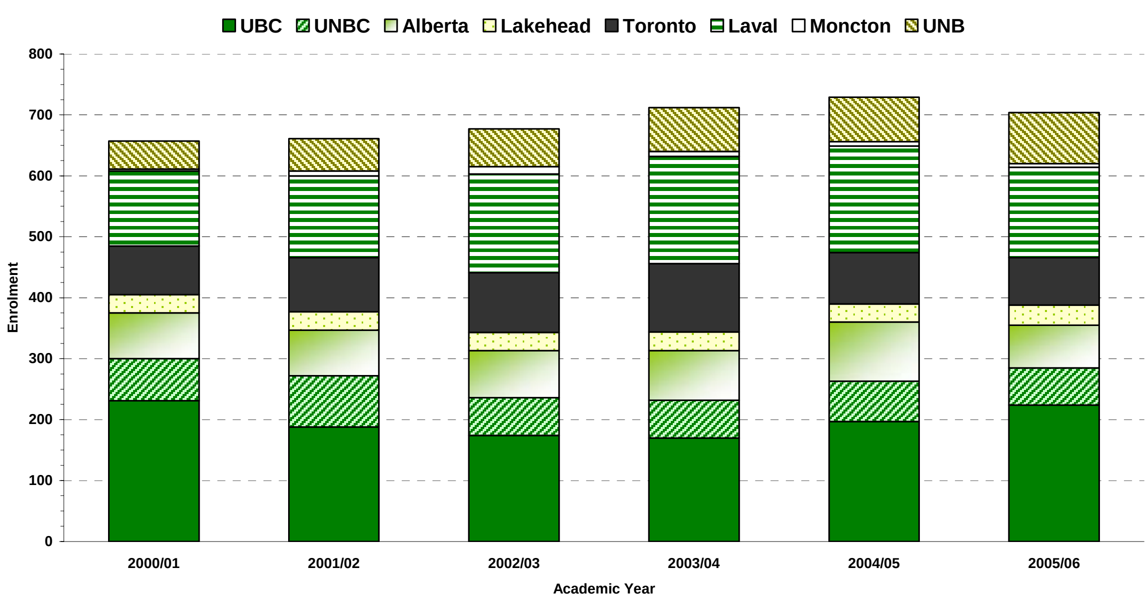
Figure IV-6: Undergraduate Enrolment in Canadian University Forest Programs



Source: Dr. Susan Watts (University of British Columbia), 2006 on behalf of the Association of University Forestry Schools and Colleges (AUFSC).
Note: Includes non-CFAB accredited degree programs.

Conversely, enrolment in graduate programs has remained fairly steady and has even increased since 2000. Given that there must be at least a four-year lag between trends in undergraduate and graduate enrolment, a corresponding decline in graduate enrolment may yet be forthcoming. However, it is unlikely that any such decline would be as dramatic as that of undergraduate enrolment as graduates enrolment have been stable historically relative to undergraduate enrolments.

Figure IV-7: Graduate Enrolment in Canadian University Forestry Programs



Source: Dr. Susan Watts (University of British Columbia), 2006 on behalf of the Association of University Forestry Schools and Colleges (AUFSC).

b) Female Students

While female undergraduates now outnumber their male counterparts on many Canadian campuses, forestry programs remain predominantly male. In the 2002/2003 academic year only 27.8% and 12.0% of the students enrolled in forestry and forest engineering undergraduate programs, respectively, were female (CAUT, 2006).

Female representation is higher in graduate forestry programs; 43.7% of the students enrolled in master's programs in forestry were women and the same could be said of 41.7% of students in forest engineering (CAUT, 2006).

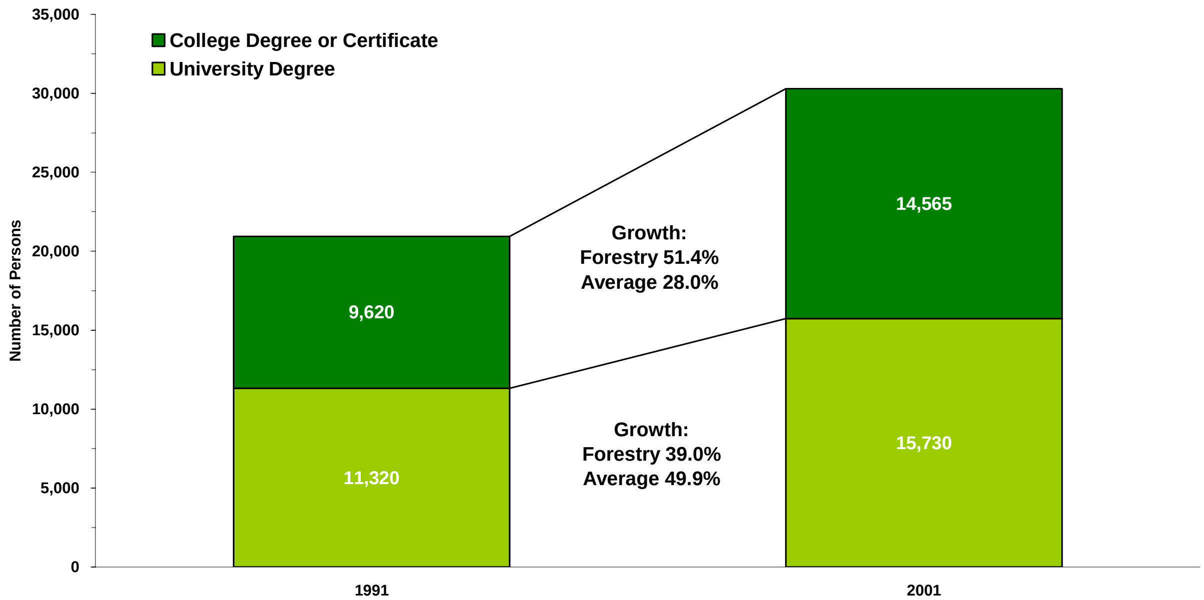
Female students are increasingly drawn away from traditional forestry programs and towards interdisciplinary environmental science programs in conservation and policy. For example, in the 2002/2003 academic year women accounted for 59.9% and 54.5% of enrolment in natural resource conservation & research and natural resource management & policy undergraduate programs, respectively (CAUT, 2006). Forestry schools and The Canadian Institute of Forestry (2005) find this trend particularly alarming: "[I]f the pool of potential students consists of an increasing number of females over time, and female students are more attracted to non-traditional programs, then the trend of decreased enrolments in forestry programs could continue to head downward."

c) Graduation Trends

The field of study data collected through the Census can be used to estimate the pool of potential professional foresters at a given point in time.[23] From 1991 to 2001 the number of people citing forestry as their major field of study at the collegiate or university level increased (Figure IV-8). However, growth in the number of people obtaining university degrees in forestry was 39.0%, which is less than average for all university fields of study (49.9%). Conversely, growth in the number of people obtaining college degrees or diplomas in forestry was 51.4%, which is higher than the average growth rate for all fields of study at the collegiate level (28.0%)

[23] Field of study refers to the field of the highest level of post-secondary education attained.

Figure IV-8: Growth of Forestry as a Field of Study, 1991 - 2001



Source: Statistics Canada, *1991 & 2001 Censuses* and *Cat. No. 97F0018XCB2001001.*
Note: Includes population over 20 years of age and highest level of post-secondary education attained.

Where do forestry graduates end up? Table IV-6 compares the occupational distribution of forestry graduates (identified by field of study) by gender to the distribution of graduates from all fields. As expected a large proportion of people who study forestry at the post-secondary level find work in the natural and applied sciences. This applies to both men (39.7%) and women (36.0%). The second and third most common occupations for men are in management (14.3%) and primary industry-related (11.5%), respectively. On the other hand, for women the next most common occupations are in business, finance & administration (16.7%) and sales & service (13.2%); both are traditional occupational fields for women.

In the lower half of Table IV-6 we see that this gendered difference in occupations for forestry graduates does not diverge significantly from the national trend (with the exception of occupational group C). However, a smaller proportion of female forestry graduates are employed in management occupations relative to the national average.

Table IV-6: Graduates by Occupational Classification, 2001

Major Occupational Classification	Forestry Men	Forestry Women	Average Men	Average Women
A Management occupations	14.3%	6.3%	13.1%	8.1%
B Business, finance and administration occupations	5.6%	16.7%	9.2%	28.0%
C Natural and applied sciences and related occupations	39.7%	36.0%	9.6%	3.0%
D Health occupations	0.6%	1.5%	2.1%	9.1%
E Occupations in social science, education, government service, religion	4.1%	8.8%	5.0%	11.2%
F Occupations in art, culture, recreation and sport	0.8%	3.3%	2.4%	3.2%
G Sales and service occupations	7.9%	13.2%	18.8%	28.5%
H Trades, transport and equipment operators and related occupations	9.4%	2.2%	25.2%	2.2%
I Occupations unique to primary industry	11.5%	9.4%	5.8%	2.1%
J Occupations unique to processing, manufacturing and utilities	6.1%	2.5%	8.6%	4.7%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Statistics Canada, *Census 2001* and *Cat. No. 97F0018XCB2001041*.
Note: Field of study is determined by highest post-secondary certificate or degree obtained.

According to Service Canada's *Job Futures* website*, Forestry professional* (C022) was the top occupation for graduates from 4-year university forestry programs. However, the next two most common occupations were *Forestry technologists & technicians* (C123) and *Logging & forestry labourers* (I216), occupations that do not require a university degree in forestry. In other words, upon graduation from undergraduate forestry programs many graduates take jobs within the forest industry for which they are overqualified in terms of the educational requirements (see Table III-3). This is an issue that could be further explored using employer and employee surveys.

2. Aboriginal People

With forest sector operations often located in more rural and remote regions of the country, Aboriginal communities have traditionally been an important service provider and source of labour for the sector.[24] In addition to geographic factors, a number of other factors and trends are contributing to the increasing importance of Aboriginal participation in the forest sector.

First, the Aboriginal population is growing faster than the total Canadian population. Between 1996 and 2001 the Aboriginal population is estimated to have increased by 10% while the overall Canadian population grew by less than 5% (Statistics Canada, 2004 & CANSIM). Second, the Aboriginal population is younger than the overall Canadian population. In 2001, over 33% of the Aboriginal population was under 15 years of age, compared with less than 19% of the overall Canadian population. There are also markedly less Aboriginal people over 65 years of age than average (4% versus

[24] This is supported by Census data in Table IV-1 which showed that Aboriginal workers are better represented in the forest industry than average for all Canadian industries.

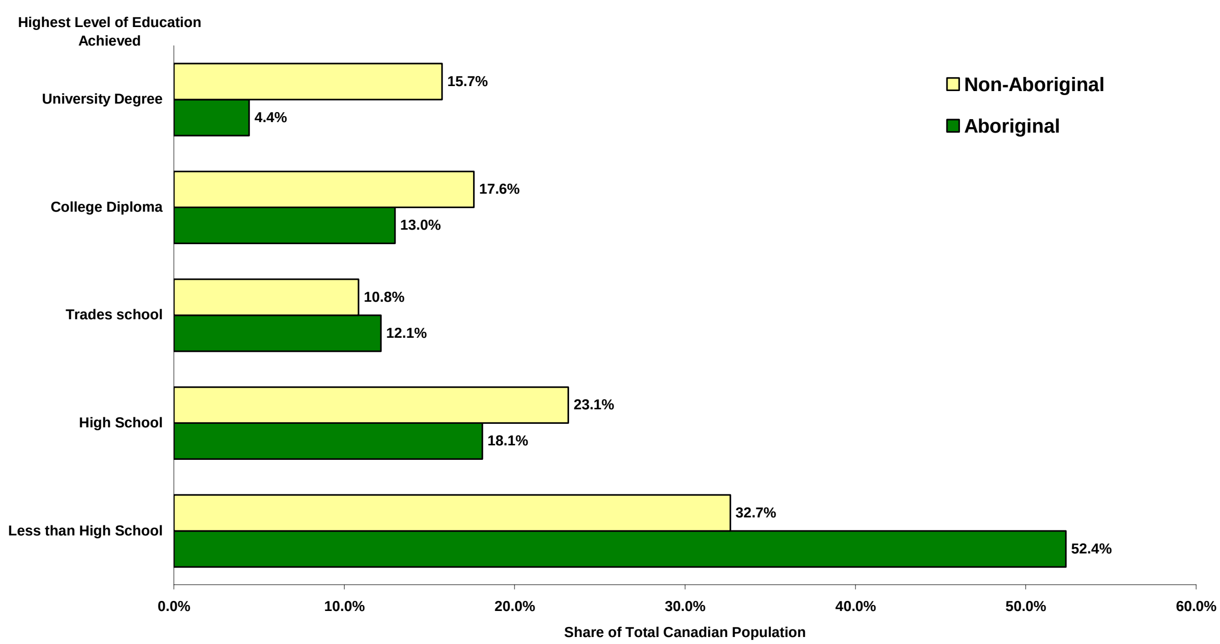
13%). Lastly, the rate of migration into urban centres is lower amongst the Aboriginal population than the non-Aboriginal rural population.

