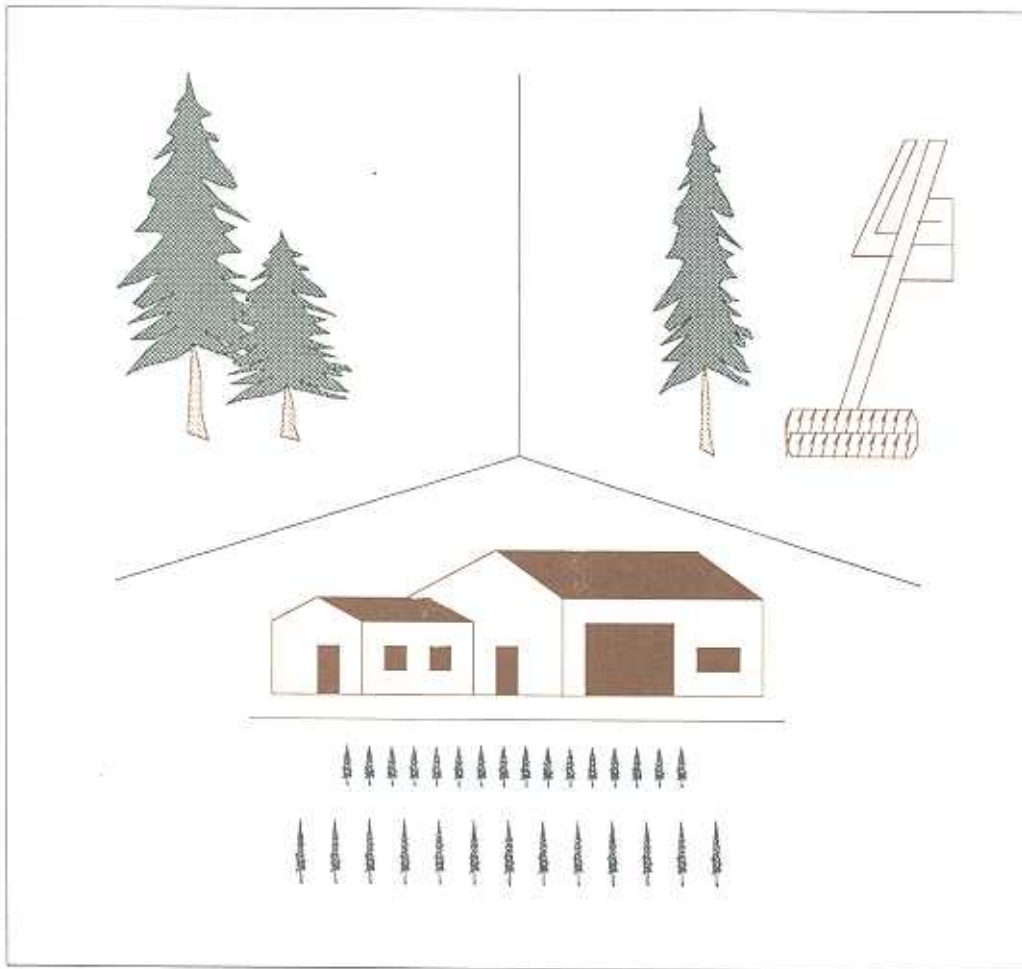




The Silviculture Labor Force in Prince Edward Island

A Socio-Economic Profile

Lorenzo Rugo



Forestry Canada

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A Socio-Economic Profile

Lorenzo Rugo
Policy and Economics Directorate

Forestry Canada
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Preface

More information is now available on Canada's forest resources and development, specifically in silviculture, forest protection and access, and research and development. This information, however, focuses mainly on the results of those activities, such as the number of hectares planted or stumpage fees collected.

Labor represents a key component of most forest management activities. Existing data used to describe, quantify and analyze this labor force are limited and concentrated in only a few provinces. Furthermore, these sources cover only a narrow range of labor force types and socio-economic categories.

Two Canadian studies on the use of human resources within the forest management services industry include that of Fraser and Howard (1987) and the Silviculture Joint Adjustment Committee (1988). The former study reported social and economic information on planting contracts and workers employed to plant trees in the province of British Columbia. The latter provided information on the British Columbia silviculture labor force, including recommendations for improving the use of human resources in that province's forest sector. These studies have contributed to understanding problems surrounding Canada's silviculture workers.

Since those initial studies other attempts have been made to improve the socio-economic information on workers within the forest management services sector. For example, a study prepared by Deloitte,

Haskins and Sells Ltd. (1988) for the British Columbia Ministry of Forests and Forestry Canada (as a follow-up to Fraser and Howard) provided social and economic information on silviculture contractors and workers employed in forest management activities other than planting.

In 1989, Forestry Canada, in cooperation with the Ontario Ministry of Natural Resources, initiated a silviculture labor force study in eastern Ontario. The following year (1990), Forestry Canada, in cooperation with the Newfoundland and Labrador Department of Forestry and Agriculture, embarked upon a similar study in Newfoundland and Labrador. The aim of these projects was to assemble extensive socio-economic data on this component of the provincial forest management services labor force. Information was solicited on the workers' personal characteristics, quality of life, economic welfare and occupational aspirations.

Although information on human resources within forestry is improving, additional information from other regions across Canada is needed to enhance forest sector decision-making at the local, regional, provincial and national levels. Questions concerning the effect of employment programs, employment opportunities and the supply of qualified workers required to meet the growing demand for forest management work need to be addressed.

Information on the forest management services labor force can be useful in four areas as follows:

1. Employment programs

There are a number of employment, training, and human resource development programs that are directed at forestry. Better data would contribute to improved program planning and design.

2. Employment opportunities

Few studies have been conducted in Canada to forecast the demand for forest management workers. During the 1980s, and continuing today, increasing international competition and new technological innovations have prompted Canadian forest product firms to streamline their operations. In the logging industry, for instance, industry has moved toward more capital-intensive operations. The extent to which similar changes are occurring within the forest management services industry is not known. Better information that would explain changes in the demand for forest management workers is needed.

3. Forest management planning

Substantial funds have been allocated to forest management programs in Canada. Careful use of this funding and the concomitant benefits of increased wood supply are important issues. Decisions made must properly balance resources, energy, technology, infrastructure and labor. Determining labor requirements poses few problems, but fulfilling them, particularly with skilled workers, does. A better understanding of the labor force is needed to assess the extent to which it is able to supply present and future employment needs.

4. Cost effectiveness

Labor is the largest cost of most forest management activities. Clearly, then, improving labor quality is one way to reduce costs and improve the efficiency of silviculture programs. Trained tree planters, for example, could reduce seedling mortality with appropriate planting techniques. This, in turn, would reduce the labor and refill stock needed to replace dead seedlings. Determining the labor quality (training and experience) of forest management workers would also permit the development of programs designed to meet other specific, identified needs.

Forest management workers: Increasing our understanding

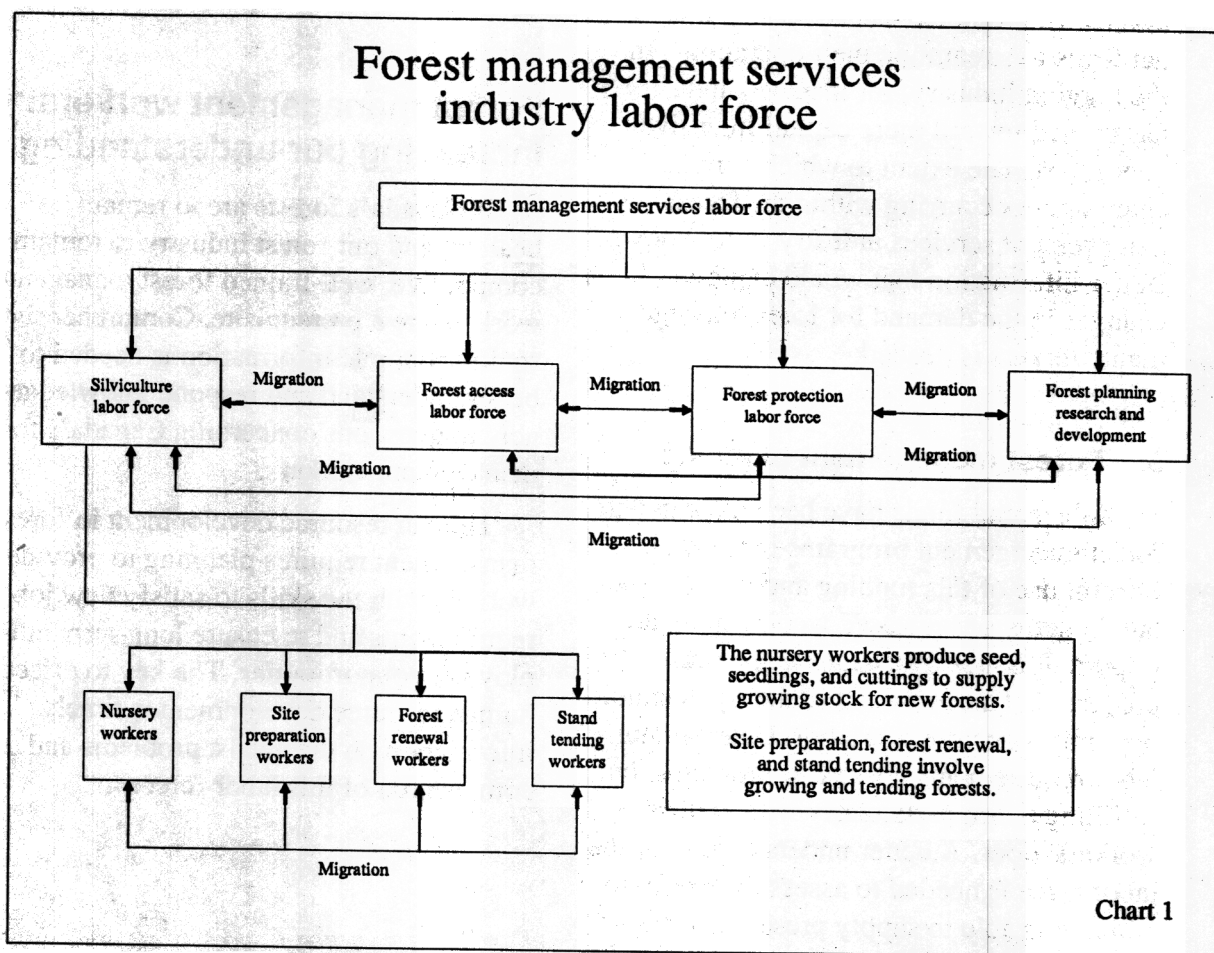
If Canada's forests are to remain healthy, and our forest industry to remain competitive, well-trained forest management workers are a prerequisite. Comprehensive socio-economic information is needed to better understand and respond knowledgeably to questions concerning Canada's forest management workers.

Human resource development in forest management requires planning to provide workers with the skills to satisfy new job requirements and to ensure long-term employment opportunities. The key to effective human resource development is timely information on the needs, problems and composition of this labor force.

Identifying the needs of specific workers necessitated developing an occupational classification system for forest management workers (*Chart 1*). Forest management services consists of four labor subgroups (individuals 15 years of age or over) employed in silviculture, forest access, forest protection or forest planning and development during a specific forest management season. This study collected and analyses information on the socio-economic and occupational aspects of one segment of this labor force, namely, silviculture.

The silviculture labor force

The silviculture labor force was selected as the initial focus, in part because of the dramatic increases in silviculture treatments in Canada over the past 10 years. In 1980, for example, approximately 340 000 hectares (ha) of forest were treated, whereas in 1988, some 720 000 ha were treated. (Silviculture treatments consist mainly of tree planting and stand tending operations).



Growth in silviculture treatments has led to a rapid expansion in the size of this labor force. Some estimates have placed the size of the silviculture labor force in Canada at 50 000 workers.¹ This workforce is not fully captured nor appreciated by conventional reporting methods such as Statistics Canada's *Labor Force Survey*.

Silviculture workers should be regarded as an essential ingredient to the well-being of our forests. With the health of our forests and the industry being dependent, in part, on quality, cost-effective silviculture treatments, the demand for well-trained silviculture workers will most certainly rise.

This study was conducted within the province of Prince Edward Island during the 1990 forest management season. It focuses on three silviculture employment groups identified as *forest renewal*, *stand tending* and *nursery*. An analysis of site preparation workers is not included because of the relatively small size of this group.

Acknowledgments

I would like to extend special thanks to the Prince Edward Island Department of Energy and Forestry, especially Jerry Gavin, director of operations, Forestry Branch, for supporting this study.*

To my field interviewer who had to undergo a variety of weather conditions and environmental situations, I extend my sincere appreciation.

From Forestry Canada, I extend many thanks to Allan Eddy, Forest Development, Prince Edward Island, and staff for their guidance and assistance in this study. In addition, a sincere thank-you to Brain Sykes, Forestry Canada, for supporting this study.

Finally, thanks to my editor/designer for the presentation of this report.

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Executive Summary

To remain competitive, Canada's forest industry must depend upon a well-trained work force. Human resource development in forest management requires careful planning to provide workers with the skills necessary to satisfy new job requirements, and to ensure long-term employment opportunities. The key to human resource development is the provision of timely information on the needs, problems and composition of the forestry labor force.

The Canadian silviculture labor force, comprised of approximately 50 000 workers, is being studied because of the increased emphasis by the silviculture industry on quality forest management work. This study provides a socio-economic profile of workers currently engaged in silviculture activities in Prince Edward Island. It represents a cooperative effort between Forestry Canada, industry and the Prince Edward Island Department of Energy and Forestry.