The combination of these factors – geographic proximity, a growing young and fairly rooted population – would imply that Aboriginal communities will continue to play an important role in labour for the forest sector. Many forest companies, such as Weyerhaeuser and Alberta Pacific, recognize this important role and have adopted policies aimed specifically at building strong, mutually beneficial relationships with Aboriginal communities located near their forest operations. Other companies, such as Tembec, have incorporated Aboriginal relations into their corporate social responsibility policies.

However, policies aimed at increasing Aboriginal labour participation will only succeed if prospective Aboriginal workers have the right skills and education to do the job. In 2001, over 52% of the Aboriginal population 15 years and above did not have a high school diploma compared to nearly 33% of the non-Aboriginal population (Figure IV-9). As already mentioned in section IV.A.4, the low levels of educational attainment amongst workers in the forest sector industries present a significant challenge to employers as they adapt to changing technologies. The challenge is even greater amongst the Aboriginal population given the lower incidence of secondary school completion.

One promising segment of the Aboriginal population for the forest industry is that which has completed trade school. In 2001, 12.1% of Aboriginal persons had completed trades school compared to 10.8% of non-Aboriginal persons.

Figure IV-9: Population by Aboriginal Status and by Highest Level of Education Achieved, 2001



Source: Statistics Canada, *Census 2001.*

3. Youth

The typical worker in the forest industry has completed some high school and works in a low-skill, entry-level occupation (see Table III-4). These low barriers to entry make youth a very natural source of labour for these occupations. Furthermore, the large share of part-time and seasonal jobs in forestry would seem to attract students. Yet, despite the relatively high wages in the industry, only 10.4% of employees in the forest industry were below 25 years of age compared to an average of 14.7% for all industries in 2005.[25] The majority of youth employment within the forest industry is attributable to wood product manufacturing, where youth make up 17.1% of employees. Only 3.5% of employees in paper manufacturing and forestry & logging are below 25 (see section IV.A.3).

One factor that may be contributing to the relative lack of youth in the labour force is the high rates of unionization in the forest sector industries. During labour downsizing, non-union members and employees with the least seniority are usually the first to be laid off and younger workers are more likely to belong to both of those groups.

Youth are not only an important labour source for low-skilled, entry-level jobs; building awareness about the forest sector further down the labour supply chain positively impacts on enrolment in post-secondary forestry programs, thereby increasing the number of people training to become forest practitioners.

The forest industry has partnered with educational institutions in the past in order to promote careers in the forest industry to youth. For example, a handful of pulp and papermaking diploma courses were offered in high schools in Quebec from the late 1970s until the mid 1990s, but they appear to have been discontinued because of low enrolment and poor job prospects (Price Waterhouse, 1994). The industry is failing to attract young people and a number of factors are contributing to this trend. Outside forest-dependent communities, awareness about job opportunities in the forest industry among youth is limited. Secondary students in urban areas receive only indirect exposure to the forest sector through courses in biology, outdoor education and wood-working in shop class. Also, many young people who are aware of the forest industry are put off by the industry's poor image (see section IV.C for further discussion).

4. Migration

With high levels of unionization and operations located in smaller communities, the forest industry, pulp and paper in particular, has been historically very insular. In the case of pulp and paper, companies prefer to promote from within and fill entry-level positions through informal referral networks (Price Waterhouse, 1994). As a result of this insularity, workforce migration in the industry is low.

a) Regional

Regional migration in the forest sector industries is lower than average for all industries. In 2001, only 5.6% of the labour force in the forest sector industries had migrated[26] within the last year while the Canadian average for all industries was 6.7%. When measured over a 5-year period, migration rates[27] for the forest sector industries increase, but remain below average.

[25] According to Statistics Canada's *Labour Force Survey.*
[26] Migration is defined as a change in Census subdivision.
[27] The migration rate is the share of total employees who are migrants.

Within the forest sector industries, the pulp and paper industry is the most insular while the wood products manufacturing industry has the most mobile labour force.

Migration rates varied across the forest occupations. Occupations requiring some post-secondary education and a higher skill level tended to have higher migration rates, as do many occupations in the forestry and logging industry - not surprising given the seasonal nature of that industry. Workers in manufacturing occupations, particularly in pulp and paper, are less likely to be migrants.

Table IV-7: Migration Rates by Industry, 2001

Industry	*Migrated within:* 1 Year	5 Years
Forest Industry	**5.6%**	**16.7%**
Forestry & Logging	6.3%	16.9%
Wood Industries	5.8%	18.3%
Pulp and paper	4.3%	12.7%
Average All Industries	**6.7%**	**21.2%**

Source: Statistics Canada, *Census 2001*.

Table IV-8: Migration Rates by Forest-Specific Occupation, 2001

NOC-S	Occupation	*Migrated within:* 1 Year	5 Years
C022	Forestry professionals	9.8%	30.0%
C123	Forestry technologists and technicians	9.2	24.9
I111	Supervisors, logging and forestry	7.7	18.2
I151	Logging machinery operators	4.3	12.8
I161	Chain-saw and skidder operators	4.2	13.1
I162	Silviculture and forestry workers	7.9	17.8
I216	Logging and forestry labourers	8.8	17.5
J015	Supervisors, forest products processing	3.9	16.7
J113	Pulping control operators	4.0	10.7
J114	Papermaking and coating control operators	1.9	9.7
J141	Sawmill machine operators	5.2	15.4
J142	Pulp mill machine operators	3.3	11.0
J143	Papermaking and finishing machine operators	4.4	13.2
J144	Other wood processing machine operators	5.8	16.4
J145	Paper converting machine operators	5.8	17.9
J146	Lumber graders and other wood processing inspectors and graders	6.2	17.2
J193	Woodworking machine operators	7.6	22.2
J223	Other wood products assemblers and inspectors	8.0	21.2
J314	Labourers in wood, pulp and paper processing	5.4	16.0
	Average for all occupations across Canada	**6.7**	**21.2**

Source: Statistics Canada, *Census 2001*.

Note: Includes total labour force (i.e. employed and unemployed).

b) Industry

Another potential source of labour for the forest sector is labour from other sectors and industries where there is a high degree of skill crossover. However, the forest sector faces stiff competition for both skilled and unskilled workers from booming industries such as petroleum and construction. Unless the economic situation in the industry improves dramatically, it is unlikely that these trends in out-migration will be reversed.

5. Immigration

Declining birth rates and an aging population mean that immigration will be the main driver of labour force growth in the coming years. Recent immigrants tend to be attracted to and settle in large urban centres where there is a greater variety of economic opportunities and immigrant networks are already well established. This trend contributes to smaller proportions of immigrant workers in the forest sector industries than average. In 2001, less than 10% of the labour force in the forest industry was composed of immigrants and only 2.4% consisted of recent immigrants.[28] This is significantly less than the Canadian average where almost 20% of the labour force was composed of immigrants and 6.4% were recent immigrants.

Within the forest sector industries, the forestry & logging industry had the lowest share of immigrant workers. The wood industry, which includes certain types of advanced wood product manufacturing whose facilities are often located closer to urban areas, had the highest proportion of immigrant and recent immigrant workers (Table IV-9).

Table IV-9: Immigrant Labour Force by Industry, 2001

	Immigrants	Recent Immigrants
Forest Industry	**9.9%**	**2.4%**
Forestry & Logging	4.9%	0.9%
Wood Industries	13.7%	3.8%
Pulp and paper	7.4%	1.0%
Canadian Average	**19.9%**	**6.4%**

Source: Statistics Canada, *Census 2001*.

Only three forest-specific occupations had a higher than average share of immigrants in their labour forces in 2001: two occupations usually found in the wood industry (*Woodworking machine operators* and *Other wood product assemblers and inspectors*) and one occupation typically found in the pulp and paper industry (*Paper converting machine operators*).

[28] Recent immigrants are defined as persons who immigrated to Canada between 1991 and 2001 (i.e. within 10 years of the 2001 Census).

Table IV-10: Immigrant Labour Force by Forest-Specific Occupation, 2001

NOC-S	Occupation	Immigrants	Recent Immigrants
C022	Forestry professionals	10.0	1.7
C123	Forestry technologists and technicians	6.3	0.7
I111	Supervisors, logging and forestry	4.2	0.6
I151	Logging machinery operators	2.9	0.2
I161	Chain-saw and skidder operators	3.1	0.5
I162	Silviculture and forestry workers	2.9	0.9
I216	Logging and forestry labourers	6.3	1.9
J015	Supervisors, forest products processing	7.4	0.8
J113	Pulping control operators	7.0	0.0
J114	Papermaking and coating control operators	11.8	2.6
J141	Sawmill machine operators	10.4	2.0
J142	Pulp mill machine operators	5.7	1.1
J143	Papermaking and finishing machine operators	16.2	6.3
J144	Other wood processing machine operators	12.4	4.1
J145	**Paper converting machine operators**	**23.7**	**9.5**
J146	Lumber graders and other wood processing inspectors and graders	12.3	1.7
J193	**Woodworking machine operators**	**26.1**	**11.4**
J223	**Other wood products assemblers and inspectors**	**23.4**	**10.0**
J314	Labourers in wood, pulp and paper processing	11.8	3.9
	Average for all occupations across Canada	**19.9**	**6.4**

Source: Statistics Canada, *Census 2001*.

Note: Includes total labour force (i.e. employment and unemployed).

Given that many of the geographic characteristics of the forest sector are at odds with the trends in immigrant settlement, it is unlikely that recent immigrants will be a significant source of labour for the sector in the near term. The exception may be on the manufacturing side of the sector, in particular wood product manufacturing, where pre-established immigrant networks could be leveraged to recruit recent immigrants.

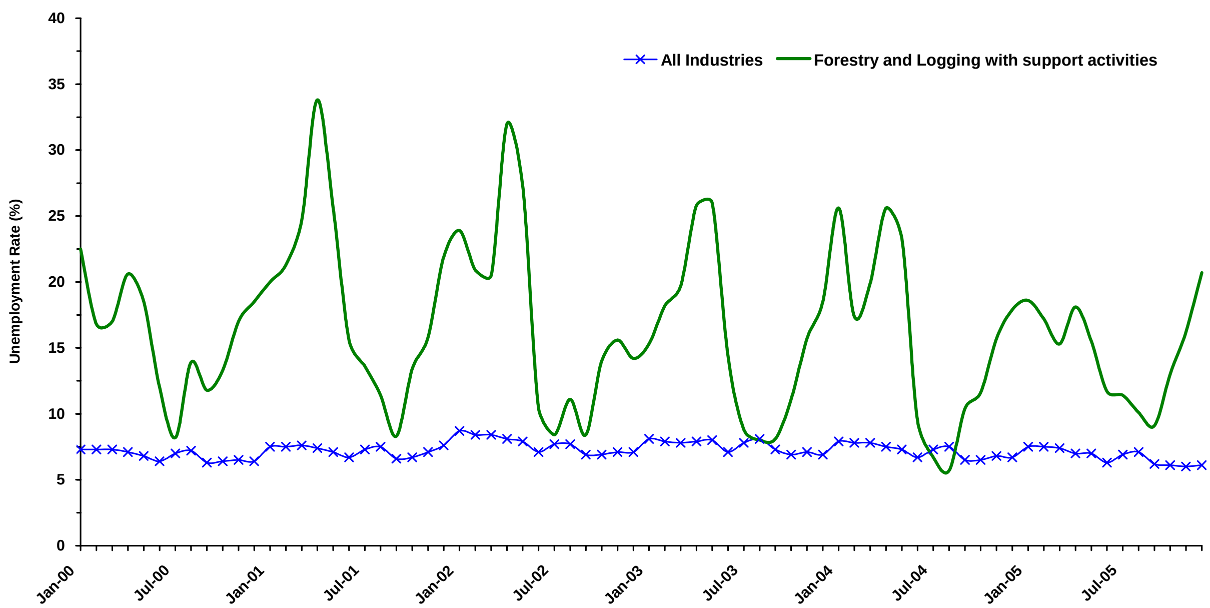
C. Public Perception of the Forest Industry

An industry's public image makes a strong impact on workers' labour market decisions. The forest industry in recent years has been plagued with a negative image due to changing values and structural shifts in the global and domestic economy. In the 1980s increased global awareness of environmental issues led to growing criticism of the practices in the natural resource industries. The forest industry has often been painted as an environmentally unfriendly industry contributing to a noticeable shift at the post-secondary level of students towards new environmentally-oriented, interdisciplinary programs and away from traditional natural science programs. There is evidence that these perceptions have trickled down to secondary school students as well. Add to this, recent negative economic news (trade disputes, mill closures, layoffs, etc.) and the perception of the forest industry becomes one of a 'behind the times,' sunset industry (Interim National Recruitment Strategy Steering Committee, 2005).

Other characteristics of the forest industry that are shaping public perception of the industry include:

- **Seasonality:** Job stability is typically desirable in a job. Employment in the natural resource industries is often cyclical and the forest industry is no different. As shown in Figure III-6, within the forest industry, forestry and logging has the largest proportion of part-time and other forms of employment. This is not surprising given the seasonal nature of logging and forestry operations, which results in wide variation in the unemployment rate in that industry. Figure IV-10 compares the unemployment rate in the forestry and logging industry to the national unemployment rate. Both are unadjusted for seasonality.

Figure IV-10: Unemployment Rate in the Forestry & Logging Industry



Source: Statistics Canada, *Labour Force Survey.*
Note: Not seasonally adjusted.

Seasonality can also be approximated through the temporary separation rate. If a worker leaves a firm and returns to the same firm within the same or following calendar year, the separation is considered temporary. Though all of the forest sector industries have above average temporary separation rates, the rate in the forestry & logging industry is nearly 2.5 times average (Table IV-11).

Table IV-11: Temporary Separation Rates in the Forest Sector Industries, 2002

Industry	Temporary Separation Rate[29]
Average all industries	29.5%
Forestry & Logging	84.0%
Wood Product Manufacturing	46.1%
Paper Manufacturing	32.9%

Source: Statistics Canada, *Longitudinal Worker File*.

- **Wages and Benefits:** While higher than average annual employment income and wages[30] in the forest industry may attract workers, the high proportion of part-time and seasonal work, which lack employment benefits, may deter others.
- **Remoteness:** Mills and forestry operations are typically located in smaller towns and remote areas of the country. However, Canada is becoming increasingly urbanized. In 2005, two-thirds of Canadians lived in Census Metropolitan Areas (CMA) and one-third lived in three CMAs: Toronto, Montreal, and Vancouver (Loreto, 2006). As a consequence, an increasing proportion of the students enrolled in forestry programs are from urban areas and have little interest in relocating to less urban areas of the country.

  Moreover, many foresters and forestry technicians and technologists have partners with careers of their own and small mill-dependent towns may not offer career opportunities for both individuals.
- **Job Prospects:** As a result of mill closures and layoffs, short-term job prospects in the forest industry are generally not good. In fact, other than *Forestry professionals*, *Job Futures* (www.jobfutures.ca) predicts “fair” or “limited” current and future job prospects for other forest occupations in spite of the high level of forecasted retirements from these occupations.
- **Low-Technology:** The forest sector industries are often perceived as being low-tech and not innovative. Statistics Canada’s 1999 *Survey of Innovation* found that while forest sector industries introduced less *product* innovations, they introduced a higher percentage of *process* innovations relative to the manufacturing industries as a whole (Schaan and Anderson, 2002). Firms in the forest industry innovate to improve product quality and respond to environmental issues and regulations. The focus away from developing new products has led to the misperception that the forest sector industries are low tech.

[29] Calculated as the number of workers temporarily separated proportional to the total number of workers in a firm. A separation is considered *temporary* if the worker returns to the same firm in the same or following calendar year.
[30] See Table V-5 and
Table V-6.

D. 10-Year Outlook for Labour Supply

1. Overall Canadian Labour Supply

Future growth of the Canadian population is expected to be positive, but sluggish due to the effects of Canada's aging population (Bergeron *et al.*, 2004). As the population ages, the rate of natural population growth will decline because of two factors. First, a smaller proportion of people will be in their child bearing years, which will decrease the fertility rate. At the same time, mortality rates will increase in the long-term. As a result, any future population growth with be primarily driven by immigration.

The declining rate of natural population growth will have a direct effect on the labour supply by reducing the growth rate of the working age population over the next decade. As the population ages, the participation rate will decline as older people are less likely to participate in the workforce than the core population.

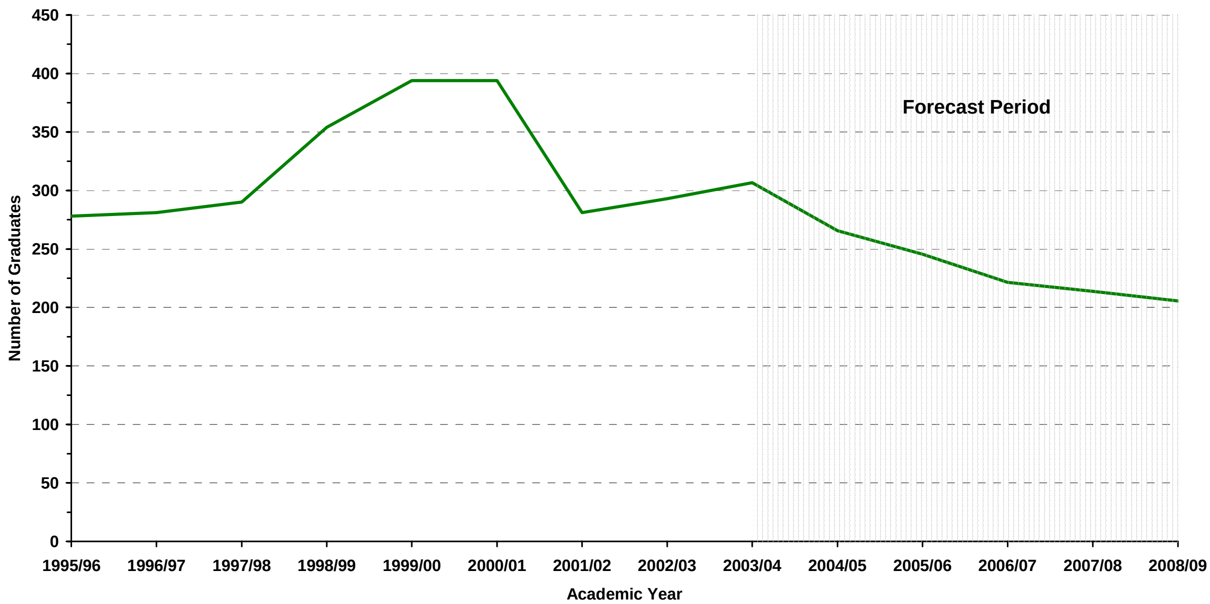
The Canadian economy is currently operating at full-employment[31] and at its production capacity. With the national unemployment rate reaching 30-year record lows and strong employment growth being fuelled by a hot Western economy, the Canadian labour market is expected to remain tight for the next year. Is this a sign of things to come? While the current strength of the Canadian economy is expected to taper off by 2008, the declining trend in working age population is irreversible and likely to cause some tightness in the labour market for certain industries.

2. Future Graduates

The number of students graduating from undergraduate programs accredited by Canadian Forestry Accreditation Board (CFAB) serves as a proxy for the number of foresters entering the labour market each year. The number of future graduates was estimated using CFAB graduation figures from 1995-2003 and the total enrolment figures from Figure IV-6, which covers the 1995/1996 academic year to the current academic year. From 2004 to 2009 the number of graduates from CFAB-accredited programs is expected to decrease by 100 to just over 200 graduates. Not surprisingly, the trend in graduation is following trend in enrolments, which have decreased dramatically over the last five years.

[31] Full employment occurs when the economy is producing to its maximum sustainable capacity, using labour, technology, land, capital and other factors of production to their fullest potential. In a situation of full employment, the unemployment rate remains above zero as some workers may still be unemployed if they are temporarily between jobs and searching for new employment ('frictional unemployment').

Figure IV-11: Forecasted Graduates from CFAB-Accredited Degree Programs



Source: CCFM, National Employer Demand Survey, Table 3; Dr. Susan Watts, University of British Columbia.

Many forestry schools are taking steps to reverse the downward trend in undergraduate enrolment. For example, the Faculty of Forestry and the Forest Environment at Lakehead University has embarked on a marketing and recruitment program in conjunction with federal and provincial ministries and professional associations (Pulkki, 2005). Fifteen of the institutions surveyed by the National Forestry Strategy Coalition have also increased their marketing efforts. Some have also revised their curriculum.

Although it is still early, according to Pulkki (2005), "preliminary application numbers seem to indicate that we are beginning to see a renewed interest in forestry education." Laval University has also reported that enrolment has increased as a result of increased marketing and recruitment efforts (CCFM, 2004).

Estimating the number of forestry technicians and technologists graduating per year is difficult because there is no national forestry college association tracking this information across Canada. According to survey data collected by Dr. Susan Watts of the University of British Columbia, enrolment in college and technical school forestry programs has decreased by nearly 30% since 2000. A coinciding decrease in the numbers graduating is likely. However, without any historical figures on the number of graduates from these programs, predicting the future number of graduates is not possible at this time.

3. Other Sources

Key to increasing the available labour supply to the forest sector is focusing on "non-traditional" sources of labour for the sector – meaning women, youth, migrants and immigrants. Attracting women and youth involves building awareness down the labour supply chain about forest careers and skilled trades. Between 1991 and 2001 the share people over 25 who graduated from a trade school remained stable at 12% while the share with university or college degrees has been increasing. Many Federal and provincial government programs already aim to promote apprenticeship programs in skilled trades to youth and high school students.[32] Should these programs succeed in increasing the number of people taking up a skilled trade the forest sector will face tough competition from the oil & gas, mining and construction industries in recruiting and retaining these people as employees.

In the short-term it is unlikely that the sector will be able to increase the amount of labour supply from “non-traditional” sources. Therefore, efforts to attract more women, youth, immigrants and migrants to the industry will require focused effort and long-term planning.

[32] For example see Human Resource Social Development Canada’s apprenticetrades.ca website.

V. Skills Shortages

A. Definition

According to Roy, Henson & Lavoie (1996), a skill shortage occurs "when the quantity of a given skill supplied by the work force and the quantity demanded by employers diverge at the existing market conditions." Therefore, a skill shortage can be *quantitative* (not enough workers) or *qualitative* (existing workers do not have the right skills). The terms "labour shortage" and "skills gap" are often in place of quantitative and qualitative skills shortages respectively.

How one defines a skill shortage depends on the labour market in question and how quickly it adjusts to shocks. Given that wages are often sticky and that hiring and training take time, "[s]kill shortages and surpluses are expected to be a permanent feature of decentralized labour markets" (Roy, Henson & Lavoie, 1996). In addition to sticky wages and slow labour supply adjustment, skill shortages can also arise from inadequate labour market information. Incomplete information slows down the adjustment process and can lengthen the duration of the shortage (Shah & Cohen, 2005).

Two methodologies are typically used to measure skills shortages – labour market indicators and employer-based surveys. The two methodologies are complementary; this section focuses on the analysis of labour market indicators and briefly discusses employer-based surveys that have been undertaken by other entities. This analysis could be built upon in the future through a comprehensive employer-based survey, which is beyond the scope of this study.

B. Quantitative Evidence: Labour Market Indicators

Quantitative indicators have the advantage of removing the subjective element usually found in employer surveys and interviews. However, analysis is often constrained by the availability of labour market data on an industry and occupational basis.

1. Employment Growth

An industry with an employment growth rate that is significantly higher than average, particularly during periods of economic expansion, may be experiencing a skills shortage.

Between Census 1996 and Census 2001 employment in the forest industry grew by 5.2%, fuelled by strong employment growth in

Table V-1: Employment in the Forest Sector, 1996 & 2001

	1996	2001	Growth
Forest Industry	280,220	294,685	5.2%
Forestry & Logging	69,700	68,700	-1.4%
Wood Industries	138,075	158,710	14.9%
Pulp & Paper	72,445	67,275	-7.1%
Other Forest Sector (1)	39,285	48,350	23.1%
Total Forest Sector	**319,505**	**343,035**	**7.4%**
All Industries	**13,318,740**	**14,695,130**	**10.3%**

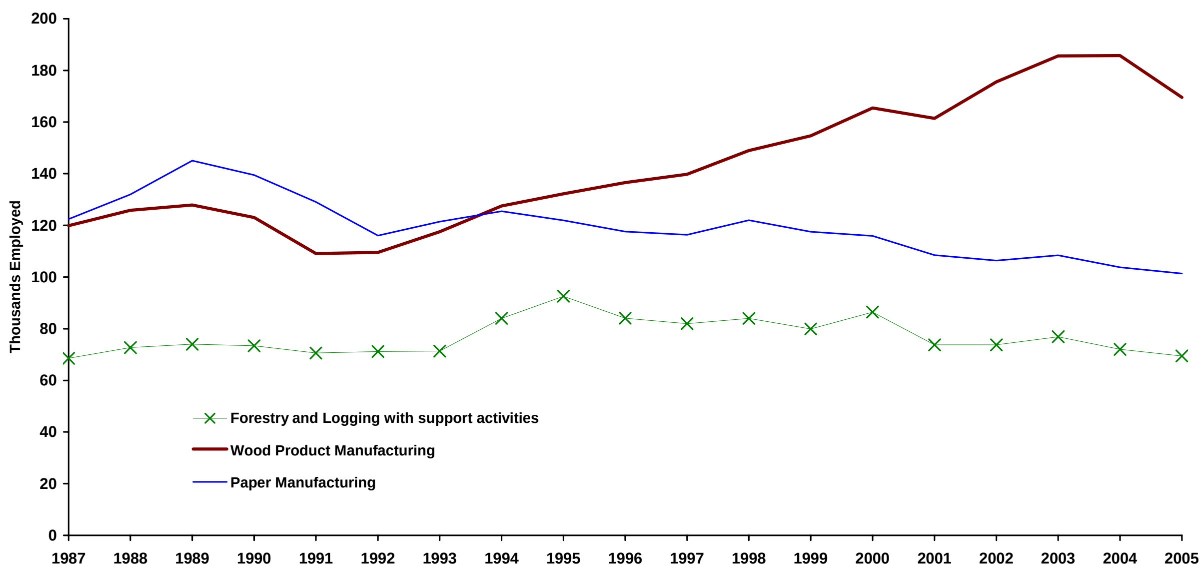
Source: Statistics Canada, *1996 and 2001 Censuses*.
(1) Defined as employment in forestry-specific occupations outside the forest industry.

the wood industries. Conversely, both the forestry & logging and pulp & paper sub-industries experienced negative job growth. Overall, the forest industry failed to keep pace with average job growth in the Canadian economy, which grew by 10.3% over the same time period.