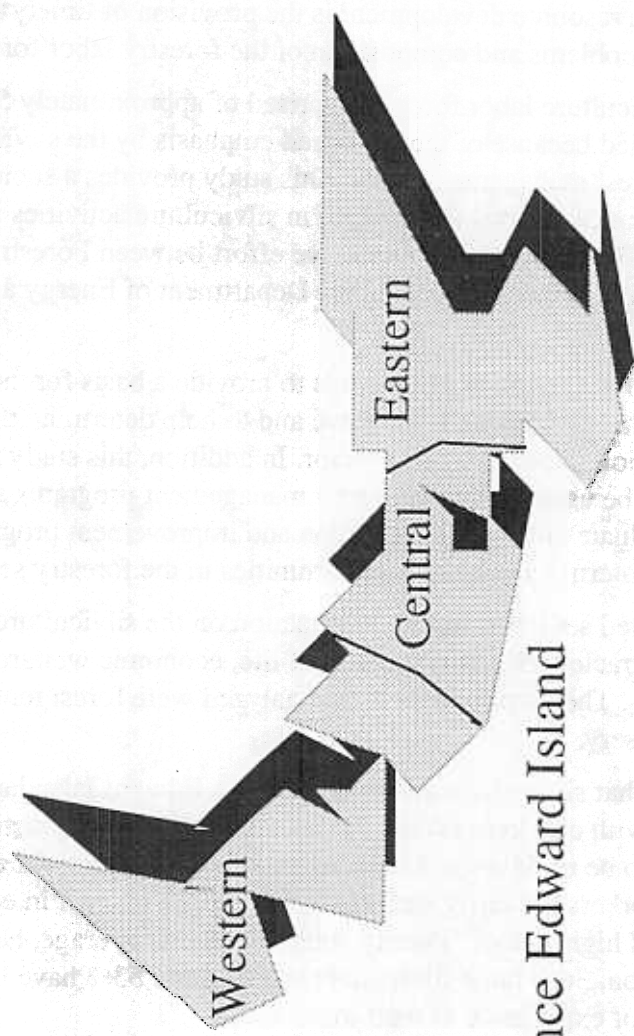
The aim of this human resource initiative is to provide a basis for monitoring developments in the silviculture labor force and to help determine the kind of training and education required by this sector. In addition, this study is a resource tool that can be used to develop forest management programs and human resources, evaluate employment creation and improvement programs, and help plan for long-term employment opportunities in the forestry sector.

The survey collected socio-economic information on the silviculture workers' personal characteristics, their quality of life, economic welfare and occupational concerns. The employment areas analyzed were forest renewal, stand tending and nursery.

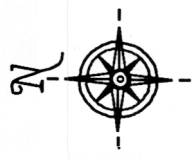
The study shows that silviculture workers in Prince Edward Island are mostly young males with children, except those involved in nursery activities, who are more likely to be middle-aged females with one to three children. As a total group these workers are fairly well educated: more than half in each group have completed high school. Twenty-four percent, on average, have some forestry education, 36% have silviculture training and 53% have brought four or more seasons of experience to their jobs.

Generally, the job market is only open to forest renewal workers for four to eight weeks per year for 40 or more hours per week. Only stand tending and nursery workers are able to work more than 12 weeks per season and earn more per year for silviculture work. In addition, some silviculture workers are multi-skilled and able to remain employed for most of the year by moving from one silviculture employment group to another.

Silviculture Labor Force in Prince Edward Island - Study Area -



Prince Edward Island



Chapter I

Objective and Methodology

Objective

Forestry Canada directed this study of silviculture workers in Prince Edward Island to:

1. develop a socio-economic profile that could be used to:
 - a) measure the effect of silviculture on employment;
 - b) prepare information that can be used to enhance the training and education of silviculture workers;
 - c) respond to joint interdepartmental opportunities for employment creation programs;
 - d) support future labor productivity studies; and
2. develop a database that can be used to track socio-economic trends in this labor force.

Methodology and questionnaire design

A questionnaire was designed to survey socio-economic information on silviculture workers in forest renewal, stand tending and nursery programs. Extensive care was taken in formulating survey questions to ensure comprehension, thereby improving response rate potential.

All questions were subject to careful review, such as: Was the information requested available in other forms? Was the item relevant to the purpose of the study;

and could the requested information be correlated to other items to help expand the study's significance? Questions were ranked by order of importance. Potentially sensitive questions such as earnings-per-year were placed near the end of the questionnaire.

Questionnaires were distributed by interviewers in group sessions held at the work site. This method was chosen to increase response rates by providing psychological encouragement and improving the workers' willingness to answer. Forestry Canada's headquarters division, in cooperation with the Department's Prince Edward Island sub-office, coordinated the survey. The Prince Edward Island Department of Energy and Forestry played an advisor/consultant role within the data collection process (*Chart 2*). A local forestry consultant was employed by Forestry Canada to manage the collection of information.

The forestry consultant, an experienced forester familiar with forest management practices in Prince Edward Island, organized project work groups by handling assignments, reviewing completed work and serving as a liaison with the study coordinator.

Interviewers (local foresters), who were also well informed on silviculture matters and capable of gaining the respect of field crews, were responsible for collecting completed questionnaires, answering questions related to the survey and augmenting good public relations with the workers.

Implementation plan for silviculture worker survey

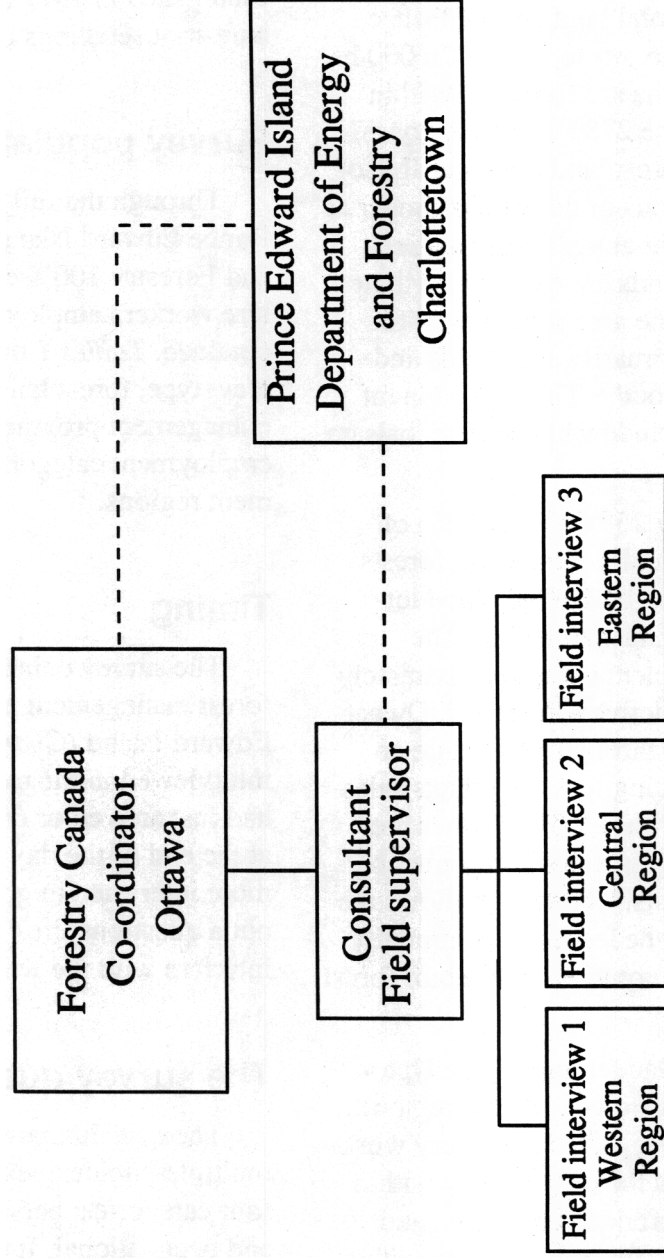


Chart 2

Survey area

The forest management regions of the Prince Edward Island Department of Energy and Forestry (consisting of Western, Central, and Eastern regions) comprised the survey area. The total land area of Prince Edward Island amounts to about 570 000 ha, of which 290 000 ha are forested. Within this forest land base 278 000 ha are considered productive forest land (land capable of producing coniferous or deciduous timber at least 12 m in height at a 50-year rotation age). The forest lands are evenly distributed, with one third of the area primarily hardwood, one third primarily softwoods and one third mixed wood.² The predominant conifer species include white spruce, balsam fir and tamarack.

Approximately 258 000 ha (93%) of Prince Edward Island's productive forests are privately owned by 16 000 wood lot owners (average land size 16 ha). The provincial government owns approximately 19 000 ha of productive forest land. Ownership is maintained through two tenure arrangements, including forest products sales permits and forest leases. The former provides exclusive rights to harvest timber or other forest products.³ The latter allows the forest land base to be leased to community organizations, but not to private sector forest companies.⁴

The J. Frank Gaudet nursery on Upton Road near Charlottetown (Central region) constituted the survey site for nursery workers. This nursery is the only facility within the province that produces bare-root and container seedlings for transplanting within forest renewal sites. The nursery has a

current production capacity of 6 million container seedlings and 6 million bare-root seedlings per annum. The production of bare-root seedlings, however, has ceased since 1990. The J. F. Gaudet nursery was established in 1979 and delivered its first bare-root seedlings in the same year.

Survey population

Through the full cooperation of the Prince Edward Island Department of Energy and Forestry 100% coverage of all silviculture workers employed in the province was obtained. *Tables 1* through *3* show the labor crew type, forest land base and the forest management program for each of the three employment categories and forest management regions.

Timing

The survey coincided with the timing of forest management activities within Prince Edward Island (*Chart 3*). Respondents were interviewed in the morning when the crews had just arrived or on rest breaks, rather than at the end of the day when workers were more interested in going home than in filling out a questionnaire. The interviews did not interfere with the work schedule.

The survey questionnaire

The questionnaire, which included 44 multiple-choice questions, was divided into four categories: personal, social, economic and occupational. It required less than 10 minutes to complete.

Table 1. Forest renewal

| Forest management region | Labor crews | Labor crew type | | Forest land tenure | |
|--------------------------|-------------|--------------------|-----------------------------------|--------------------|-------|
| | | Private contractor | P.E.I. Dept. of Energy & Forestry | Private | Crown |
| Eastern | 3 | 3 | 0 | 3 | 0 |
| Central | 2 | 1 | 1 | 1 | 1 |
| Western | 2 | 2 | 0 | 1 | 1 |

Average crew size: 5 workers -- private contractor, 10 workers -- province.

Table 2. Stand tending

| Forest management region | Labor crews | Labor crew type | | Forest land tenure | |
|--------------------------|-------------|--------------------|-----------------------------------|--------------------|-------|
| | | Private contractor | P.E.I. Dept. of Energy & Forestry | Private | Crown |
| Eastern | 6 | 4 | 2 | 3 | 3 |
| Central | 4 | 4 | 0 | 3 | 1 |
| Western | 7 | 7 | 0 | 7 | 0 |

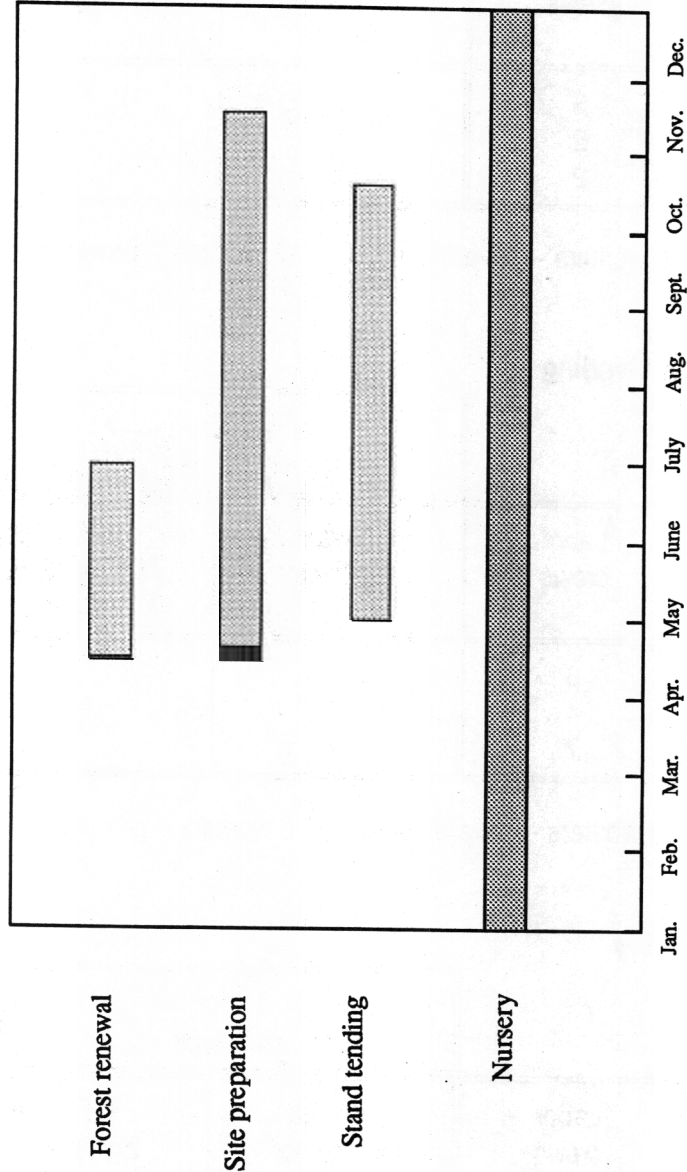
Average crew size: 4 workers -- private contractor, 6 workers -- province.

Table 3. Nursery

| Forest management region | Labor crews | Labor crew type | | Forest land tenure | |
|--------------------------|-------------|--------------------|-----------------------------------|--------------------|-------|
| | | Private contractor | P.E.I. Dept. of Energy & Forestry | Private | Crown |
| Eastern | 0 | 0 | 0 | 0 | 0 |
| Central | 1 | 0 | 1 | 0 | 1 |
| Western | 0 | 0 | 0 | 0 | 0 |

Crew size: 23 workers -- province.

Timing of silviculture activities in Prince Edward Island



Source: Forestry Canada

Chart 3

Personal data

Basic tombstone data such as sex, age and marital status permitted an assessment of the human resources involved in silviculture.

Social data

Items such as 'housing' provided information to assess the 'quality of life' of silviculture workers.

Economic data

Information on income, marketable skills and employment history enabled the assessment of the economic welfare of silviculture workers.

Occupational data

Information on worker aspirations, the degree of job security and job satisfaction, enabled the assessment of subjective problems that may need future attention.