In contrast, employment in forest-specific occupations in the rest of the forest sector grew by 23.1% between 1996 and 2001.

Figure V-1 below, uses monthly employment data from the LFS to illustrate similar employment trends. After a sharp decline in employment in the early 1990s, wood manufacturing recovered and employment expanded rapidly until 2004. Employment levels in the forestry & logging and paper manufacturing industries recovered slightly in the mid-1990s, but have since been decreasing.

Figure V-1: Average Annual Employment Level in Forest Industry



Source: Statistics Canada, *Labour Force Survey* .

At an occupational level, employment growth between 1996 and 2001 varied considerably (Table V-2). While some occupations, like *Forestry professionals, Woodworking machine operators, Pulp mill machine operators* and *Other wood products assemblers and inspectors* experienced tremendous employment growth, others such as *Pulping control operators* dropped sharply.

Table V-2: Employment Growth by Forest-Specific Occupation, 1996 - 2001

NOC-S	Occupation	Growth Rate 1996 - 2001(%) Full-Time, Full Year	All Employed
C022	Forestry professionals	36.8	42.6
C123	Forestry technologists and technicians	6.5	3.2
I111	Supervisors, logging and forestry	-11.7	-20.7
I151	Logging machinery operators	37.6	12.7
I161	Chain-saw and skidder operators	1.8	-22.5
I162	Silviculture and forestry workers	8.8	18.8
I216	Logging and forestry labourers	1.8	-15.0
J015	Supervisors, forest products processing	-6.2	-5.9
J113	Pulping control operators	-36.1	-36.1
J114	Papermaking and coating control operators	-7.3	-13.9
J141	Sawmill machine operators	5.0	-1.0
J142	Pulp mill machine operators	41.6	33.3
J143	Papermaking and finishing machine operators	4.4	-1.6
J144	Other wood processing machine operators	21.7	15.2
J145	Paper converting machine operators	2.5	-0.9
J146	Lumber graders and other wood processing inspectors and graders	31.4	19.7
J193	Woodworking machine operators	61.5	37.5
J223	Other wood products assemblers and inspectors	96.1	47.2
J314	Labourers in wood, pulp and paper processing	24.6	12.3
	Average for all occupations	**14.6**	**10.3**

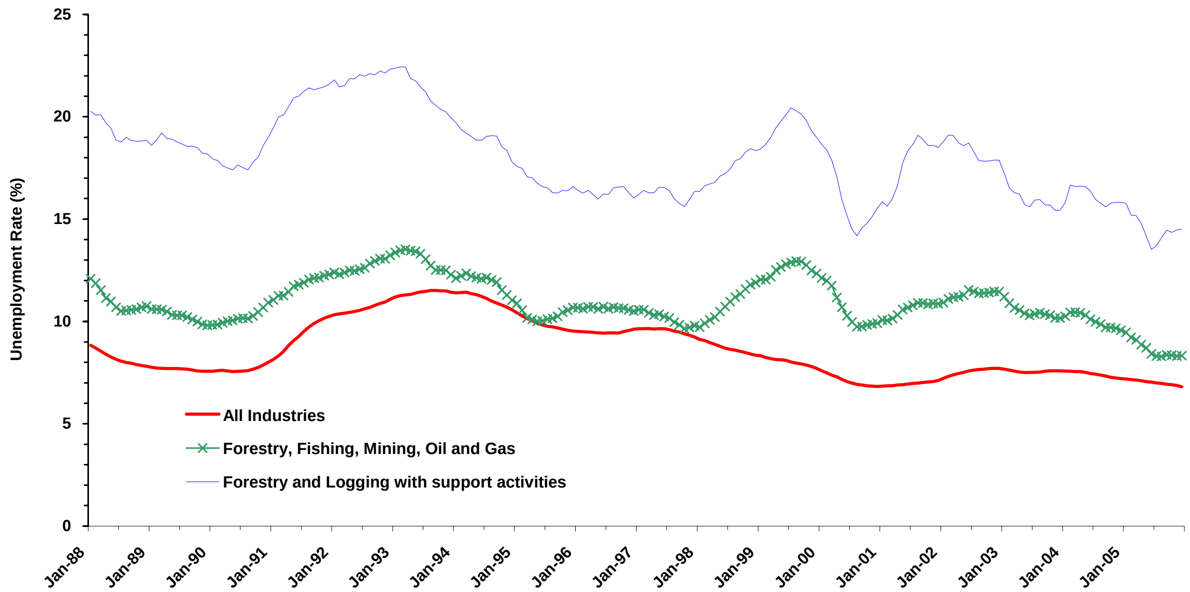
Source: Statistics Canada, 1996 and 2001 Censuses.
Note: Includes forest occupations across all industries.

2. Unemployment Rate

The unemployment rate is one of the most commonly used indicators of labour imbalances. Typically a high unemployment rate is a signal of a labour excess while a low unemployment rate is a signal of scarcity.

Canada’s national unemployment rate has been declining since the early 1990s. The forest industry has also experienced a downward trend in unemployment (Figure V-2 and Figure V-3); however, unemployment rates in the forestry & logging industry have consistently been well above the national average. At the end of 2005, the unemployment rate in forestry & logging was double the national average (14% versus 7%).

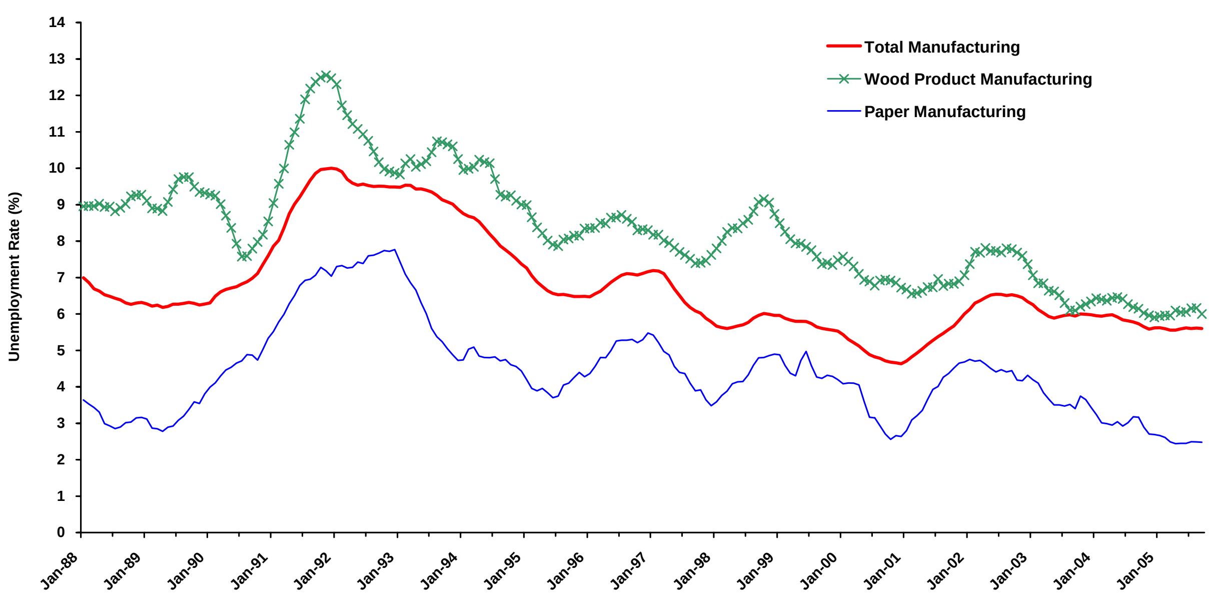
Figure V-2: Unemployment Rate in the Extractive Industries



Source: Statistics Canada, *Labour Force Survey.*
Note: Unemployment Rate is calculated as a 12-month moving average.

Historically, relative to the average for the manufacturing industry as a whole, the paper manufacturing has a very low unemployment rate whereas unemployment in the wood product manufacturing industry has been higher than average. Despite decreasing employment levels, the paper manufacturing industry had an unemployment rate of less than 3% in the third quarter of 2005.

Figure V-3: Unemployment Rates in the Manufacturing Industries



Source: Statistics Canada, *Labour Force Survey* .
Note: Unemployment Rate is calculated as a 12-month moving average.

The unemployment rate for forest-specific occupations outside the forest industry is more difficult to measure. Once again, employment data by occupational code from the Census provides the best estimate of the ‘rest of the forest sector.’ Table V-4 (section V.B.3) shows unemployment rates in the forest sector in 1996 and 2001. The unemployment rate in non-industry forest sector fell by over 4% during that time period, which was more than the average decrease for all industries. Unemployment in the forest industry also decreased during that time period, but by a smaller magnitude.

Unemployment rates by forest occupation varied widely reflecting the seasonal nature of certain occupations. For several occupations unemployment rates were significantly below average. In general, unemployment rates remained fairly stable over the time period, with only a few occupations experiencing decreases in the unemployment rate that matched the Canadian average for all industries.

Table V-3: Unemployment Rate by Forest-Specific Occupation, 1996 & 2001

		Unemployment Rate (%)	
NOC-S	**Occupation**	**1996**	**2001**
C022	Forestry professionals	3.1	3.2
C123	Forestry technologists and technicians	14.5	15.8
I111	Supervisors, logging and forestry	15.9	18.3
I151	Logging machinery operators	41.8	39.9
I161	Chain-saw and skidder operators	46.9	41.8
I162	Silviculture and forestry workers	41.6	43.2
I216	Logging and forestry labourers	32.7	29.1
J015	Supervisors, forest products processing	3.8	2.9
J113	Pulping control operators	3.5	2.6
J114	Papermaking and coating control operators	3.5	2.2
J141	Sawmill machine operators	8.7	11.1
J142	Pulp mill machine operators	5.3	5.9
J143	Papermaking and finishing machine operators	5.0	5.5
J144	Other wood processing machine operators	8.7	6.9
J145	Paper converting machine operators	7.2	5.3
J146	Lumber graders and other wood processing inspectors and graders	10.0	8.9
J193	Woodworking machine operators	10.6	7.3
J223	Other wood products assemblers and inspectors	11.2	8.1
J314	Labourers in wood, pulp and paper processing	12.5	11.5
	Average for all industries	**10.1**	**7.4**

Source: Statistics Canada, *1996 and 2001 Censuses*.
Note: Includes forest occupations in all industries.

One of the downfalls of using the unemployment rate as an indicator is that it requires knowledge of the natural rate of unemployment for that specific industry. In other words, the relatively low unemployment rate in the paper manufacturing industry may not necessarily indicate that there is a skills shortage in that industry; the low unemployment rate may simply be a characteristic of that industry.

Another drawback is that unemployment data typically categorizes a person by their last job held, which may not be an occupation for which they were qualified or in which they are conducting their current job search. Moreover, unemployment figures do not capture underemployment and therefore may underestimate industry labour supply (Shah & Burke, 2005).

3. Participation Rate

The labour force participation rate the ratio of the total labour force (total employed and unemployed) to the population aged 15 and over. The participation rate measures how much of the population is participating in the labour market. An industry facing a labour shortage is expected to experience an increase in the participation rate. To meet their staffing needs firms may increase wages and improve benefits, which may induce entry into the labour market.

Between 1996 and 2001, the overall Canadian economy saw only a small increase in the participation rate while the participation rate in the forest industry decreased by 0.3%. In fact, all of the forest sector industries experienced a slight decrease in the labour participation rate. In contrast, the participation rate in the rest of the forest sector increased by 3%. Unfortunately with only two data points for comparison drawing robust conclusions regarding trends in the participation rate is difficult.

Table V-4: Unemployment and Participation Rates in the Forest Sector, 1996 & 2001

	1996		2001	
Industry	**Unemployment Rate**	**Participation Rate**	**Unemployment Rate**	**Participation Rate**
Forest Industry	15.5%	92.2%	13.7%	91.9%
Forestry & Logging	32.1%	88.7%	29.8%	88.3%
Wood Industries	9.0%	93.3%	8.2%	93.1%
Pulp & Paper	6.2%	95.0%	5.1%	94.0%
Other Forest Sector (1)	14.1%	90.8%	11.5%	90.6%
Total Forest Sector	**15.4%**	**92.1%**	**13.4%**	**91.7%**
All Industries	**10.1%**	**65.5%**	**7.4%**	**66.4%**

Source: Statistics Canada, *1996 and 2001 Censuses*.

(1) Defined as employment in forestry-specific occupations (NOC) outside the forest industry.

4. Real Wages

One of the most useful ways to measure skills shortage is through trends in real wages (Roy, Henson & Lavoie, 1996). In a market economy, increasing wages over time along with decreasing unemployment rates can provide some evidence of a shortage of labour and vice-versa.

a) Real Wages by Industry

As seen in section III.A.3, historically, the average annual income of persons employed full-time in the forest industry has been higher than average. However, according to Census data, incomes in the forest industry grew *more slowly* than average between 1996 and 2001. In fact, in real terms, average employment income *decreased* for those employed full-time in some sub-industries. The pulp & paper industry experienced the strongest income growth, though still below average, while employment income in the other industries dropped in real terms.

Table V-5: Average Annual Employment Income

Industry	Employment Income 1996	Employment Income 2001	Real Growth*
Forest Industry	**$ 37,960**	**$ 43,704**	**5.2%**
Forestry & Logging	45,550	48,224	-4.0%
Wood Industries	37,098	40,039	-2.0%
Pulp & Paper	54,030	61,510	3.9%
Canadian Average	**37,815**	**43,577**	**5.3%**

Sources: Statistics Canada, *Census 1996 and 2001; Catalogue no. 62-001.*
Note: Includes only persons employed full-time, full-year
* Assumes prices increased by 9.9% from 1996 to 2001.

More recent data from the SEPH supports the finding that jobs in the forest sector industries pay more than average. However, contrary to the Census data, SEPH data on average weekly wages finds that real wage growth in the paper manufacturing and wood product manufacturing industries has been stronger than average (Table V-6). Between 2001 and 2005, average weekly wages in the paper manufacturing industry grew by 6.9% in real terms while wages in the wood manufacturing industries grew by 3.8% compared to an all-industry average of only 1.2%. On the other hand, real wages in the forestry & logging industry decreased by 1.3% over the same time period.

Real wage growth by industry varied considerably across the three dominant regions for the forest industry – British Columbia, Ontario and Quebec. In B.C., where employment levels have been decreasing, wages have risen by more than the provincial average in the paper and wood industries. On the other hand, in Ontario real wages in the wood and paper industries grew only modestly and at rates below the provincial average. Real wages in the forestry & logging industry in Quebec deteriorated dramatically while those in the paper industry rose.

Table V-6: Growth in Average Weekly Real Wages by Industry and Region, 2001 - 2005

Region	Forestry & Logging	Paper	Wood	All Industries
Canada	-1.3%	6.9%	3.8%	1.2%
B.C.	2.9%	8.8%	9.1%	4.7%
Ontario	3.2%	2.3%	0.8%	3.0%
Quebec	-9.9%	7.0%	-1.0%	-0.8%

Source: Statistics Canada, *Survey of Employment, Payroll and Hours*.
Note: Real growth rate is calculated from annual averages and assumes prices rose by 7% over the time period.

b) <u>Real Wages by Occupation</u>

Table V-7 shows the real growth rate of average employment income for forest occupations within and outside the forest industry between 1996 and 2001. During that period prices rose by 9.9%[33] and employment income for all occupations in all industries grew on average by 5.3% in real terms (Table V-5). Within the forest sector, growth in real income varied widely by occupation and by sub-sector. Some occupations faired poorly both inside and outside the industry (e.g. *Chain-saw and skidder operators* and *Silviculture and forestry workers*). Some occupations faired well inside the industry and poorly outside it (e.g. *Pulping control operators*) and vice-versa (e.g. *Logging machinery operators*). No occupation experienced higher than average real income growth *both* inside and outside industry.

[33] Measured as the change in annual average CPI from 1996 to 2001.

Table V-7: Real Average Employment Income Growth by Occupation, 1996 - 2001

NOC-S	Occupation	Forest Industry	Rest of Sector
C022	Forestry professionals	-0.7%	5.0%
C123	Forestry technologists and technicians	-5.4%	4.2%
I111	Supervisors, logging and forestry	2.2%	1.6%
I151	Logging machinery operators	-7.5%	26.5%
I161	Chain-saw and skidder operators	-11.3%	-38.8%
I162	Silviculture and forestry workers	-22.5%	-15.7%
I216	Logging and forestry labourers	-2.3%	-2.6%
J015	Supervisors, forest products processing	-0.1%	-7.5%
J113	Pulping control operators	13.2%	-9.0%
J114	Papermaking and coating control operators	8.8%	-2.4%
J141	Sawmill machine operators	-5.8%	12.8%
J142	Pulp mill machine operators	3.3%	-27.6%
J143	Papermaking and finishing machine operators	4.2%	7.4%
J144	Other wood processing machine operators	-6.4%	-7.6%
J145	Paper converting machine operators	-7.7%	-1.3%
J146	Lumber graders and other wood processing inspectors and graders	-2.4%	5.3%
J193	Woodworking machine operators	8.9%	2.8%
J223	Other wood products assemblers and inspectors	0.6%	-3.5%
J314	Labourers in wood, pulp and paper processing	0.1%	-0.7%

Source: Statistics Canada, *1996 and 2001 Censuses*.

Notes: Assumes 9.9% inflation over time period. Includes only persons employed full-time, full-year.

Despite the wide variation in real income growth, jobs within the forest industry continue to pay more than jobs in the rest of the forest sector (see Table III-2). However, real incomes for the forestry professionals and forestry technologists and technicians are growing faster outside the forest industry.

Shah & Burke (2005) warn that the interpretation of wage differential data requires knowledge of the labour supply and demand elasticities. When demand and supply are highly elastic, it is possible to underestimate a shortage because small changes in wages result in large changes in labour supply. On the other hand, when demand and supply are inelastic, shortages may be overestimated as large changes in wages result in only small changes in supply. Changes in wages should be analyzed in conjunction with changes in employment levels and the participation rate.

Another pitfall of using wage data is that institutional factors can make wages sticky – meaning slow to adjust. This is particularly relevant to highly unionized industries such as the forest industry.

5. Separation & Hiring Trends

Other labour market indicators that can be used to measure skills shortages are trends in hiring and separation. Flows of new entrants and leavers reveal industry labour demand. Typically in a growth industry, the number of layoffs will be low while the number of new hires will be high. Jobs in industries that labour finds "desirable" would be expected to have low voluntary separation rates (i.e. quits and retirements).

Table V-8 compares permanent separation and hiring rates in the forest sector industries to the average for all industries over a five year period from 1998 to 2002. High permanent layoff and hiring rates in the forestry & logging industry indicate above average labour turnover. Despite this instability, jobs in the forestry & logging industry are considered fairly attractive as the rate of voluntary separation due to retirement or quiting is below average.

Table V-8: Separation and Hiring Rates by Forest Sector Industry, 1998 - 2002

	Permanent Separation Rates (%)					Hiring
	Layoff	Quit	Retire	Other[34]	Total	Rate (%)
Forestry & Logging						
1998	28.31	4.60	0.04	3.59	36.55	31.61
1999	24.11	5.02	0.01	3.86	33.01	35.57
2000	22.84	5.73	0.04	3.93	32.54	29.72
2001	21.61	4.83	0.06	3.58	30.08	26.78
2002	21.17	4.39	0.08	2.84	28.48	26.59
Wood Product Manufacturing						
1998	7.57	7.00	0.26	5.73	20.57	23.13
1999	6.43	7.71	0.14	5.94	20.22	27.13
2000	6.67	9.12	0.17	6.12	22.09	22.93
2001	7.11	7.89	0.12	7.70	22.81	19.74
2002	6.28	8.09	0.27	6.13	20.77	22.67
Paper Product Manufacturing						
1998	2.84	2.83	0.49	3.55	9.72	9.38
1999	3.49	3.11	0.47	4.46	11.52	10.26
2000	2.77	3.60	0.44	4.35	11.15	9.75
2001	4.59	3.28	0.47	5.69	14.03	9.26
2002	2.58	3.13	0.62	4.30	10.62	7.31
Average All Industries						
1998	6.24	6.88	0.31	5.51	18.94	21.57
1999	5.74	7.30	0.20	5.85	19.09	21.76
2000	5.40	8.28	0.22	5.97	19.87	23.01
2001	5.76	7.85	0.23	6.23	20.07	20.04
2002	5.27	7.56	0.22	6.03	19.09	19.80

Source: Statistics Canada*, Longitudinal Worker File.*

[34] Refers to permanent separation due to return to school, pregnancy, illness or other.

In contrast, employment in the paper products industry has historically been relatively stable. The industry is characterized by low turnover rates. Permanent layoff and quit rates have been less than half the average rate, which may be a reflection of heavy unionization. Another factor, cited by Price Waterhouse (1994) is the pulp and paper industry's tradition of "providing long-term career-oriented jobs with excellent wages and benefits that are above general industry averages." This in conjunction with limited local employment opportunities in mill towns has led to low voluntary separations. On the other hand, the retirement rate in paper products industry has been nearly double average. Not surprising given the older average age of workers in that industry.

In the wood products manufacturing industry, the flows of workers have been very close to the average for all Canadian industries.

6. Skill Levels

Though increasing income by occupation does give some indication of the types of skills that are in surplus/shortage, all of the indicators discussed thus far are used primarily to identify *quantitative* labour market imbalances rather than *qualitative* imbalances. The National Occupational Classification system assigns a skill level to each occupation, which can be used to ascertain which skill *levels* are in demand. Table V-9 below explains how skill levels are determined from occupational codes.

Table V-9: Skill Levels from the National Occupational Classification System (NOC)

2nd Digit of NOC[35]	Skill Level	Education/Training
N/A	0	• Management occupations
1	A	• University degree
2 or 3	B	• 2-3 years of post-secondary education at college, technical institute or CÉGEP; or, • 2-5 years of apprenticeship training; or, • 3-4 years of secondary school and more than 2 years of on-the-job training, occupation-specific training course or specific work experience.
4 or 5	C	• 1-4 years of secondary school education; or, • Up to 2 years of on-the-job training, training courses or specific work experience.
6	D	• Short work demonstration or on-the-job training; or, • No formal educational requirements.

Source: Human Resources and Skills Development Canada, *National Occupational Classification 2001*.

a) Real Wages by Skill Level

Changes in real wages by skill level are reflective of Canada's movement towards a knowledge-based economy. In general, occupations requiring higher skill levels

[35] This applies to all occupations except management occupations. For management the first digit is always zero.

experienced stronger real income growth between 1996 and 2001 than occupations requiring lower skill levels (Table V-10).

The average incomes by skill level grew significantly less than average in the forest industry, with the exception of skill level D - the labouring and elemental occupations – which experienced real income growth of 4.4%. Average incomes for occupations at skill levels B and C *shrank* in real terms. Much of this negative real income growth can be attributed to the forestry & logging industry. All skill levels in the forestry & logging industry, except those at level D, experienced negative real income growth. On the other hand, in the pulp & paper industry many skill levels experienced above-average real income growth. This may be an effect of unionization in that industry.

Full-time employment incomes struggled to keep pace with inflation; occupations at skills levels B, C and D in the forest industry witnessed negative real income growth. The pulp & paper industry was, once again, the exception; real incomes in that industry for all skill levels grew at rates often higher than average. Strong real income growth in the pulp & paper industry may have resulted from higher than average labour productivity growth in that industry. Between 1989 and 2000, labour productivity growth in the pulp & paper industry grew by 4% (CSLS, 2004), which was well above average and the highest for all forest sector industries. It is believed that scientific breakthroughs in mechanical pulp technology as well as cost-reducing optimization in the manufacturing process were the primary factors supporting this productivity growth (CSLS, 2004).