Response rate

Interviewers reported good cooperation from workers. Most were pleased to answer the questionnaire and hoped the information would lead to long-term employment opportunities. Worker literacy posed no problems, although assistance was available to clarify or to explain how to answer the questionnaire. The response rate was calculated by dividing the number of respondents by crew size on the job site. *Table 4* shows the average response rate by employment group.

Table 4

| Response rate by silviculture employment group | |
|--|-----------|
| Employment group | Average % |
| Forest renewal | 98 |
| Stand tending | 98.5 |
| Nursery | 95.8 |

Silviculture worker profile

Using survey data, the supply of silviculture workers was analyzed both quantitatively and qualitatively. Quantitative analysis considered, for example, income, hours of work, wage types and labor migration. The qualitative analysis dealt with areas such as demographic composition, human resource investment and occupational aspirations.

The demand for silviculture workers, which considers how much labor to employ at different wage rates for a given level of technology, was not addressed. There are, however, many influences worth noting that may affect this demand, such as the level of forest management expenditures, the management plan implemented and the environmental focus.

Quantitative analysis

Income

The survey requested information on gross income, silviculture income and additional income. This permitted the calculation of silviculture income as a percentage of *gross income*. (Gross income is the total income from all sources including government welfare payments. Additional income identifies the primary income source when not derived from silviculture.)

Hours of work and wages

Work scheduling and payment methods were also surveyed. Operators use a variety of methods to calculate pay, including hours per day, hours per week and weeks per year.

Wages may be offered according to time worked (hourly), work completed (piece) or fixed amount (salary). The type of compensation offered can influence labor productivity, efficiency and profitability.

Silviculture labor migration

Labor migration—the movement from one employment group to another—provides an insight into the degree of worker attachment to their jobs and the factors that may induce them to move. Factors such as wage differentials, age, geography and the unemployment rate can cause voluntary or involuntary migration. Workers may also choose to move because they are dissatisfied with their present jobs or be forced to change jobs because they were dismissed.

The survey differentiated workers who migrate among employment groups into four categories: *absolutely new entrants* (with no experience in any form of silviculture and new to the present employment category); *new entrants* from other silviculture fields (with experience in some form of silviculture but new to the present employment category); *relatively new entrants* (with silviculture experience in their current employment categories but not employed for one or more consecutive seasons); and *veterans* (with experience in their current employment categories and employed for one or more consecutive seasons).

Qualitative analysis

Labor demographics

Labor demographic analysis compares variables such as sex and age distribution in the labor force to provide an indication of male and female participation rates. In addition, this analysis provides the basis for comparisons between forestry and non-forestry work.

Human resource analysis

Human resource analysis reviews the labor quality of a working population. Formal education, job training and experience can be used to determine a worker's ability to perform the job. This classical approach for assessing labor quality was adopted in this study.

An analysis of human resource investments can also indicate reasons for wage differentials by age group and employment category. It facilitates determining how much capital should be devoted to education and training compared with other labor investments.

Education

Education is a major form of human resource investment. It determines the worker's potential marketability, mobility and productivity. Education also increases the value of the worker in terms of services that can be offered to the employer and the number of potential job opportunities available.

Education can either be general or specialized. General education is not necessarily job-specific, whereas specialized education provides skills that are job-specific. The survey assessed labor quality based upon education, classified as formal (general, e.g. high school) and forestry (specific).

Training

Training, as an addition or alternative to formal education, is another major form of human resource investment. Like education, training can be both general and specific. *General training* can be used anywhere, not just in the firms that provide the training. *Specific training*, however, is useful only in the company that provided the training. The distinction between general and specific can sometimes be difficult to make as the training may contain elements of both. Moreover, training once deemed 'specific' may in fact be transferable to the production process of another firm.

Experience

Abilities accumulated from on-the-job involvement is the third and often overlooked form of human resource investment. Monitoring the workers' 'experience' provides an indication of the new workers' adjustment into an employment category, such as job turnover rates and worker retention.

Worker aspirations

The survey examined worker aspirations in three areas: employee outlook, silviculture training and worker concerns.

Employee outlook

Workers were asked if they had adequate skills and experience to ensure future employment in silviculture. Two assumptions were made: the first, that silviculture employment opportunities (labor demand) will exist in the future; the second, that innovations in silvicultural technology will remain constant. Workers were asked to assess their ability to secure future jobs and their human resource worth, based on their future employment potential, given current conditions.

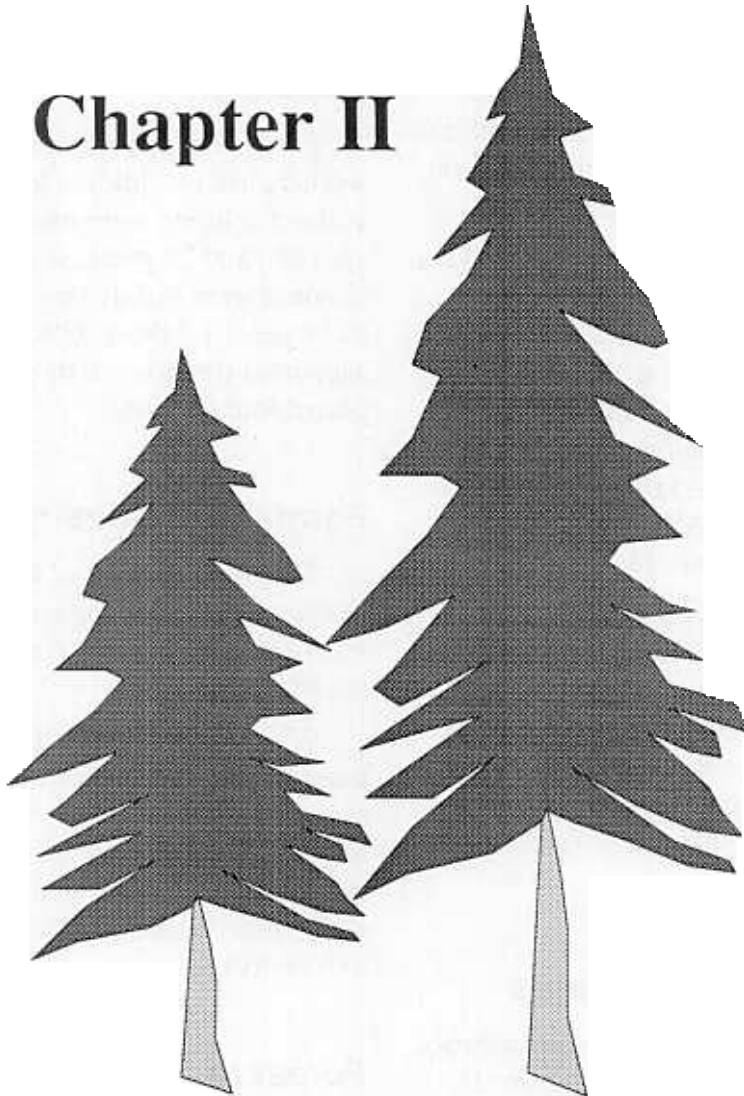
Silviculture training

To assess the demand for silviculture education and training, workers were asked if they desired additional education or training. No mention was made about who would provide or bear the cost.

Worker concerns

Silviculture workers were asked to express their concerns about being employed in a particular silviculture employment category. Response possibilities ranged from work site remoteness to working conditions. Assessing "areas that may need future attention" can be used to increase the attractiveness of the industry or help to avert major labor problems.

Chapter II



Forest Renewal Employment

Forest renewal workers are those publicly or privately employed individuals, 15 years of age or over, who receive pay or profit from providing services in forest renewal. Forest renewal is the process of establishing a tree crop on forest or other suitable lands through artificial reforestation, such as sowing seeds or planting, and natural regeneration such as modified harvest practices. In this study the data pertains exclusively to the forest renewal occupation of planting container seedlings.

Approximately 40 forest renewal workers were employed during the 1990 spring planting season in Prince Edward Island. Eighty-six percent were employed by private silviculture operators and 14% by public silviculture operators (for example, the Prince Edward Island Department of Energy and Forestry). All forest renewal workers were non-unionized.

The following analysis provides a detailed socio-economic profile for the 39 forest renewal workers who responded to the survey. The analysis regards forest renewal workers as a homogeneous body and does not differentiate by public or private labor crew, private or Crown land, or forest management program.

Sex, age and marital status

The forest renewal employment category was 77% male and 23% female (*figure 1*). Eighty-five percent of those workers were between the ages of 15 and 34 (*figure 2*). Within this age group the percentage of male and female workers was about the same (83% male and 88% female). In the 45+ age group the percentage was equally split between male and female.

The marital status of forest renewal workers was 49% married and 46% single (never married). The majority of the married workers were within the 25-34 age group. Most single workers were between the ages of 15-24 years.

Dependents

Forty-nine percent of all forest renewal workers had no children to support. Those without children were mostly between the ages of 15 to 24 years. Workers supporting children were mainly between the ages of 25 to 34 years. Of those with children, 48% supported from one to three and 3% supported four or more.

Formal and forestry education

Sixty-nine percent of forest renewal workers reported completing at least high school and 28% some form of post-secondary education.

When asked whether their formal education included forestry courses, only 13% indicated that they had received some education in forestry (*figure 3*). Of the 13%, all reported an education within 'forestry general' (implying a university-level education in forestry).

Forest renewal training

Production resources such as labor, capital and energy required to manage a forest generally reflects a province's overall forest management plan. The forest management plan in turn considers the current state of the forest (a reflection of past manage-

Forest renewal workers Sex distribution

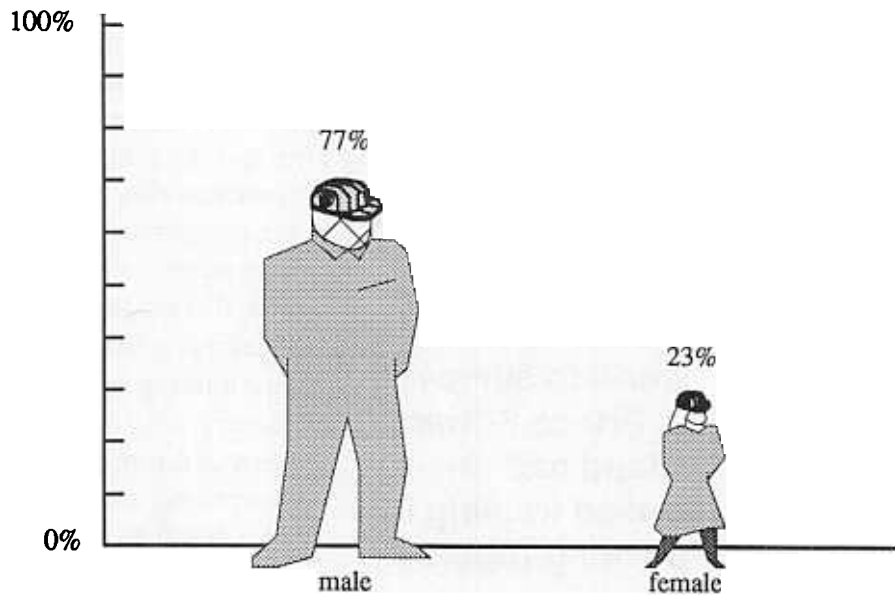
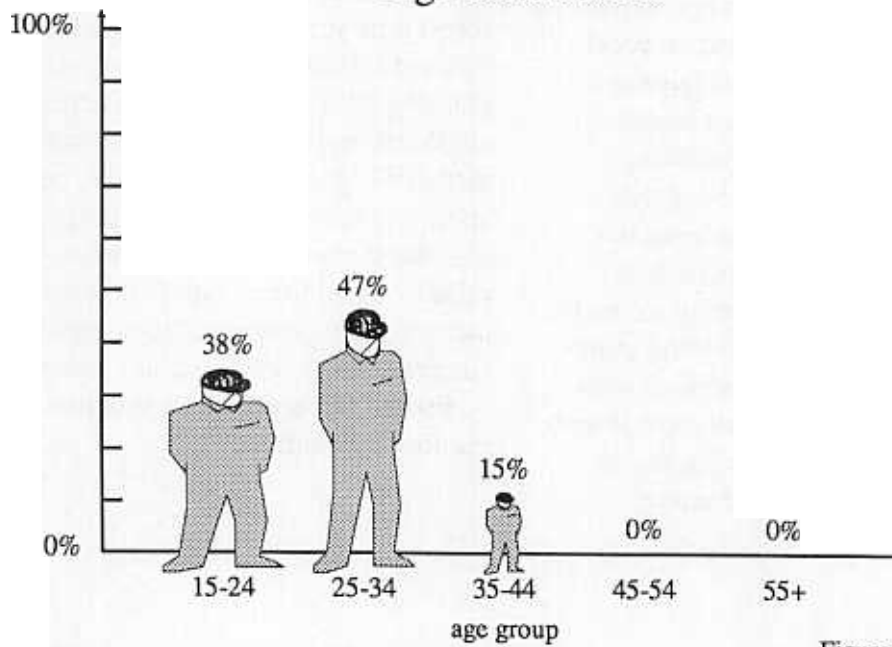


Figure 1

Forest renewal workers* Age distribution



*includes male and female workers

Figure 2

ment practices) and the management objective (normally the establishment of a harvest level that can be sustained over the long term and that evens out the forest age-class distribution).

In Prince Edward Island the province's forest management plan mirrors the current state of its forest and it can be characterized as having an unbalanced age-class structure, high volumes with low marketability and large volumes of white spruce approaching maturity.⁵ The unbalanced forest age-class distribution and the province's industrial and non-industrial wood requirements has given rise to three impending wood supply shortages, namely, softwood saw logs, softwood pulp logs, and hardwood fuel wood.

The course of action cited by the province to alleviate their wood supply problem includes evening out the forest age-class structure of their 'old forest' and an acceleration of the 'new forest'. This requires regulating the 'old forest' to last longer through improved resource allocation, protection and access. Simultaneously accelerating the 'new forest' necessitates intensive silvicultural practices such as forest renewal (artificial regeneration) and stand tending (thinning). Prescribing intensive silvicultural practices demands investments in capital and energy, but most importantly, labor, which represents the key to successful silvicultural programming.