Table V-10: Real Average Annual Employment Income Growth by Skill Level, 1996 - 2001

	Real Employment Income Growth				
Skill Level	**Forest Industry**	**Pulp & Paper**	**Forestry & Logging**	**Wood Industries**	**Canadian Average**
All Employed					
0	3.3%	11.0%	-6.1%	11.6%	11.6%
A	1.7%	6.9%	-1.2%	2.2%	5.7%
B	-1.1%	3.5%	-0.8%	-0.2%	3.2%
C	-0.2%	1.9%	-1.2%	0.9%	6.4%
D	4.4%	10.0%	3.3%	2.4%	0.6%
Full-Time Employed					
0	0.7%	13.0%	-14.2%	10.9%	9.5%
A	0.9%	6.8%	-2.4%	-0.3%	2.5%
B	-4.2%	1.0%	-4.9%	-3.2%	1.1%
C	-5.2%	0.5%	-5.7%	-5.6%	2.8%
D	-0.5%	7.1%	-2.1%	-4.0%	-0.7%

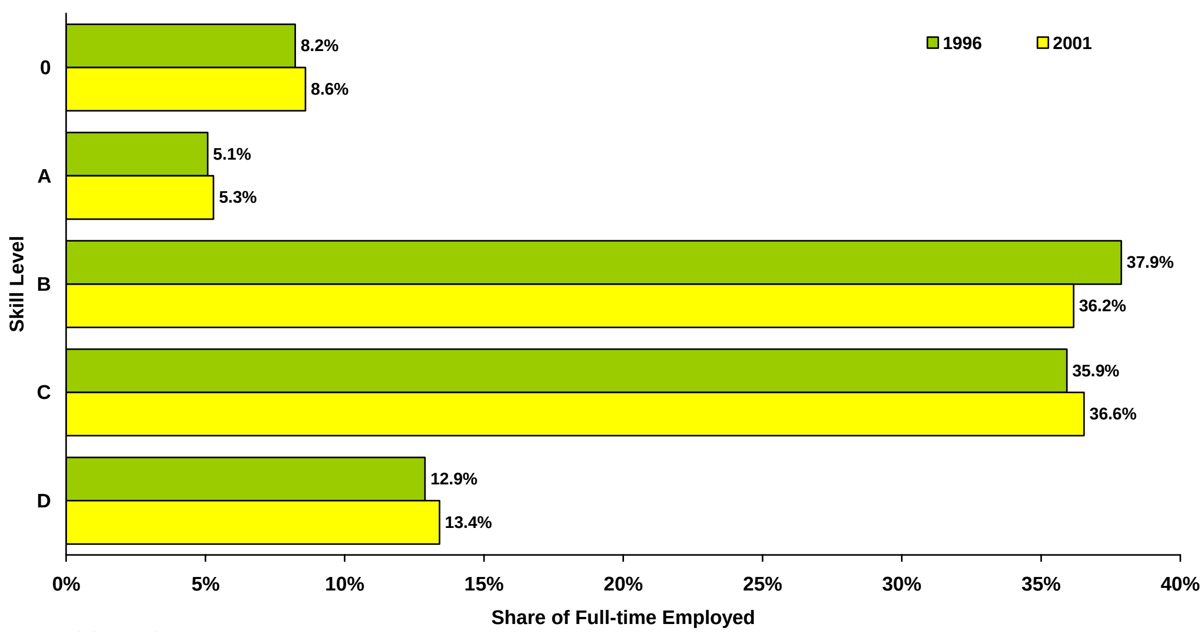
Source: Statistics Canada, *Census 1996 & 2001*; CANSIM, *table 326-0002*.
Note: Assumes prices rose by 9.9% between 1996 and 2001.

b) Changes in Skill Level

In conjunction with examining wages by skill level, the changing distribution of labour by occupational skill level can provide insight into whether labour is responding to industry demand for certain skill levels by moving into different occupations.

From 1996 to 2001, the distribution of workers by occupational skill level did not change significantly in the forest industry. Figure V-4 provides mild evidence of some 'hollowing out.' Full-time workers appear to be shifting either towards higher skilled, managerial and supervisory occupations or towards lower skilled, labouring occupations. This is consistent with what would be predicted by the evidence in Table V-10. If labour is fully mobile then workers would be expected to move out of skills levels where full-time incomes are decreasing (levels B, C and D) and into skill levels where incomes are increasing (0 and A). Here labour supply only partially seems to be responding to changes in real wages perhaps because wages or benefits in the forest industry are remain relatively high for low-skilled jobs relative to similar jobs in other industries.

Figure V-4: Full-Time Workers in the Forest Industry by Skill Level



Source: Statistics Canada, *Census 1996 & 2001* .

However, skills upgrading is not a trend unique to the forest industry; the Canadian labour market as a whole is becoming more highly skilled. Conversely, labour movement into lower skill occupations is not a trend mirrored in the overall economy.

c) Changes in Educational Attainment

Education level is an imperfect measure of the minimum skill level required for an occupation as it does not take underemployment into account. Many individuals work, for various reasons, in occupations for which they overqualified in terms of education level. That said the distribution of workers by highest level of education attained provides insight into the *typical* skill profile of a worker in that occupation.

In the forest sector, the distribution of workers by education levels did not change significantly between 1996 and 2001; therefore, the results as presented in Table VIII-1 and Table VIII-2 of the Appendix. There is evidence, however of general educational upgrading in the majority of the forest occupations with notable exceptions for *Forestry Professionals* (C022) and *Forest technologists and technicians* (C122).

C. Qualitative Evidence: Employer Surveys

From an employer's standpoint, employees' skills are often insufficient; therefore, it is easy to elicit positive responses to survey questions on skill shortages. Employers tend to have a broader definition a "skills shortage" that often includes marginal increases in labour costs and general recruitment difficulties (Shah & Burke, 2005). Furthermore, as Roy, Henson & Lavoie (1996) note, these general recruitment difficulties may reflect problems internal to the firm, such as low wages or poor recruitment strategies, rather than a true dearth of qualified workers.

Nonetheless, employer surveys are an important tool in analyzing skills shortages because firms often internalize labour pressures. In the short-term firms may increase work hours, increase overtime or shift part-time employees to full-time. Without employer input, skill shortages may go undetected until they are acute. However, employer-based surveys should not be used in isolation to assess skills shortages; they should be examined alongside economic indicators.

Employer surveys have been conducted recently by other organizations to measure skills shortages in specific occupations in the forest sector. The Canadian Council of Forest Ministers' survey addressed the sector's demand for foresters and forestry technicians and technologists. Based on responses and the numbers graduating, the survey found no short-term shortage in these occupations. The exception was in the federal government, where the retirement rate is higher. The authors did feel that in the next 4 to 10 years post-secondary institutions would need to significantly increase the number of forestry graduates or at least curb the declining trend in enrolment in order to replace retiring workers.

A comprehensive employer survey, which covers the range of occupations in the forest sector, is needed to complete the picture of what is currently going on in the sector's labour market. In addition, first hand information from employers would contribute to a more robust forecast of future labour demand. Emphasis should be placed on determining the skill needs for future workers in the sector.

D. Summary and Assessment

Is there currently a skills shortage in the forest sector? Will the forest sector experience a shortage in the future?

At the industry level, the quantitative evidence examined in this study does not point to a generalized *quantitative* skills shortage in the forest sector. The labour market indicators are summarized below in Table V-11.

Table V-11: Summary of Skills Shortage Indicators by Sub-Industry

Indicator	Wood	P&P	F&L	Rest of Sector	Canada
Employment Growth (1996 – 2001)	↑	↓	↑	↑↑	↑
Unemployment Rate (1988 – 2005)	↓	↓	↓	↓	↓
Participation Rate (1996 – 2001)	↓	↓	↓	↓	↑
Real Wages (FT/All) (1996 – 2001)	↓/ ↑	↑/ ↑↑	↓/ ↓	N/A	↑/↑
Retirement Rate (1998 – 2002)	Average	High	Low	N/A	
Layoffs (1998 – 2002)	Average	Low	High	N/A	
Hiring Rate (1998 – 2002)	Average	Low	High	N/A	

- **Employment:** Within the forest sector industries, only the wood industries experienced positive and above average employment growth between 1996 and 2001. Employment growth in the forest occupations in the rest of the forest sector was also positive and more than double average. Recent data from the LFS also does not indicate a skills shortage; employment levels in the forest sector industries have been declining. However, the downward trend is a fairly new one for the wood products manufacturing sector; employment rose steadily until 2004 and has since been declining.
- **Unemployment Rate:** Since the early 1990s, the unemployment rate in the paper manufacturing and wood product manufacturing industries has been decreasing. The same is true of the forestry & logging industry however, only since early 2000. Declining unemployment rates are consistent with trends in the Canadian economy generally and therefore, this indicator is largely inconclusive.
- **Participation Rate:** The overall labour participation rate in the Canadian economy increased slightly between 1996 and 2001. The participation rate in the forest sector industries decreased marginally across the board.

- **Real Wages:** Between 1996 and 2001 average annual employment income for people employed full-time in the forest sector industries not only grew less than average, but also failed to keep pace with inflation. The exception was in the pulp and paper industry where real wages grew modestly. Since 2001 average weekly wages[36] for all employees in the paper manufacturing and wood product manufacturing industries grew at a rate greater than average. The forestry & logging industry continued to see real wages deteriorate.
- **Retirement Rate:** Due to the relatively older workforce in the pulp & paper industry, the industry's retirement rate was higher than average between 1998 and 2002. The retirement rate in the wood products manufacturing industry has been close to average while the rate in the forestry & logging industry has been below average.
- **Layoff Rate:** Historically, the layoffs rate in the pulp and paper industry has been well below average, the wood industries have been average and the forestry ^ logging industry well above average.
- **Hiring Rate:** With a low layoff rate, the hiring rate in the pulp & paper industry has also been lower than average. Hiring in the wood industries has been at a rate close to average while in the forestry & logging industry it has been well above average.

In summary, at the industry level the existing quantitative evidence does not support a labour shortage. The pulp & paper industry appears to be the most at-risk given rising real average incomes, traditionally high retirement rates and traditionally low layoffs rates. However, these indicators must be observed while taking into account the impacts of unionization and the large number of layoffs that have occurred in the industry since 2002.

The quantitative evidence does offer some mild support for *qualitative* skills shortages in the forest sector industries. Real wages for occupations at skill levels 0 and A have been increasing (though by less than average) as have real wages for those employed part-time in occupations at skill level D (Table V-10). In response, labour has been moving into these occupations where wages are rising

At the occupational level, we follow the methodology used by Veneri (1999), where an occupation is said to be undergoing a shortage if it meets the following three conditions:

1. Employment growth rate is at least 50% greater than average;
2. Real wages increased at least 30% faster than average; and,
3. Unemployment rate is at least 30% below average.

[36] Including overtime wages.

Applying these criteria to the Census data for all employed, none of the forest occupations are found to be experiencing a quantitative skills shortage. In fact, only **five** occupations satisfy **two out of three** of Veneri's criteria:

- Forestry professionals (C022)
- Pulping control operators (J113)
- Papermaking and coating control operators (J114)
- Woodworking machine operators (J193)
- Other wood products assemblers and inspectors (J223)

When the criteria were applied to full-time employment, only **three** occupations satisfied **two out of the three** criteria[37]:

- Forestry professionals (C022)
- Pulping control operators (J113)
- Papermaking and coating control operators (J114)

These results are generally compatible with future outlooks. Bergeron *et al.* (2004) do not foresee strong labour demand in the forest sector. Despite anticipated weak supply, the sector is not expected to experience broad-based labour shortages in the future. That said, the portion of the sector employed in government, research or education may experience some skills shortages due to lower average retirement ages in those industries. In terms of occupations, Table III-7 shows that employment levels in only a few forest occupations are expected to grow faster than average. Those that are expected to experience strong growth are primarily low-skill occupations (skill level C). There is potential for a shortage of forestry professionals as well given that retirement pressures are anticipated to be high for high-skill occupations requiring a university education and occupations in management, education and government service. Low enrolment in post-secondary forestry programs is expected to continue.

[37] The same unemployment rates were used for the full-time, full-year analysis as was calculated for the all employed analysis.

VI. Forecasted Supply and Demand Balance

The assessment of the future labour market balance in the forest sector draws upon the three analyses presented in this study: forecasted labour demand, forecasted labour supply and the historical labour balance, measured using skills shortage indicators.

A. Future Labour Demand

Overall, future labour demand in the forest sector will be weak. Under our baseline production forecast, employment levels are expected to decrease in the forest sector industries to 274,000 in 2015 from 339,000 in 2005. Under our high demand scenario, employment levels will decrease slightly to 316,000 by 2015. Employment levels in the the panels, particle board and other wood products industry are expected to increase in under this scenario thereby placing that sub-industry most at-risk of a labour market imbalance should future production growth be strong (Table III-6).

While evidence does not support a generalized future labour imbalance, HRSDC's COPS model does predict that there will be imbalances for certain occupations and skill levels. However, the labour pressure in these occupations will be driven by the large outflows of retirees rather than by the creation of new jobs. Examples of such occupations include *Forestry technologists and technicians* (C123), *Papermaking and coating control operators* (J114), and *Pulp mill machine operators* (J142).[38] Additionally, in terms of skill levels, COPS predicts strong demand in managerial occupations and occupations requiring a university education. In the forest sector, this will likely translate into strong demand for *Forestry Professionals* (C022).

B. Future Labour Supply

Growth in the future Canadian labour supply will be driven by immigration. This trend does not bode well for the forest sector because, owing to a variety of factors, the sector has historically not attracted a large proportion of immigrants. It is anticipated that because of this trend, the forest sector's labour supply will shrink relative to other sectors that are more attractive to immigrants.

Forestry schools and colleges are the main source of forestry professionals, technicians and technologists. Enrolment in these schools has decreased dramatically over the last several years translating into a coinciding decrease in the number of graduates. The weak supply of forest practitioners will continue unless enrolment trends are reversed.

For the other forest occupations, making a robust assessment of the future labour supply is a challenge. With the exception of *Forestry Professionals* (C022) and *Forestry technologists and technicians* (C123), the forest occupations have low educational requirements making it difficult to pin point the sources of labour for these occupations. Workers in these occupations come from a variety of sources including: trade schools, high schools, Aboriginal and rural communities. Two key labour sources that the forest sector, industry in particular, will continue to see weak supply from in the short term are

[38] See
Table III-7 for additional examples.

the skilled trades and 'non-traditional' sources (women, migrants, immigrants and youth). Supply from these sources might be increased in the long term with concerted effort.

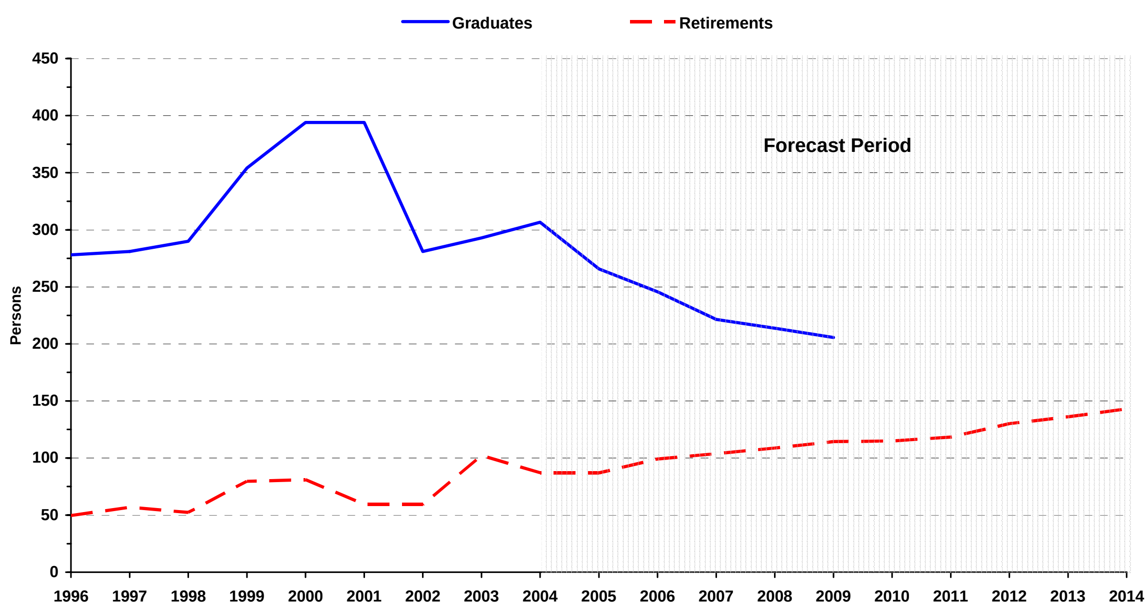
The lack of detailed information on labour supply to specific forest occupations makes forecasting future supply difficult. This is one area in which employer surveys would be particularly useful in filling-in information gaps.

C. Historical and Future Labour Market Balance

The historical labour market indicators examined in Section V do not provide evidence to support a skills shortage in any of the forest sector industries. However, they do provide mild support for shortages in specific forest occupations and occupations at higher (levels 0 and A) and lower (level D) skill levels only.

The sole occupation where there is an easily identifiable source of labour is *Forestry Professional* (C022). This occupation provides a good illustration of what the future may hold for the labour market in the forest sector; though in the near term there will not be a shortage of professional foresters, should trends continue there is a strong possibility of a shortage in the future (Figure VI-1).

Figure VI-1: Forecasted CFAB-Accredited Degree Program Graduates and Retiring Forestry Professionals (C022)



Source: CCFM, *National Employer Demand Survey*, Table 3; Dr. Susan Watts, University of British Columbia; and HRSD, *Canadian Occupational Projection System*

Forest occupations where retirement pressures and labour demand are expected to be strong over the next ten years are at greater risk of experiencing a skills shortage. Examples include *Forestry technologists and technicians* (C123), *Papermaking and coating control operators* (J114), and *Pulp mill machine operators* (J142).

VII. Implications for Stakeholders

The Canadian forest sector has been going through a period of dramatic change. Canadian forest companies have been responding not only to long-term structural challenges, but also to the short-term challenges presented by, amongst other things, the strong Canadian dollar, rising production costs and weakened demand in some key product markets. Human resource issues have in some way been lost in the fray.

The recent tightness in the labour market caused by the resource sector boom in Western Canada has helped bring human resource issues back into the spotlight. For forest sector employers, competition with "hot" industries like construction and petroleum for both skilled and unskilled labour has revealed, and in some cases exacerbated, recruitment and retention challenges. While some of these human resource challenges are expected to abate as commodity prices moderate, others may be aggravated by the wave of baby boomer retirements.

Human resources issues are competitiveness issues and therefore should be integrated into firm-level, industry-level, and government-level competitiveness initiatives.

The aim of this study was to provide an overview of the labour market in Canada's forest sector, such as to identify current and potential future labour market issues. While the analysis did not find evidence of a generalized shortage of skilled and unskilled labour currently, a future labour market imbalance is forecasted. Based on the analysis, a number of initiatives to address these labour challenges are recommended:

- **Conduct Employer-Based Survey:** This study is an important first step in measuring current and forecasting future labour market imbalances. The quantitative analysis revealed that there are significant information gaps that are limiting a robust assessment of current and future skills shortages in the sector. As a next step, a survey of forest sector employers should be undertaken by government in consultation with industry, educational institutions and other forest sector employers. It is only through asking employers themselves that the specific future skills needs of the forest sector can be identified.
- **Improve Public Perception of the Industry:** The negative perceptions that are plaguing the forest sector industries are contributing to the shrinking amount of labour supplied to the industry. Youth, in particular, are highly influenced by image when making labour market decisions. Stakeholders can partner to improve the perception of the forest sector industries.
- **Increase Awareness of Careers in the Forest Sector:** Linked to improving the forest industry's public perception, employers and educational institutions must work together to promote careers in the forest sector in elementary and secondary schools. Examples of existing school-based initiatives are the *Viens vivre le forêt* awareness program at the Duchesnay forestry school in Quebec and the *WoodLINKS* Wood Products Manufacturing Education and Certification program in British Columbia.
- **Promote Forest Sector Careers to 'Non-traditional' Groups:** Women, immigrants and migrants/movers are considered non-traditional sources of labour for the forest

sector. Creating a diverse and stable future labour supply for the forest sector will depend on attracting more workers from these groups provided they have the right skills and training. The traditional insularity in the sector has deterred non-traditional groups from pursuing careers in the forest sector. The pulp & paper industry is the most insular of the forest sector industries. It has the lowest representation of all non-traditional groups and Aboriginal employees.

  - **Women:** Forest sector employers need to provide an attractive work environment for women. Professional associations, industry, schools and colleges can partner to develop school-based programs that specifically target female students.
  - **Migrants/Movers:** The forest sector has few regulated occupations. For the handful of occupations that are regulated (e.g. professional foresters and skill trades) mobility issues are minimal as agreements and programs aimed at easing inter-provincial movement are already in existence.[39] The main challenge for employers is attracting labour from *outside* the remote and rural communities where forest operations are typically located.
  - **Immigrants & Foreign Workers:** Established immigrant networks can be leveraged to recruit recent immigrants particularly on the wood manufacturing side where these networks are more likely to exist. However, attracting international professional-level workers will be a challenge for employers given the regional differences in forests and forestry practices. One way to inform foreign students training to be foresters about the Canadian forest sector would be through a program of international co-op/exchange programs run by forestry schools and colleges.

- **Increase Post-Secondary Enrolment in Forestry Schools & Colleges:** Canadian forestry schools can increase their promotional and marketing efforts in order to attract more students and increase the number of graduating foresters in the future. Industry and educational institutions should partner to ensure that current curriculum and programs will meet the future needs of forest sector employers.

- **Upgrade Skills and Education Levels:** The low levels of educational attainment amongst employees in the forest industry have serious implications for training, productivity and hence competitiveness. Though historically human capital accumulation has not been as significant a driver of labour productivity growth in the forest industry as innovation and capital deepening, it remains a factor and a potential source of significant competitive advantage. Increased mechanization in the industry is changing both the number and types of workers that are in demand. Typically, as a process becomes mechanized, fewer workers are needed but, remaining workers must be more highly skilled. Forest sector employers should encourage workers to upgrade their skills and education level through work-study programs, apprenticeships, in-house training or employer-sponsored educational leave. A strong focus should be made on the completion of secondary school with emphasis on math and science courses.

[39] For example the Interprovincial Standards "Real Seal" Program (www.red-seal.ca).

- **Reinforce Partnerships with Aboriginal Communities:** Due to a combination of demographic and geographic trends, it is becoming increasingly important to further strengthen the relationship between forest sector employers and Aboriginal communities. New partnerships between the forest industry and local Aboriginal communities that focus on education and skills development will assist in ensuring that Aboriginal people will have the right qualifications and skills to pursue employment opportunities in the forest industry.

VIII. Appendix

Table VIII-1: Distribution of Full-Time Employees by Educational Attainment, 1996

NOC-S	Occupation	Below High School	High School	Trades certificate or diploma	College certificate or diploma	Diploma below bachelor's	Bachelor's degree(s)	University degree above bachelor's
C022	Forestry professionals	3.2%	4.2%	5.0%	16.1%	2.6%	**50.7%**	18.4%
C123	Forestry technologists and technicians	6.1%	11.3%	12.7%	**47.1%**	4.0%	13.6%	5.2%
I111	Supervisors, logging and forestry	**33.6%**	16.4%	13.3%	23.8%	1.4%	9.4%	2.0%
I151	Logging machinery operators	**60.6%**	20.4%	14.0%	3.9%	0.0%	0.9%	0.0%
I161	Chain-saw and skidder operators	**56.9%**	20.4%	15.2%	5.8%	0.3%	1.3%	0.0%
I162	Silviculture and forestry workers	**29.5%**	20.7%	9.7%	22.1%	3.2%	10.6%	2.8%
I216	Logging and forestry labourers	**43.2%**	27.7%	13.5%	10.6%	1.4%	3.0%	0.8%
J015	Supervisors, forest products processing	**29.5%**	27.7%	18.9%	14.9%	1.3%	6.6%	1.1%
J113	Pulping control operators	25.4%	**40.8%**	14.1%	12.2%	0.6%	6.3%	0.6%
J114	Papermaking and coating control operators	35.1%	**40.6%**	15.0%	6.2%	0.9%	1.8%	0.0%
J141	Sawmill machine operators	**55.6%**	25.5%	13.8%	3.1%	0.5%	1.4%	0.2%
J142	Pulp mill machine operators	33.5%	**38.0%**	16.2%	10.1%	0.7%	1.1%	0.3%
J143	Papermaking and finishing machine operators	37.9%	**39.7%**	11.5%	8.8%	0.9%	0.7%	0.4%
J144	Other wood processing machine operators	**54.5%**	25.6%	12.4%	6.1%	0.0%	1.1%	0.2%
J145	Paper converting machine operators	**47.2%**	33.2%	10.2%	7.6%	0.4%	1.3%	0.2%
J146	Lumber graders and other wood processing inspectors and graders	**36.3%**	30.6%	22.2%	7.4%	0.6%	2.0%	1.0%
J193	Woodworking machine operators	**54.3%**	22.8%	12.8%	6.9%	0.5%	2.1%	0.5%
J223	Other wood products assemblers and inspectors	**48.4%**	30.9%	13.0%	5.9%	0.6%	1.3%	0.0%
J314	Labourers in wood, pulp and paper processing	**45.6%**	33.4%	13.1%	6.1%	0.4%	1.4%	0.2%

Source: Statistics Canada, *1996 Census*.

Note: Includes all industries, FTFY employed only. Figures may not sum due to rounding.