Only 23% of all forest renewal workers surveyed in Prince Edward Island had received training in planting (figure 4).

Silvicultural operations are basically labor intensive and require workers both in quantity and quality. Quality suggests having workers with a proper mix of education, training and experience. Focusing on the training component, forest renewal workers were asked if they had received any silviculture training after leaving school; only 31%

indicated they had. Although the proportion of workers with silviculture training is low, this result implies a greater emphasis on silviculture training rather than forestry education as a major form of future human resource investment. Of those who said they had received silviculture training, 57% rated their training 'good', 31% 'adequate' and 12%

'exceptional'. No workers rated their training as 'poor'.

Although worker development emphasizes silviculture training, only 23% of all forest renewal workers surveyed in Prince Edward Island had received training in planting (figure 4). With the increasing emphasis on reforestation, measured in terms of higher planting targets, concerns about not having sufficient human resources to serve the reforestation program have been raised.⁶ In addition, there are concerns about meeting free-growing obligations, given the current work force,⁷ because fewer than one quarter of all forest renewal workers have training in planting.

Forest renewal workers

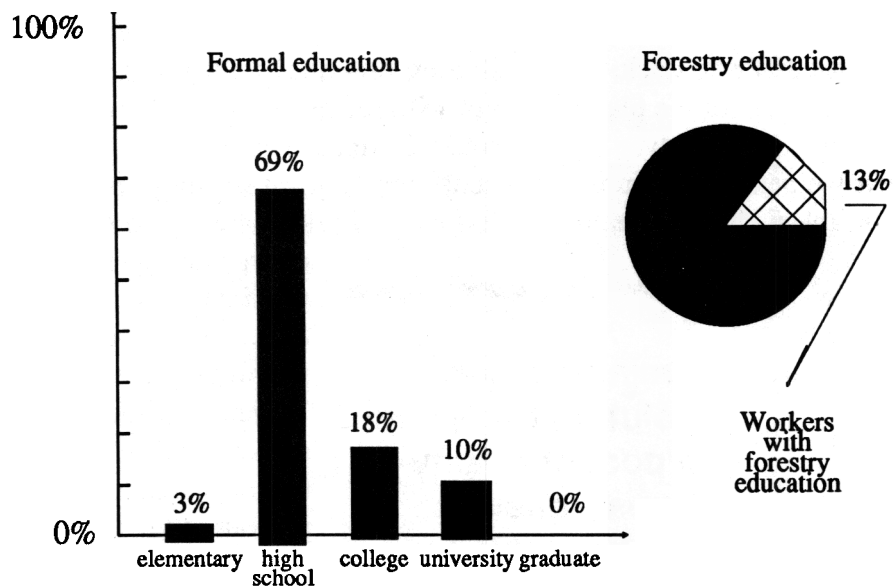
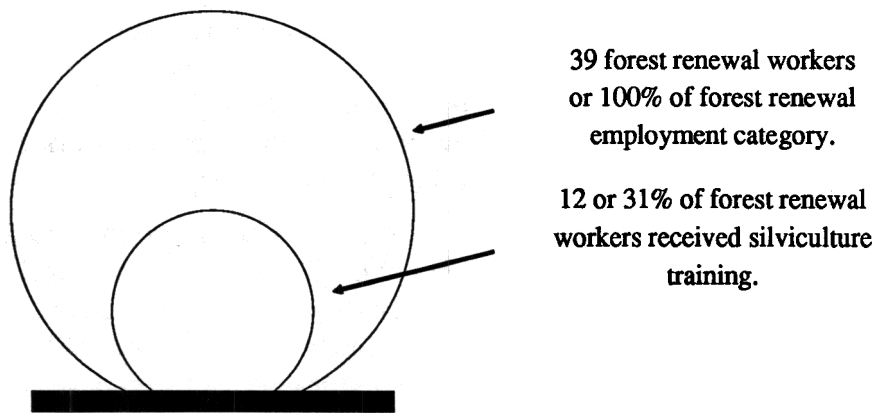


Figure 3

Proportion of forest renewal workers with tree planting training



Only 23% had tree planting training.

Figure 4

Undoubtedly, the first growing season following plantation is critical for seedling survival because of seedling mortality that occurs unrelated to competition.⁸ These causes include quality of planting stock, planting techniques, harshness of the planting site, weather, and planting quality. Although human involvement affects most of these mortality variables, planting quality (actual planting of the seedling) is of particular interest because it directly involves the forest renewal worker. There are many attributes associated with planting quality that can lead to seedling mortality. These include, freshness of seedling stock, shallow planting, vertical alignment, spacing, J, L, or U rooting, and loose planting.⁹

Although site assessments to oversee the quality control process of planting seedlings on forest renewal sites exist, forest renewal (planting) contractors are often penalized for seedlings that were improperly planted or spaced. The penalty for improper spacing or density has been quoted as being twice the contracted price.¹⁰ Successive penalties have resulted because there is a limited pool of quality forest renewal workers available to ensure that seedlings are planted properly.

Some contractors have suggested creating an assessment process to ensure seedlings are planted properly before an assessment is made by the Prince Edward Island Department of Energy and Forestry. This would, however, result in a loss of productive time in an already short planting season. In addition, monitoring guidelines among contractors implies added supervisory costs in an already competitive business.

Demand for quality forest renewal workers has been echoed by many contractors when considering the province's quality control process on forest renewal sites.

Demanding quality workers, however, is not without its costs. Planter productivity could decline if workers have to take additional care to plant seedlings properly.

Assuming workers are employed through an entire planting season (approximately 4 to 8 weeks), an overall reduction in their forest renewal income could result. Therefore, demanding quality workers, which implies having quality planting, cannot occur without compromising the economic welfare of the forest renewal workers.

Solutions to abate this problem have been mentioned in an earlier study on silviculture workers in Newfoundland and Labrador (Rugo, 1992) with some solutions being more feasible than others. These have included extending the work day, hiring additional workers, and increasing piece wages. Worker training, which was the foremost solution suggested for workers in Newfoundland, is also relevant for the forest renewal workers of Prince Edward Island.

Training is the solution to having a pool of quality forest renewal workers able to satisfy free-growing obligations. Forest renewal training can enable workers to maintain (or increase) worker earnings, and meet (or improve) planting objectives within defined seasonal constraints. Training can improve the labor productivity of forest renewal workers through better instruction in planting techniques.

Training is the solution to having a pool of quality forest renewal workers able to satisfy free-growing obligations.

Workers who received training in planting obtained it from two sources: government (42%) and company (42%). Other training sources included 'at home' (8%), meaning self-taught, and 'other sources' (8%), such as through silviculture equipment manufacturers and distributors.

Most forest renewal training throughout Prince Edward Island, whether offered by the province or the private sector, was taught using an informal approach such as learning by doing, observing others, and being reprimanded for mistakes. Some have characterized tree planter training as a "short show and tell seminar" combined with a planting demonstration under ideal site conditions.¹¹ At the present time, there are no plans for a formal renewal worker training program in the province.

Forest renewal experience

The survey revealed that 12% of all forest renewal workers had no previous experience in artificial reforestation. These workers were 'new entrants' into the forest renewal employment category, but not necessarily into the silviculture labor force. This low number of new workers could be explained by a low job turnover rate among these workers because of a decrease in forest renewal operations, which would, in turn, decrease labor demand. However, the number of seedlings planted per annum has increased and further increases are projected in future years. But although planting activity has increased, the prevailing preference of contractors is to hire tree planters who have some experience in forest renewal operations. Limited labor separations, due to a limited amount of voluntary quits, may also contribute to a low job turnover rate among 'new entrants' in the forest renewal employment category.

Forest renewal workers with one to three seasons of forest renewal experience represented 44% of this employment group. A concentration of workers in this range may be accounted for by the Prince Edward Island silviculture industry's preference to hire experienced workers.

Workers with four or more seasons of experience accounted for an additional 44% of the total population (*figure 5*). This highlights an ability to retain an experienced pool of forest renewal workers over the long-run.

Table 5 compares forest renewal experience with experience in other silviculture fields. Interestingly, 12% of the new workers had no experience in any other silviculture activity. These workers were 'absolutely new entrants'. In addition, there was a positive correlation ($r = 0.90$) between the number of forest renewal workers with additional seasons of experience in forest renewal and the proportion of workers with experience in other fields. In other words, as the amount of forest renewal experience increased, the proportion with experience in other silviculture fields also increased. This indicates that workers with additive exposure to forest renewal activities, for example, planting, tended to branch out into other silviculture fields and gain more experience.

Human resource assessment

Table 6 compares all three forms of human resource investment. No workers reported having 'some' forestry education, silviculture training or forest renewal experience. By contrast 13% had 'no' forestry education, silviculture training or forest renewal experience. All other workers (87%) claimed combinations of education, training and experience.

Table 5. Proportion of forest renewal workers with and without experience in other silviculture fields

| Seasons of experience in forest renewal | Forest renewal workers % | Proportion of workers with no experience in other silviculture fields % | Proportion of workers with experience in other silviculture fields % |
|---|-----------------------------|--|---|
| 0 | 12 | 12 | 0 |
| 1 to 3 | 44 | 3 | 41 |
| 4 to 6 | 33 | 20 | 13 |
| 7 to 9 | 8 | 5 | 3 |
| 10 or more | 3 | 3 | 0 |
| Total | 100 | 43 | 57 |

Residence

The survey revealed that 54% of all forest renewal workers lived in a rural setting. Forty-three percent reported residing in a community such as a village or town. Only 3% were from a farm setting. Interestingly, this residential composite resembles the province-wide composite provided by Statistics Canada.

According to Statistics Canada, the non-farm rural population is the largest single sector of the island's population, accounting for 53.5% of the total, compared with 38%

urban and only 8.5% rural farm population.¹² Many forest renewal workers (69%) reported their terms of residence within their current community, rural or farm setting as being more than five years.

Examining residence, 49% were home owners, 41% rented their dwellings and 10% fell into the 'other' category—those workers who were dependent upon others to bear accommodation costs (*figure 6*). Most workers within the 15 to 24 age group rented their dwellings, while the majority of workers within the 25 to 44 age category owned

**Table 6. Overall human capital assessment
Forest renewal worker**

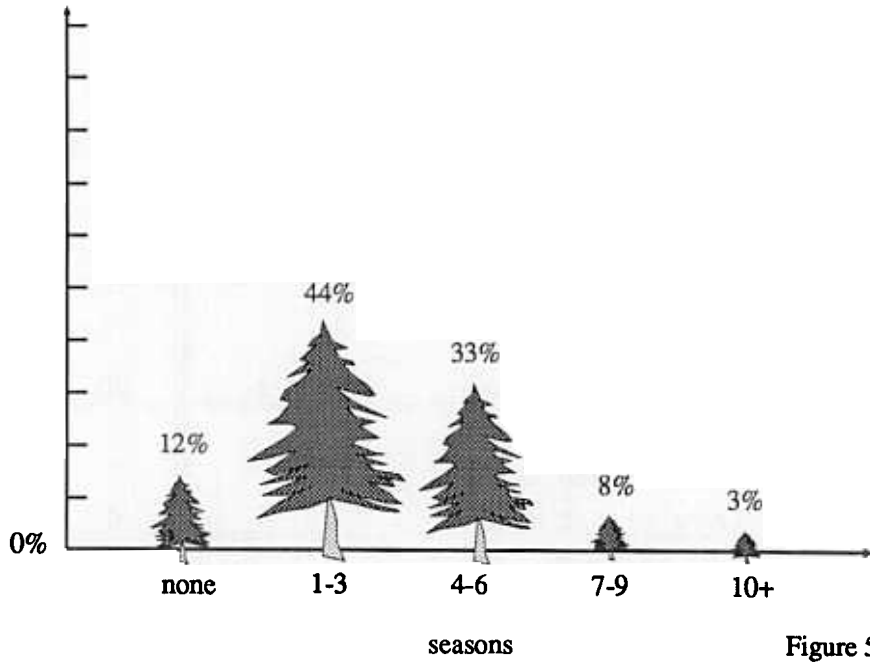
| Conditions | Workers | % |
|--|----------------|------------|
| no forestry education no silviculture training no forest renewal experience | 5 | 13 |
| no forestry education no silviculture training with forest renewal experience | 21 | 54 |
| no forestry education with silviculture training with forest renewal experience | 8 | 20 |
| with forestry education no silviculture training no forest renewal experience | 0 | 0 |
| with forestry education with silviculture training no forest renewal experience | 4 | 10 |
| with forestry education no silviculture training with forest renewal experience | 1 | 3 |
| no forestry education with silviculture training no forest renewal experience | 0 | 0 |
| with forestry education with silviculture training with forest renewal experience | 0 | 0 |
| Total | 39 | 100 |

their homes. The majority (74%) of all forest renewal workers used their personal vehicles as the means of transportation to and from work. The distances traveled from their current residences to the work site, however, varied considerably: 31% traveled less than 20 km to their work site while 27% traveled more than 40 km.

Income sources

Twenty-six percent of all forest renewal workers reported their gross income (income from all sources) in 1989 as less than \$10,000. No workers reported a gross income greater than \$30,000.

Forest renewal experience



Forest renewal workers Residence status

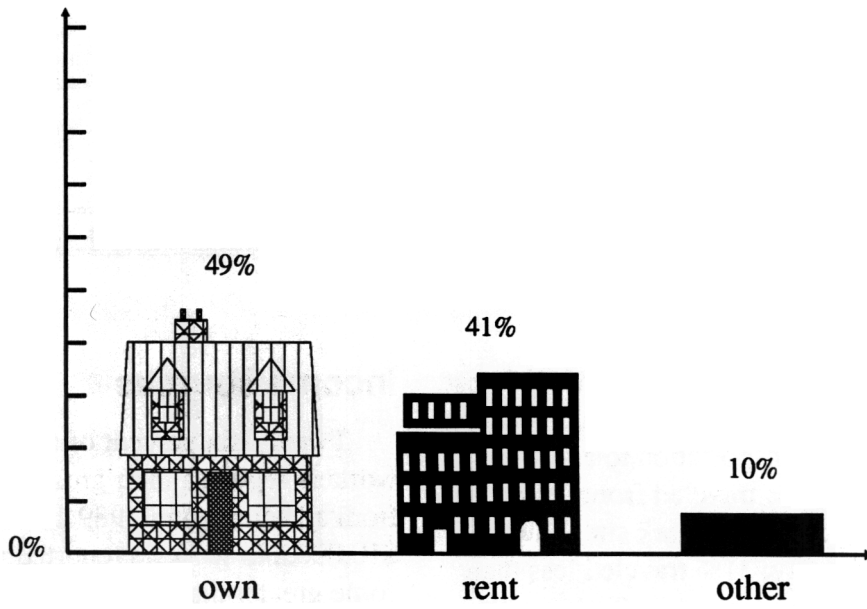


Figure 6

Forty-one percent of the forest renewal workers stated that none of their 1989 gross income came from silviculture. Their income was totally dependent upon sources other than silviculture: 75% from public sources, 12.5% from non-forest sources and 12.5% from farming.

Only 3% of all forest renewal workers derived all of their gross income from employment in silviculture. The remaining 56% derived between 25 and 75% of their gross income from silviculture employment and supplemented it with income such as public assistance (40%), non-forest sources, (32%), farming (23%) and logging (5%) (figure 7).

There are three plausible explanations for having so many workers dependent on public revenue to supplement silviculture worker earnings. These explanations deal with the issues of demand deficit unemployment, seasonal unemployment and insurance induced unemployment. Frictional and structural unemployment may also account for some dependence on public revenue sources, however, they are linked to regular job search activities as a result of normal labor market dynamics or a mismatch between employer job requirements and worker job qualifications.

Although dependence on public assistance can be rationalized, some explanations may be more prevalent than others. It is conceivable that these numbers can be largely attributed to problems associated with the unemployment insurance program, the seasonal nature of silvicultural employment, and to a lesser extent, the demand deficit forces in the Prince Edward Island economy.

i) Demand deficit

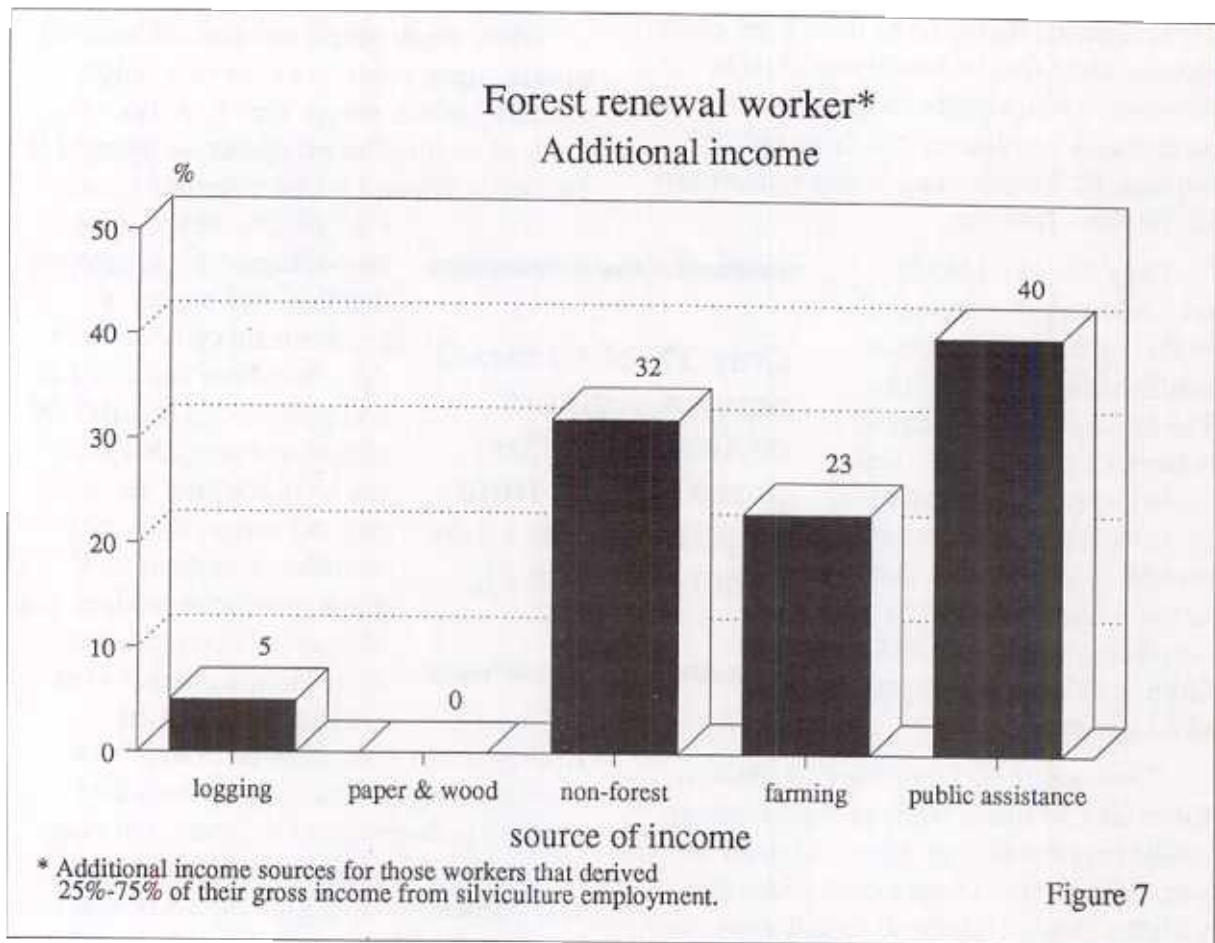
While the dependence of forest renewal workers upon public revenue as a supplementary income source may have been the result of an insufficient aggregate demand in the Prince Edward Island economy to provide jobs; there are some plausible reasons suggesting that this may not be the predominant cause. Firstly, the silviculture industry has complained of a shortfall of skilled and unskilled workers.¹³ In addition, the agricultural sector, the largest contributor to the island's gross provincial product, has also complained of a major shortfall of available workers and has indicated a

willingness to seek offshore labor.¹⁴ This excess demand for skilled and unskilled workers indicates there are many job vacancies in both forest and non-forest related employment, such as agriculture. Nonetheless, this should not preclude any notion that demand deficit unemployment does exist and is regarded as a contributing factor in explaining the dependence on public assistance.

ii) Seasonal constraints

Silvicultural work opportunities such as tree planting are largely seasonal in nature. The environmental and climatic conditions associated with these operations tend to define the duration of employment and conversely, the length of unemployment. Once the silviculture employment opportunity has been exhausted, workers can supplement their yearly income with, for example, unemployment insurance, provided they meet the qualifying conditions. Although a

Only 3% of all forest renewal workers derived all of their gross income from employment in silviculture. (figure 7).



demand for workers may exist in other sectors of the Prince Edward Island economy such as farming, many employment opportunities run parallel to the peak of the silviculture season, thus limiting job vacancies for workers leaving the silviculture sector. In addition, job vacancies that are available to silviculture workers in the agricultural sector are discouraging when considering wage differentials. The wage range for silviculture workers is \$5.00 to \$12.50 per hour with an average wage of \$7.65, while the wage range for general farm labor is \$5.50 to \$8.00 per hour, with an average wage of \$6.00.¹⁵

iii) Insurance induced

Closely related to the seasonal nature of silviculture, in particular forest renewal, as an explanation of dependence on public revenue, is the unemployment insurance (UI) program. Unemployment insurance benefits have traditionally had an impact on labor supply and participation rates in Canada. Specifically, concerns have been raised that unemployment insurance reduces the incentive to work and increases the dependence on UI as an income support program, rather than as an insurance program.

Unemployment insurance benefits can create both income and substitution effects on the work decisions of an individual worker. The income effect is unclear, but the substitution effect is in favor of increasing leisure time rather than work time, since the income forgone by the choice of an additional hour of leisure will decrease with the introduction of UI benefits.¹⁶

The unemployment insurance program and its preponderance as an income support program has raised concerns regarding the total effect it may have on the silviculture labor force. Within the silviculture industry, some contend that the UI program creates a disincentive to work and is responsible for the shortage of silviculture workers. More specifically, some believe that unemployment insurance encourages workers to limit their silviculture employment to the minimum qualifying period for unemployment insurance, because the sum of the UI benefits is greater than the earnings obtainable from continuing silviculture employment.¹⁷ Furthermore, unemployment insurance benefits tends to diminish job search activities by claimants and increase the duration of job searching thus contributing to lengthening the average unemployment period.¹⁸

For silviculture workers who remain working the duration of the silviculture season, unemployment insurance benefits can support them through the industry's shut-down over the winter months. While

some debate the disincentives of unemployment insurance, others charge that the substitution effect for more leisure time, UI benefits may draw more workers into more seasonal occupations such as silviculture, and solve the worker shortage problem in the long run.

Low income cut-off

The unemployment insurance program and its preponderance as an income support program has raised concerns regarding the total effect it may have on the silviculture labor force.

Few forest renewal workers (26%) reported gross incomes (incomes from all sources) below the 1989 low income cut-off point (poverty line) of \$8,983 for rural areas in Canada.¹⁹ (The poverty line is based on a family unit of one individual.) The number of weeks employed and the type of employment, whether full or part time, are not relevant to the calculation. The rural low income cut-off point was chosen because 54% of all forest

renewal workers resided in a rural setting.

A limited group of forest renewal workers surveyed in 1990 reported a 1989 income below the poverty line that was earned from areas other than silviculture. Although studying individuals with incomes beneath the poverty line is important, worker incomes below that point and secured from some or all silviculture employment are of particular interest.

Separating forest renewal workers with incomes below the poverty line (26%) into two groups, 40% reported having incomes not generated from silviculture in 1989, and 60% reported incomes secured from some or all silviculture employment.

The number of workers earning some or all of their incomes from silviculture and who still appear to fall below the poverty line may be somewhat inflated because many could be students, perhaps skewing the results. Given that most student incomes in Canada fall below the poverty line, it is felt that data on student forest renewal workers should be treated separately and extracted from the pool of forest renewal workers.

One may contend that there is no difference between a student or non-student worker because both are generally employed for the same period of time and generally receive the same income.

The rationale for separating student workers when considering income levels is that students tend to return to school, thus leaving the work force, while non-students search for other forms of employment. Those workers who remain in the general labor force and derive a gross income below the poverty line are the real concern. Given this, it is important to extract student forest renewal workers earning some or all of their incomes in silviculture and recalculate the number of workers who would then fall below the poverty line.

The silviculture labor force survey collected information on whether forest renewal workers were students or non-students. Two student workers were removed from the population of six workers.

The remaining four non-students represented 10% of the forest renewal employment category, earning some or all of their incomes from silviculture below the poverty line. Since some of these workers may be married, their combined incomes could raise their financial standing above the poverty line based on a family unit of two.

Wage types and frequency of pay

Piece wages are the most commonly used method of payment for forest renewal workers in Prince Edward Island, with 74% of all workers being paid on this basis. Workers are paid according to the number of seedlings they plant. The basic premise underlying the piece wage is the assurance that seedlings will be planted and labor productivity will be maintained at an acceptable level. Productivity is especially important given the four to eight-week window to complete forest renewal operations in the province.

Despite assuring an adequate level of production, the offering of piece wages has led to concerns among industry and government regarding the quality of some plantations. Some contend that piece wages encourage workers to plant seedlings very quickly because their end-of-day compensation is dependent upon the additive nature of piece work. Subsequently, maintaining a certain degree of planting quality remains a concern, because contractors are penalized by the province for improperly planted seedlings. In part, these quality concerns may explain the industries' desire for experienced forest renewal workers.

A small group of forest renewal workers (23%) were paid an hourly rate and 3% were paid a combination hourly rate plus piece work bonus. Crew chiefs and supervisors tasked with managing the job site were largely found to have been receiving the hourly rate.

The majority of forest renewal workers (87%) were paid biweekly. The remaining were paid monthly (8%), or upon job completion (5%).

Work hours, days and weeks

The length of a working day among 64% of forest renewal workers was eight hours per day. Eighteen percent reported a working day greater than eight hours, fluctuating between nine to ten hours. The remaining 18% worked less than eight hours.

The majority of forest renewal workers (54%) labored a work week greater than 40 hours. A typical work week may consist of six work days and may not necessarily be defined by Monday to Saturday employment. Weather conditions, for example, frequently determines the orientation of the work week. Other factors, such as the size and number of planting operations, tendering of planting contracts and human factors may also influence the employable planting time.

In Prince Edward Island the planting window is approximately from four to eight weeks in duration between mid-April and mid-June. Within this period 87% of tree planters were employed between four and eight weeks. Ten percent worked more than nine weeks and 3% worked fewer than four weeks.

Silviculture labor migration

The survey indicated that five workers were 'absolutely new entrants' into the silviculture labor force in 1990 (*figure 8*). No workers claimed to be 'new entrants' into the forest renewal category with experience in other fields. 'Relatively new entrants' accounted for 11 workers (those who did not join the silviculture labor force in 1989 but returned to work in 1990). The 'relatively new entrants' were calculated using the difference between silviculture workers who did not secure any 1989 gross income from silviculture (41%) and the 'absolutely new entrants' (12%). Finally, there were 23 'veteran' workers who were employed in forest renewal during the 1989 forest management season and who returned in 1990.

Employee aspirations

Overall, 69% of forest renewal workers felt confident about being able to secure future employment in silviculture, given their present skills and experience. Only 5% were uncertain about future employment opportunities.

Education or training demand

Sixty-seven percent of all forest renewal workers were in favor of obtaining additional silviculture education and training. Of those, 46% demanded more training in site preparation, 27% forest renewal, 19% stand tending and 8% in other areas such as forest management planning (*figure 9*).