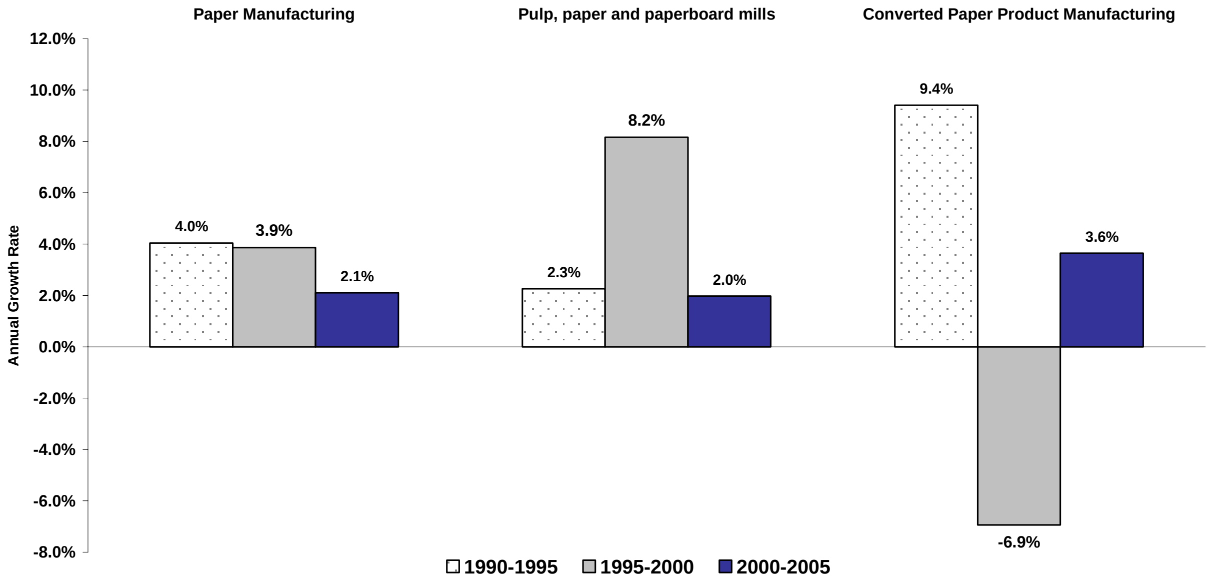
Table VIII-2: Distribution of Full-Time Employees by Educational Attainment, 2001

NOC-S	Occupation	Below High School	High School	Trades certificate or diploma	College certificate or diploma	Diploma below bachelor's	Bachelor's degree(s)	University degree above bachelor's
C022	Forestry professionals	2.4%	5.4%	4.2%	14.6%	2.6%	**54.8%**	16.1%
C123	Forestry technologists and technicians	6.0%	12.6%	13.6%	**52.3%**	2.7%	8.2%	4.5%
I111	Supervisors, logging and forestry	**29.8%**	20.6%	12.7%	23.2%	3.0%	8.9%	1.8%
I151	Logging machinery operators	**57.7%**	20.3%	16.9%	3.5%	0.7%	1.0%	0.3%
I161	Chain-saw and skidder operators	**57.9%**	21.3%	13.8%	5.6%	0.0%	0.7%	0.8%
I162	Silviculture and forestry workers	**36.4%**	14.4%	17.8%	17.8%	0.8%	8.9%	3.8%
I216	Logging and forestry labourers	**42.2%**	30.4%	12.8%	11.0%	0.8%	2.4%	0.0%
J015	Supervisors, forest products processing	26.6%	**27.9%**	19.3%	15.7%	2.2%	6.8%	1.6%
J113	Pulping control operators	22.5%	**41.2%**	15.2%	15.7%	1.0%	3.9%	0.0%
J114	Papermaking and coating control operators	36.0%	**37.6%**	15.2%	6.9%	1.0%	2.4%	0.7%
J141	Sawmill machine operators	**53.7%**	26.9%	13.1%	5.1%	0.3%	0.8%	0.1%
J142	Pulp mill machine operators	26.7%	**41.6%**	17.0%	12.1%	0.5%	1.8%	0.2%
J143	Papermaking and finishing machine operators	34.4%	**42.3%**	13.7%	6.8%	0.6%	2.1%	0.3%
J144	Other wood processing machine operators	**46.7%**	30.2%	14.2%	7.5%	0.5%	0.9%	0.0%
J145	Paper converting machine operators	**43.4%**	35.1%	10.4%	8.4%	0.8%	0.9%	1.0%
J146	Lumber graders and other wood processing inspectors and graders	**32.2%**	30.4%	24.3%	9.6%	0.6%	2.0%	0.9%
J193	Woodworking machine operators	**46.9%**	28.7%	13.7%	8.1%	0.7%	1.4%	0.4%
J223	Other wood products assemblers and inspectors	**49.9%**	29.6%	10.1%	6.6%	0.7%	2.5%	0.6%
J314	Labourers in wood, pulp and paper processing	**42.3%**	35.9%	12.1%	7.5%	0.6%	1.4%	0.1%

Source: Statistics Canada, *2001 Census*.

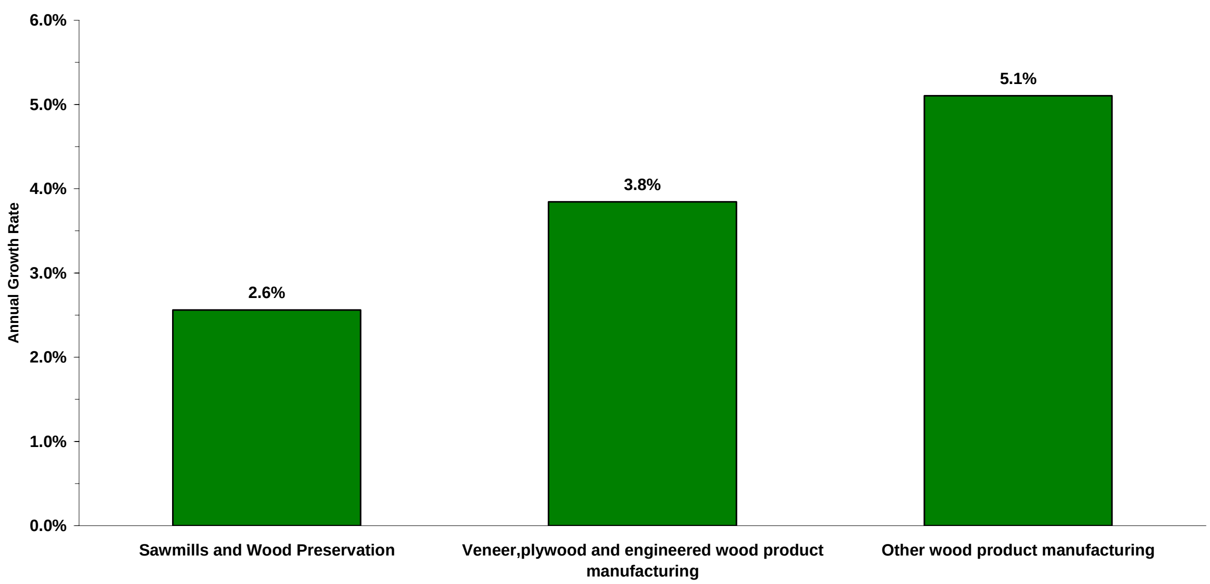
Note: Includes all industries, FTFY employed only. Figures may not sum due to rounding.

Figure VIII-1: Annual Average Growth in Labour Productivity in the Paper Manufacturing Sub-Industries



Source: Centre for the Study of Living Standards.
Note: Labour productivity is measured as Real GDP per Hour Worked.

Figure VIII-2: Annual Average Growth in Labour Productivity in the Wood Product Manufacturing Sub-Industries, 2000 - 2005



Source: Centre for the Study of Living Standards.
Note: Labour productivity is measured as Real GDP per Hour Worked.

IX. References

Bergeron, Louis-Philippe *et al.* (2004). Looking-Ahead: A 10-Year Outlook for the Canadian Labour Market 2004 – 2013 (SP-615-10-04E). Ottawa, ON: Human Resources and Skills Development Canada.

Canadian Association of University of Teachers. (2006). *Almanac of Post-Secondary Education in Canada*. Ottawa, ON: CAUT.

Canadian Council of Forest Ministers, Deputies Committee. (2004). National Employer Demand Survey for Foresters and Forestry Technicians.

Canadian Council of Forest Ministers. (2005). Wood Supply in Canada, 2005 Report. Ottawa: ON: CCFM.

Canadian Forest Service – Natural Resources Canada. (2006). The State of Canada's Forests 2005-2006, Ottawa, ON: Natural Resources Canada.

Canadian Labour and Business Centre. (2004). Workforce Profile of the Natural Resources Sector. Ottawa, ON: CLBC.

CANSIM. Consumer Price Index, Historical Summary (1985 to 2004) (table 326-0002). www40.statcan.ca/cbin/fl/cstprintflag.cgi.

CANSIM. Estimates of population, by age group and sex, Canada, provinces and territories, annual Estimates of population, by age group and sex, Canada, provinces and territories, annual (table 051-0001).

Centre for the Study of Living Standards for Natural Resources Canada. (2004). Report on Productivity Trends in Selected Natural Resource Industries in Canada (CSLS Research Report 2004-06). Ottawa, ON: CSLS.

Hoberg, George *et al.* (2003). Image and Enrolments. *FOCUS*, *10* (6), 22-23.

Hopwood, A., MacTavish, J., Moar, A., Scott, G., & Smith, P. (1992). Aboriginal Forestry Training & Employment Review (AFTER) Final Draft Phase 1. Ottawa, ON: National Aboriginal Forestry Association.

House of Commons Standing Committee on Industry. (Undated). Productivity and Innovation: A Competitive and Prosperous Canada. (Available at: http://www.parl.gc.ca/infocomdoc/36/2/indu/studies/reports/indy20/04-toc-e.html)

Hull, Jeremy. (2005). Post-Secondary Education and Labour Market Outcomes Canada, 2001. Winnipeg, MB: Prologica Research Inc.

Human Resources Development Canada. (2001). *National Occupational Classification Occupational Descriptions NOC 2001* (LM-247-05-01E). Ottawa, ON: Canadian Government Publishing.

Interim National Recruitment Strategy Steering Committee. (2006). The Crisis in Post-Secondary Enrolments in Forestry Programs: A Call to Action for Canada's Future Forestry Professional/Technical Workforce. (Available at: http://www.cif-ifc.org/english/e-recruiters-white-paper.shtml).

Lamontagne, François. Demographic Profile of the Natural Resources Sector. Ottawa, ON: Canadian Labour and Business Centre.

Leonhardt, David and Bajaj, Vikas. (2006). Read Between All Those For-Sale Signs. *The New York Times*. August 27. (www.nytimes.com)

Lewis, Kathy & Hawkins, Chris. (2003). A Crisis in our Forestry Schools…and our Profession? *FOCUS, 10* (6), 20-21.

Loreto, Richard (2006). Demographic Trends in Canada: What Are the Potential Impacts on the Forest Sector? (Presentation made on February 2, 2006 at Ottawa, Ontario).

MacKenzie, Andrew & Dryburgh, Heather. (2003). The Retirement Wave. *Perspectives*, Spring, 40-46.

MITAC. (2005). Prospecting the Future: Meeting the Human Resource Challenges in the Canadian Minerals and Metals Industry. Ottawa, ON: MITAC.

Moazzami, B. (2006). An Economic Impact Analysis of the Northwestern Ontario Forest Sector. Thunder Bay, ON: Department of Economics, Lakehead University.

Price Waterhouse. (1994). The Canadian Pulp and Paper Industry: A Focus on Human Resources (Cat. No. MP43-311/1994E). Ottawa, ON: Ministry of Supply and Services Canada.

Pulkki, Reino. (2005). Forestry: A 'Smart' Career Choice. *Lakehead University Magazine.* Spring/Summer 2005. (available at: http://magazine.lakeheadu.ca/page.php?p=25&i=4)

Pyper, Wendy & Giles, Philip. (2002). Approaching Retirement. *Perspectives,* Winter, 9-16.

RISI. (2005). *World Pulp & Recovered Paper Forecast*, December, 5 (3).

RISI. (2006a). *North American Lumber 15-Year Forecast*, August. (www.risiinfo.com)

RISI. (2006b). *North American Wood Panels 15-Year Forecast*, September. (www.risiinfio.com)

RISI (2006c). *North American Graphic Paper 15-Year Forecast*, September. (www.risiinfo.com)

Roy, Richard, Henson, Harold & Lavoie, Claude. (1996). A Primer on Skill Shortages in Canada (R-96-8E). Hull, QC: Human Resources Development Canada.

Schaan, Susan and Anderson, Frances. (2002). Innovation in the Forest Sector. *The Forestry Chronicle, 87*(1), January/February.

Smith, Douglas A. (2002). Forecasting future skills needs in Canada. In M. Nuegart & K. Schömann (Eds.), *Forecasting Labour Markets in OECD Countries: Measuring and Tackling Mismatches* (pp. 66-89). Cheltenham, UK: Edward Elgar.

Statistics Canada. (2004). A Profile of Canada's North American Indian Population with Legal Indian Status. *(Presentation).*

Statistics Canada. (2005). Population Projections for Canada, Provinces and Territories 2005 – 2031 (Catalogue no. 91-520-XIE). Ottawa, ON: Statistics Canada.

U.S. Energy Information Administration (EIA). http://tonto.eia.doe.gov/dnav/pet/hist/rwtcd.htm

Veneri, Carolyn M. (1999). Can Occupational Labor Shortages be Identified Using Available Data? *Monthly Labor Review,* March, 15-21.

Winistorier, Paul M. (2005). Competitiveness, Manufacturing, and the Role of Education in the Supply Chain of the Forest Industry. *Forest Products Journal, 55* (6), 6-16.

Wood Manufacturing Council. A Situational Analysis of the Advanced Wood Products Manufacturing Industry. (http://www.wmc-cfb.ca/programs/situational.htm).

Wood Manufacturing Council. A Survey of the Educational Needs of the Advanced Wood Products Processing Sector. (http://www.wmc-cfb.ca/programs/educational.htm).

www.labourmarketinformation.ca

www.jobfutures.ca