Forest renewal workers
Labor migration

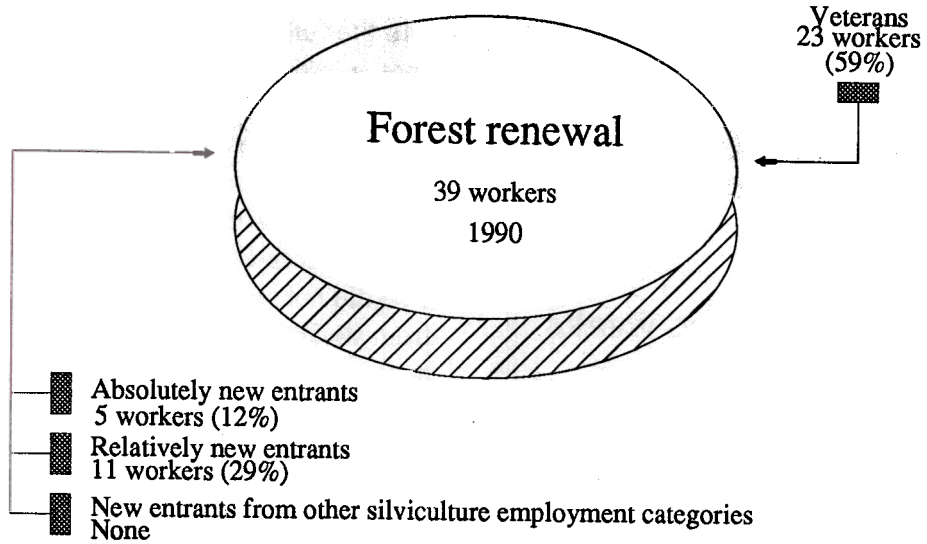


Figure 8

Forest renewal workers
Education or training demand

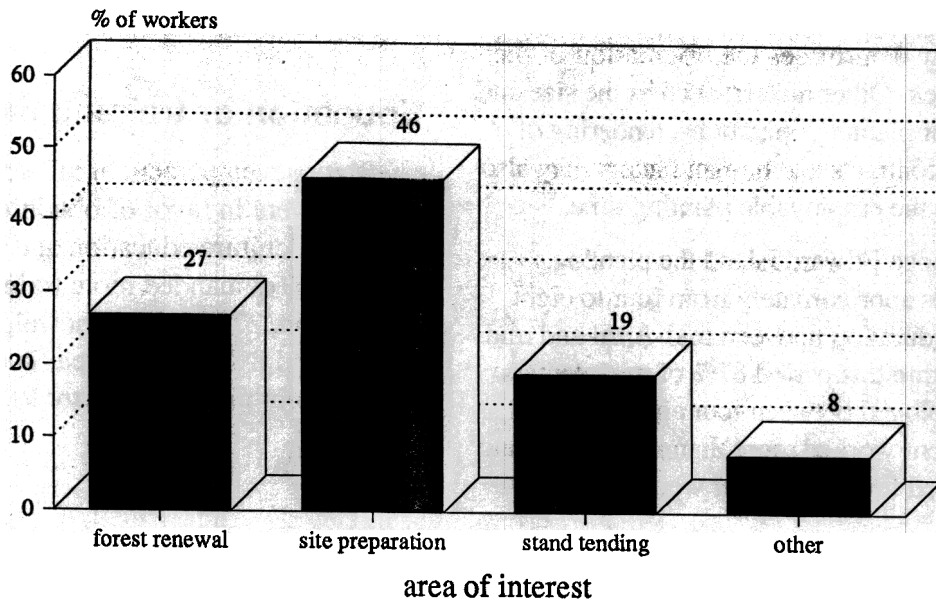


Figure 9

Worker concerns

In answering the subjective question of worker concerns, respondents addressed topics ranging from working conditions to wages (*figure 10*). These responses provide a general indicator of worker morale and problems that may need future attention. The work environment ranked as the most significant concern of forest renewal workers. Sixty-two percent complained of working in the rain, working in varying temperatures and having to contend with insect

bites. The 'other' category ranked as the second greatest area of concern. These dealt with the degree to which forest renewal sites have undergone adequate site preparation and the poor accessibility of some sites.

The seasonal nature of the job, implying a short employment opportunity, was also a concern among some workers. The hours of work and remoteness of the job site were not a problem. Physical difficulty and wages were minor issues.

Forest renewal worker concerns

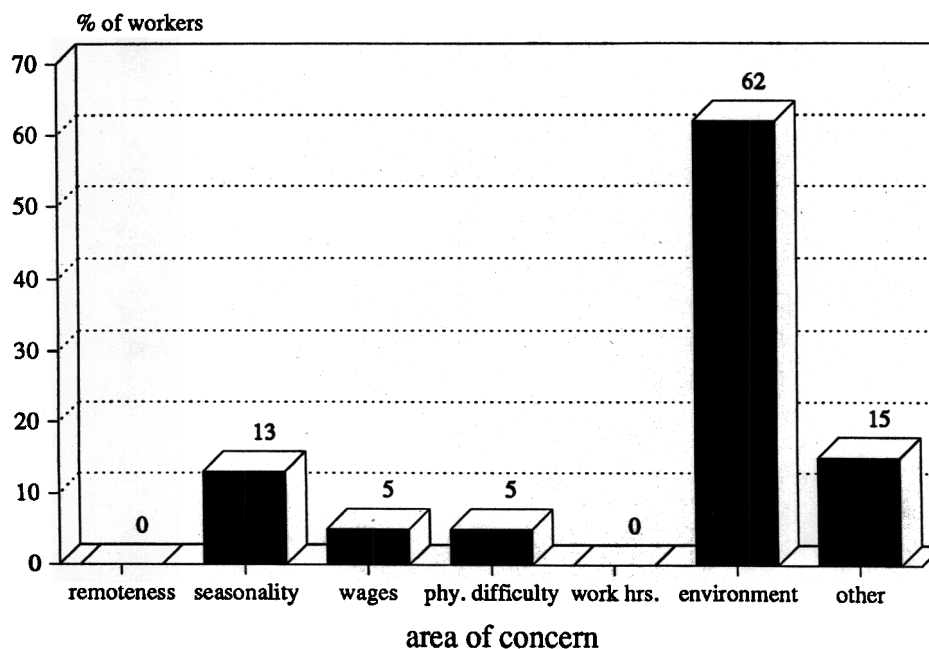
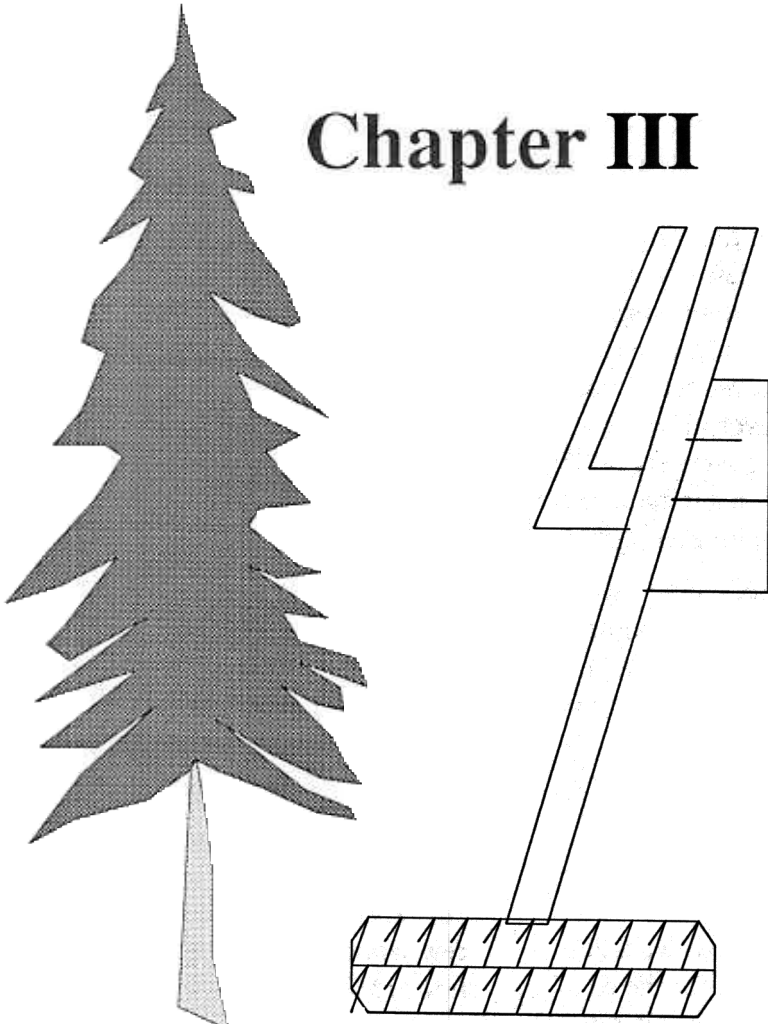


Figure 10



Chapter III

Stand Tending Employment



Stand tending workers are those publicly or privately employed individuals, 15 years of age or over, who receive pay or profit from providing services in stand tending. Stand tending involves caring for an established timber stand at any stage of its life for the benefit of the forest crop.

In this study the data pertains to workers employed in 'thinning operations'. Thinning involves the partial removal of stems from a cutting block. Partial removal entails pre-commercial or commercial thinning. Thinning is used to effect a species change, accelerate growth or improve the form of residual trees. Workers employed in thinning activities may be referred to as 'cutters' within the province, however, they are referred to as stand tending workers in this study. Workers employed in site reclamation are not covered in this employment group.²⁰

Approximately 63 stand tending workers were employed during the 1990 summer tending season in Prince Edward Island. Seventy-three percent were employed by private silviculture operators and 27% by public silviculture operators (for example, the Prince Edward Island Department of Energy and Forestry). All stand tending workers were non-unionized.

The following analysis provides a detailed socio-economic profile for the 61 stand tending workers who responded to the survey. This analysis regards stand tending workers as a homogeneous body and does not differentiate by public or private labor crew, private or Crown land or forest management program.

Sex, age and marital status

The stand tending employment group was 98% male and 2% female (*figure 11*). Seventy-four percent were between the ages of 15 and 34 and 26% were 35 years and over (*figure 12*). Fifty-nine percent of stand tending workers were married and 38% single (never married). Single workers were generally between 15 and 24 years of age. Married workers were predominantly within the 25 to 34 age group.

Dependents

Forty-six percent of all stand tending workers reported no child dependencies. Of those with children, 51% supported from one to three children and 3% supported four or more. Those without children were generally between 15 and 24 years of age. Workers supporting children were mostly between the ages 25 and 34 years old.

Formal and forestry education

Fifty-six percent of stand tending workers reported completing at least high school and 28% some form of post-secondary education. This employment group had very few workers with only an elementary education (16%) and they were concentrated within the 15 to 24 year age group.

Thirty percent indicated they had received some education in forestry (*figure 13*). Of those, 72% reported an education in 'forestry general' (implying a university-level education in forestry), 22% in forest technology and 6% in forest engineering.

Stand tending workers Sex distribution

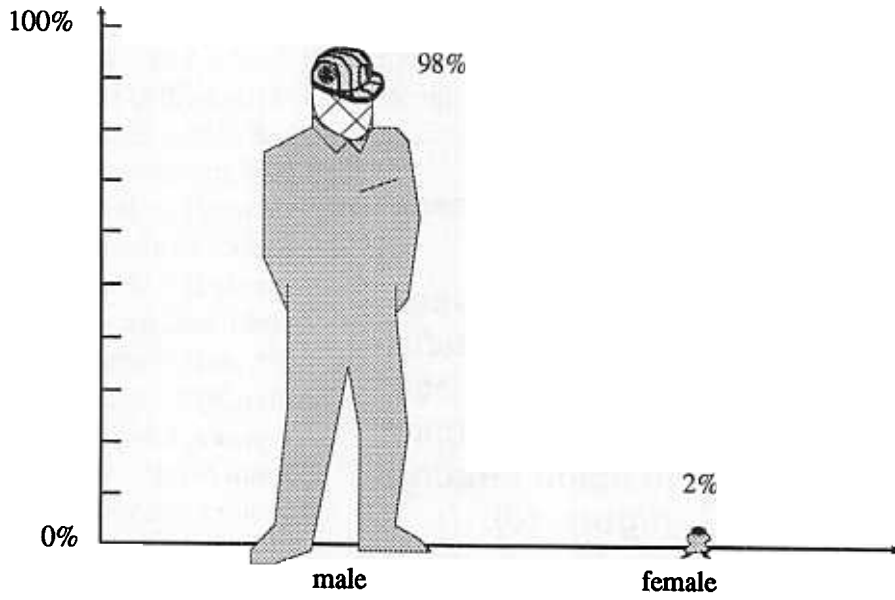
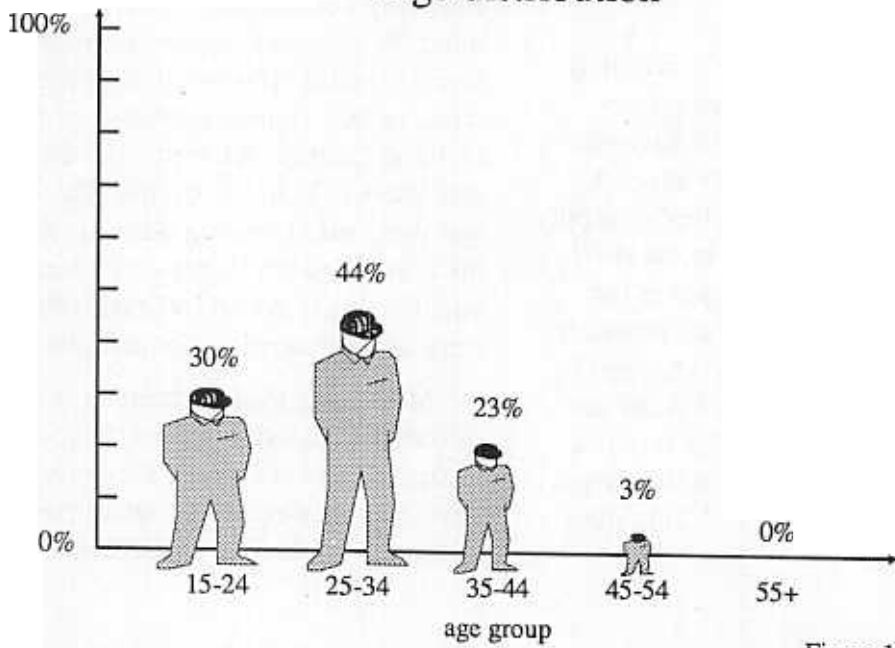


Figure 11

Stand tending workers* Age distribution



*includes male and female workers

Figure 12

Stand tending training

Stand tending workers were asked if they had received any training after leaving school; 50% or 31 workers indicated they had. This figure implies a heavy emphasis on silviculture training rather than forestry education as a major form of human resource investment. Of those who said they had received silviculture training, 81% rated their training as 'good', 13% 'adequate' and 6% 'exceptional'. No workers rated their training as 'poor'.

Forty-six percent of all stand tending workers had received training in stand tending (*figure 14*). This number suggests the need to increase training in stand tending so workers can adequately respond to the existing abundance of over-mature softwood forest, such as white spruce, which requires a harvest level that can be sustained over a long term.²¹

A sustained harvest regime is required because large areas of mature and over-mature forests are intended to be harvested quickly and replaced with a new crop. A rapid harvest would result in a timber supply exceeding the current demand in the short term and an extremely low supply in the long term as the supply of mature timber is exhausted.²² The current annual harvest for softwood saw logs is 75 000 m³ while the projected demand by the year 2000 is 104 000 m³. The sustainable harvest level without silviculture is 39 400 m³.²³ This short-

age can only be addressed through the controlled harvesting of 'old growth forest', thinning of young stands and plantation establishment.

Implementing this forest management program will require skilled silviculture workers geared, in particular, toward stand tending operations. There is, currently, a shortage of these skilled workers in the province and it is self-evident that additional trained workers are needed because fewer than 50% have the necessary training. Obviously, there is room for this employment group to expand. Growth for skilled workers within this employment group is possible over the next decade as the primary forest management objective in Prince Edward Island will be to increase the available wood supply.

Training in stand tending was reported as having been obtained from the government (84%), and company sources (16%). Many workers who received this training were, in fact, trained through a program at Holland College, referred to as the Silviculture Worker Training Course. This course was designed to develop skilled individuals for the Prince Edward Island silviculture industry, with funding provided by Canada Employment and Immigration Commission (CEIC).

Most stand tending training is composed of formal programs such as those offered through Holland College that provide skill development directed at both the entry and advanced levels. The entry-level course is

Forty-six percent of all stand tending workers had received training in stand tending (*figure 14*).

Stand tending workers

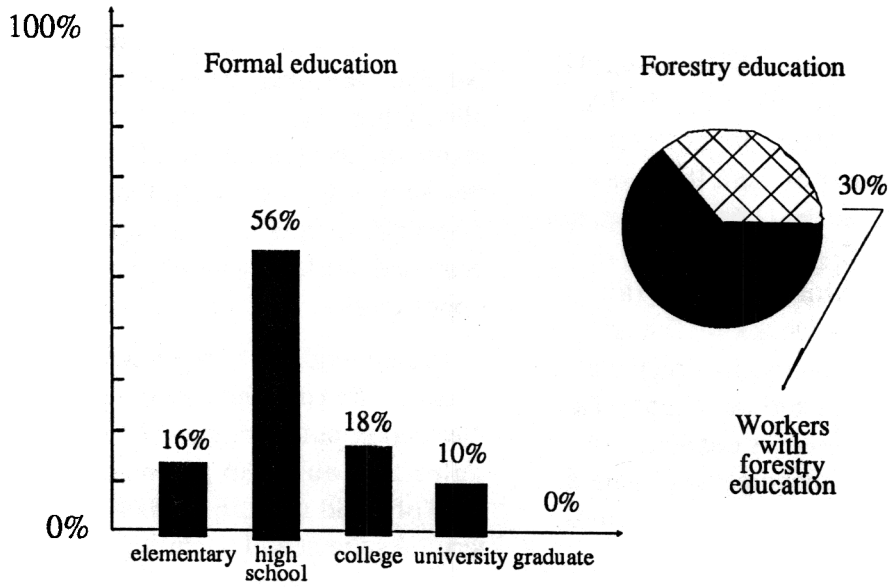
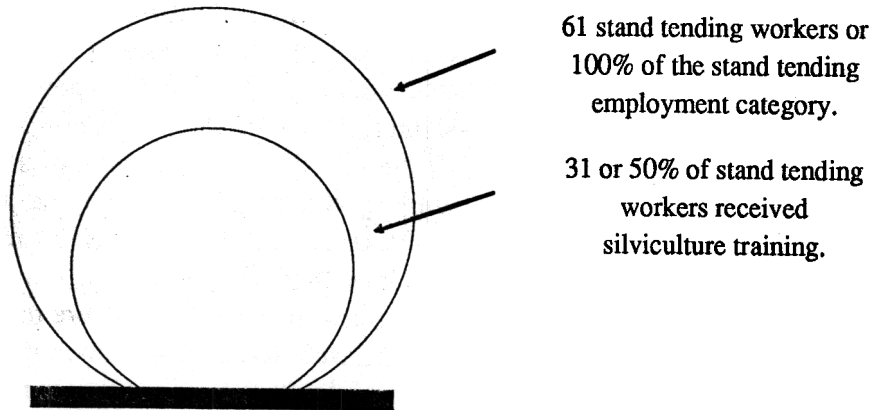


Figure 13

Proportion of stand tending workers with stand tending training



46% had stand tending training.

Figure 14

targeted for 'new recruits' and the subject matter, although oriented toward chainsaw work, is centered around work safety, saw maintenance and repair. The 'how to' aspects of stem removal are also stressed. All training participants are referred to Holland College by CEIC. Students are not exempt from collecting unemployment insurance benefits while on course. Those workers not eligible for UI benefits are eligible for financial assistance while on course (a maximum of \$275 per week).²⁴ The advanced-level training course is directed at silviculture contractors and their supervisory personnel. Course content is designed to enhance the workers' technical and managerial skills, such as job layout, product utilization and advanced chainsaw use.

Stand tending experience

The survey reported that 8% of all stand tending workers had no previous experience in stand tending. This low incidence of new entrants may be explained by the limited space available for training entry-level workers through the Silviculture Worker Training Course offered by Holland College.

Workers having one to three seasons of experience accounted for 50% of this employment group. The forest management objective of balancing the forest age class distribution, and human resource development initiatives to train a pool of workers to undertake 'cutting operations', may provide some reasons for a large worker group with one to three seasons' of job experience. In addition, workers enrolled at Holland College as early as 1987 would have received

on-the-job work experience, thereby also accounting for many of the workers in the one to three season range.²⁵

The forest management objective to balance the forest age-class distribution, thus alleviating a timber supply crisis through stand tending (cutting of old growth and thinning of young growth), among other forest management tactics, may also have provided workers with return employment opportunities.

Stand tending workers with four or more seasons of experience accounted for 42% of the total population (*figure 15*). This number reflects the ability to retain an experienced pool of stand tending workers over the long term. As the need for cutting and thinning operations remains prevalent over the next decade an increase in the number of workers with four or more seasons of experience can be expected.

Table 7 compares stand tending experience in other silviculture fields. Interestingly, 6% of the new workers had no experience in any other silviculture activity. These workers were 'absolutely new entrants'. In addition, there is a positive correlation ($r = 0.98$) between the number of these workers with additional seasons of experience in stand tending and the proportion of workers in other fields. As the amount of stand tending experience increased, the proportion with experience in other silviculture fields also increased. Consequently, it appears that workers with additive exposure to stand tending were inclined to branch out into other silviculture fields and gain more experience.

Table 7. Proportion of stand tending workers with and without experience in other silviculture fields

| Seasons of experience in stand tending | Stand tending workers % | Proportion of workers with no experience in other silviculture fields % | Proportion of workers with experience in other silviculture fields % |
|--|----------------------------|--|---|
| 0 | 8 | 6 | 2 |
| 1 to 3 | 50 | 9 | 41 |
| 4 to 6 | 21 | 11 | 10 |
| 7 to 9 | 11 | 1 | 10 |
| 10 or more | 10 | 5 | 5 |
| Total | 100 | 32 | 68 |

Human resource assessment

Table 8 compares all three forms of human resource investment. Only 3% of workers surveyed had no forestry education, silviculture training or stand tending experience, compared with 26% who had at least some. Seventy-one percent reported some combination of forestry education, silviculture training and experience.

Residence

The survey revealed that 47% of all stand tending workers lived in a village, town or city. Forty-three percent resided in a rural setting and the remaining 10% were from a farming locale. Many stand tending workers reported their terms of residence as greater than five years.

Examining residence, 62% were home owners, 30% rented their dwellings and 8% were in the 'other' category—those dependent upon others to bear accommodation costs (figure 16). Most workers within the 15 to 24 age group rented their dwellings and the majority of workers within the 25 to 44 age category owned their homes. The majority (87%) of all stand tending workers used their personal vehicles as the means of transportation to and from work. The distances traveled from their current residences to the work site, however, varied considerably. For example, 30% traveled less than 20 km to their work site while 28% traveled more than 40 km.

Stand tending experience

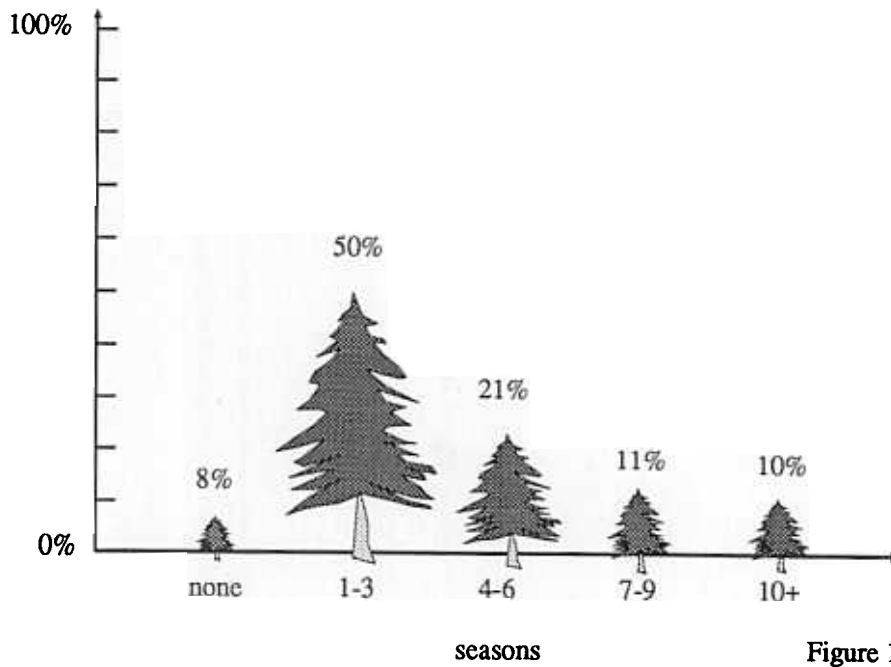


Figure 15

Stand tending workers Residence status

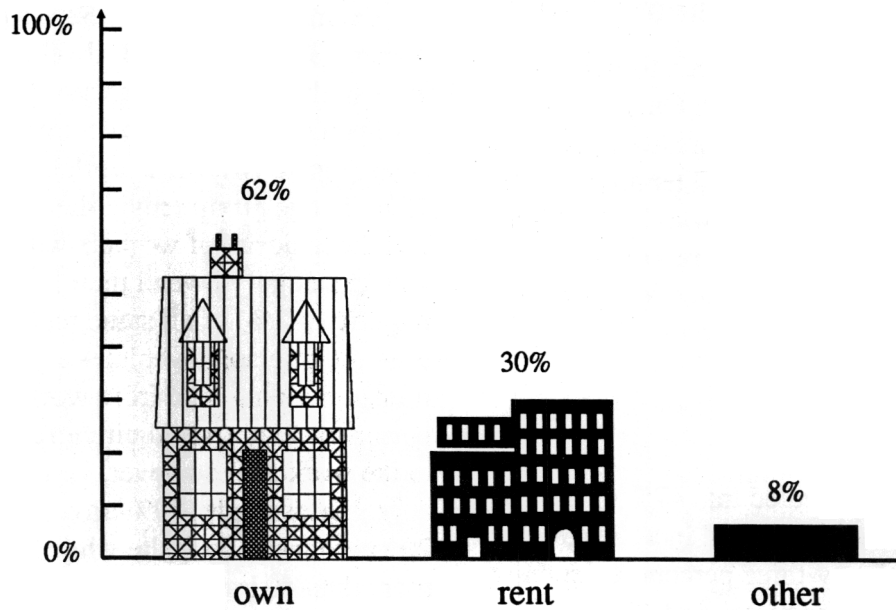


Figure 16

**Table 8. Overall human capital assessment
Stand tending worker**

| Conditions | Workers | % |
|---|----------------|------------|
| no forestry education no silviculture training no stand tending experience | 2 | 3 |
| no forestry education no silviculture training with stand tending experience | 16 | 26 |
| no forestry education with silviculture training with stand tending experience | 17 | 29 |
| with forestry education no silviculture training no stand tending experience | 0 | 0 |
| with forestry education with silviculture training no stand tending experience | 0 | 0 |
| with forestry education no silviculture training with stand tending experience | 7 | 11 |
| no forestry education with silviculture training no stand tending experience | 3 | 5 |
| with forestry education with silviculture training with stand tending experience | 16 | 26 |
| Total | 61 | 100 |

Income sources

Thirty-one percent of all stand tending workers reported their gross income in 1989 as being less than \$10,000. Five percent received a gross income greater than \$30,000.

Eleven percent stated that none of their 1989 income was attributed to employment in silviculture. Income was also dependent upon sources other than silviculture; 43% public assistance and 57% non-forest related employment. Fifteen percent of all stand tending workers derived all their gross income from employment in silviculture.

Seventy-four percent of stand tending workers secured between 25 and 75% of their 1989 gross income from employment in silviculture. Additional income sources included, 85% from public assistance, 9% from non-forest employment, 4% from logging and 2% from farming (*figure 17*).

Again, there are three possible explanations for this high dependence on public revenue as a supplementary income. These may include unemployment issues such as demand deficit unemployment, seasonal and/or insurance induced unemployment and frictional or structural unemployment. Although these explanations may account for most reasons for such a high dependency on public revenue as a supplementary income source, some workers were in fact receiving unemployment insurance benefits while attending the Silviculture Worker Training Course at Holland College.

Wage types and frequency of pay

Fifty-five percent of all stand tending workers were paid piece wages. Thirty percent of these workers were paid at an hourly rate and 15% were salaried. These included crew chiefs, supervisors and managers who oversaw the tending crews on the job site.

The frequency of pay among stand tending workers was split 48% weekly and 48% biweekly. Only 4% were paid upon job termination.

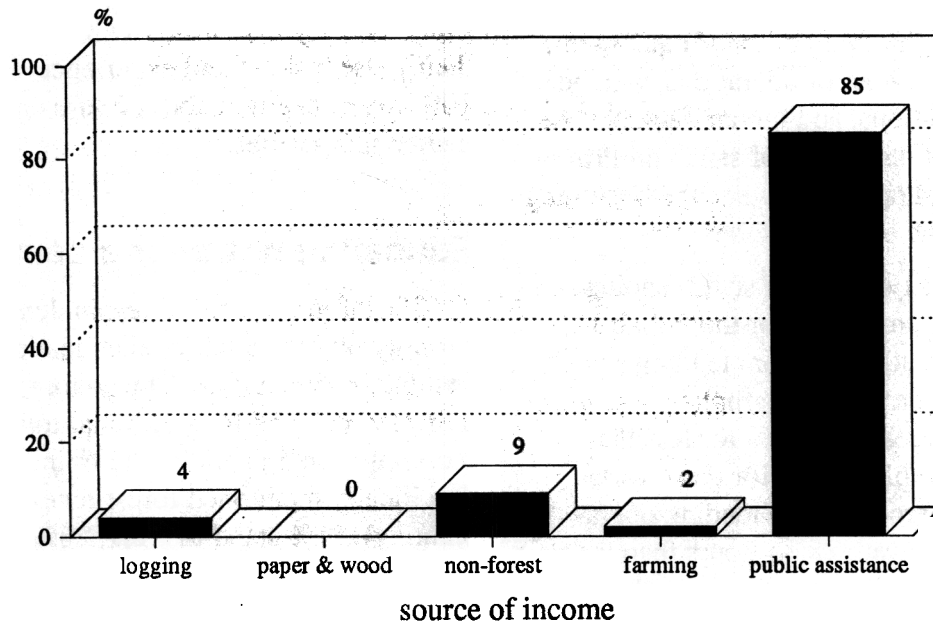
Work hours, days, and weeks

Most stand tending workers (67%) labored an eight-hour day. Twenty-eight percent reported working between nine and ten hours. The remainder (5%) worked fewer than eight hours.

Most (62%) also worked a 40-hour week. The work week appears to be oriented from Monday to Friday, although tending operations on weekends are possible. There are two distinct work systems under which stand tending workers can operate, namely commuter or camp site. Under the **commuter system** workers travel daily to the work site. Under a **camp site system** workers remain on the job site for the duration of the work week, or in some cases, until the job has been completed. In Prince Edward Island the commuter system is the dominant work system for stand tending workers.

Seventy-four percent of stand tending workers secured between 25 and 75% of their 1989 gross income from employment in silviculture. (*figure 17*).

**Stand tending workers*
Additional income**



* Additional income sources for those workers that derived 25%-75% of their gross income from silviculture employment.

Figure 17

**Stand tending workers
Labor migration**

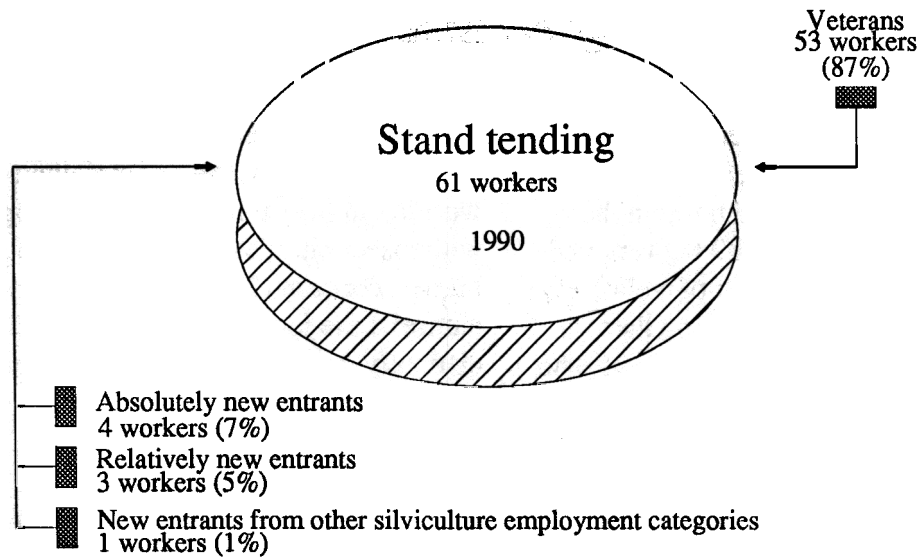


Figure 18

The maximum number of work weeks available for stand tending is controlled by biology and climate. Other factors also impinge upon employable stand tending time, such as the availability of equipment, the size and number of operations, weather and site conditions, and human factors. The partial and total removal of stems on Prince Edward Island occurs between the beginning of May and the end of October.

The majority (49%) of stand tending workers were employed for more than 12 weeks and usually the entire tending season. Thirty-eight percent were employed between four and 12 weeks and 13% for less than four weeks. Explanations for these variations are numerous. Small tending operations require fewer person-hours than larger operations. In addition, certain stands have a higher stem density, requiring heavy thinning, while others may require special attention.

Silviculture labor migration

The survey indicated that four workers were 'absolutely new entrants' into the silviculture labor force in 1990 (*figure 18*). One worker was 'new' to stand tending but had experience in other silviculture fields. 'Relatively new entrants' accounted for three workers (those who did not join the silviculture labor force in 1989 but returned to work in 1990). This number of 'relatively new entrants' was calculated using the difference between silviculture workers who did not secure any 1989 gross income from silviculture (11%) and 'absolutely new entrants' (6%). Finally, there were 53 'veteran' workers who were employed in stand tending during the 1989 forest management season and returned in 1990.

Employee aspirations

Overall, 84% of the stand tending workers felt confident about being able to secure future employment in silviculture, given their present skills and experience. Only 10% were uncertain about future employment opportunities.

Education or training demand

Sixty-four percent of respondents strongly favored additional education or training in silviculture. Thirty-six percent indicated no need for additional training. Of those interested in additional training, 33% specifically mentioned forest renewal (tree planting), 31% stand tending, 26% nursery, and 10% site preparation (*figure 19*).

Worker concerns

In answering this subjective question respondents addressed topics ranging from working conditions to wages (*figure 20*). These responses provided a general indication of worker morale and problems that may need future attention.

Work environment ranked as the most significant concern of stand tending workers. Forty-seven percent complained of working in the rain and having to contend with insect bites. Wages were the second highest concern (23%), with the seasonal nature of the job ranking third. Physical difficulty, hours of work and job remoteness were minor concerns.

Stand tending workers Education or training demand

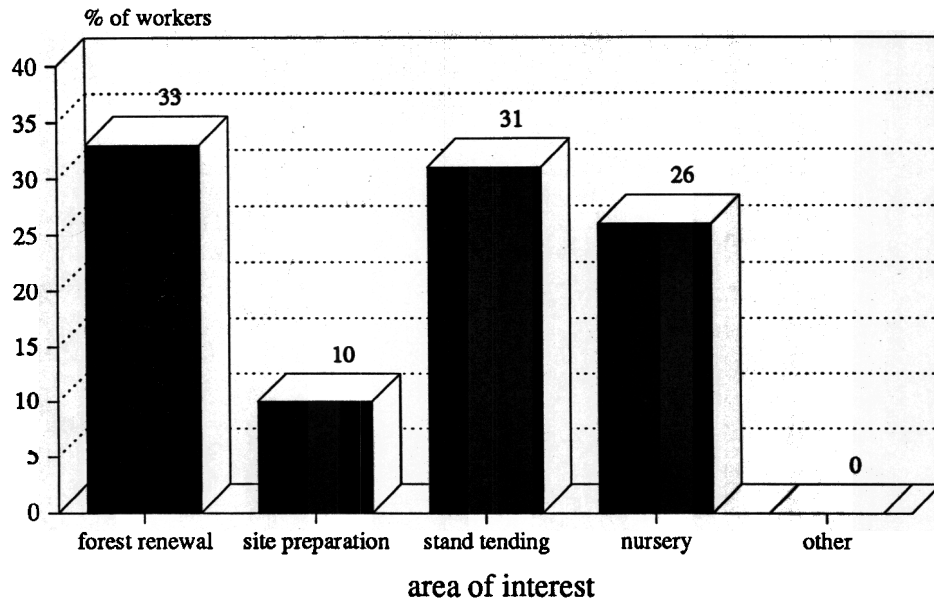


Figure 19

Stand tending worker concerns

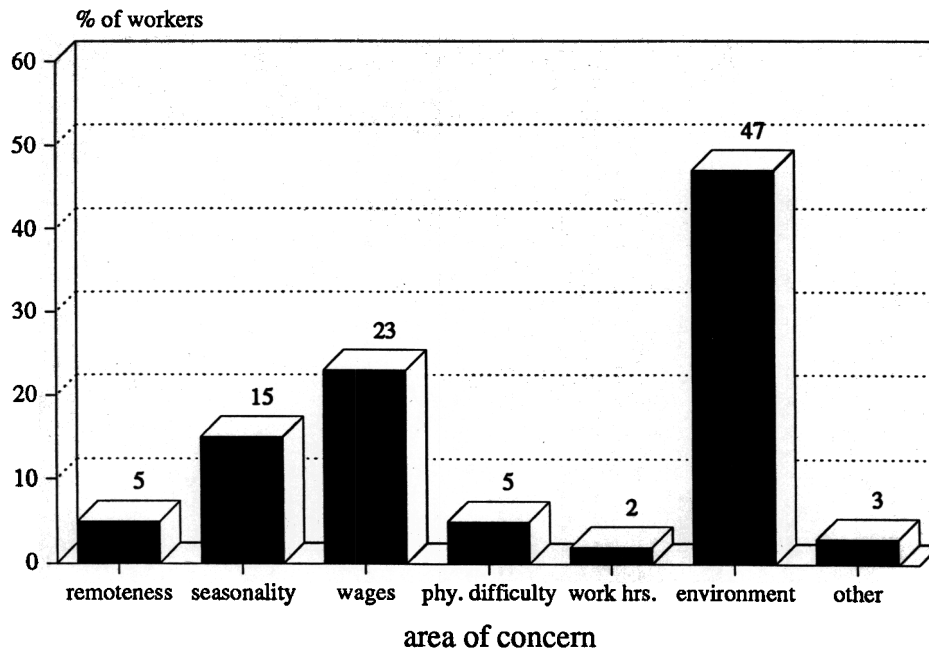
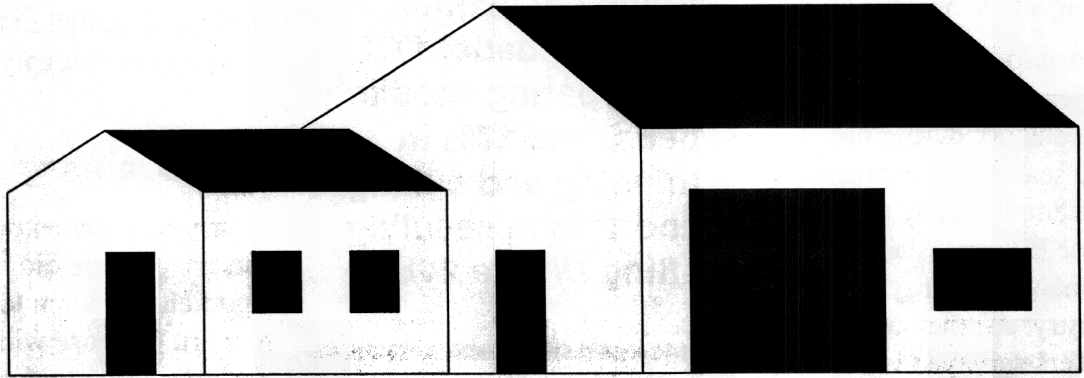


Figure 20

Chapter IV



Nursery Employment

Nursery workers are those publicly or privately employed individuals, 15 years of age or over, who receive pay or profit from providing silvicultural services in a nursery. Nursery workers produce seedlings and seed for new forest crops. This analysis pertains to the occupations of seedling lifting (uprooting seedlings to transplant into a forest renewal site), plantation site preparation, planting, and culling and thinning.

Approximately 24 workers were employed in this category during the 1990 season. All workers were employed by the Prince Edward Island Department of Energy and Forestry. All the nursery workers surveyed were non-unionized.

The following analysis provides a detailed socio-economic profile for the 23 nursery workers who responded to the survey. The analysis regards nursery workers as a homogeneous body and does not differentiate by public or private labor crew, private or Crown land or forest management program.

Sex, age and marital status

In 1990, nursery employment was 57% female and 43% male (*figure 21*). Seventy-eight percent of all workers were between 25 and 44 years of age (*figure 22*). The

percentage of male and female workers was virtually the same within the 25 to 44 age group (males 77%, females 80%) and differed in the 45+ age group (males 23%, females 10%).

Of those nursery workers with training, 49% were trained in planting seedling beds, 17% in preparing seedling beds, and 17% in thinning and culling, and 17% in seedling lifting (*figure 24*).

Twenty-two percent were single (never married) while 74% were married. Most married nursery workers were between 25 and 44 years of age, while most single workers appeared in the 15 to 24 age category.

Dependents

Thirty-nine percent of nursery workers did not report any children to support. Of those with children, 44% supported from one to three and 17% supported four or more children. Most workers with children were between 25 and 44 years of age.

Formal and forestry education

Fifty-two percent of all nursery workers had completed at least high school and 39% some form of post secondary education.

Interestingly, 30% indicated some education in forestry (*figure 23*). Of those, all reported an education in forest technology, implying a college-level education in forestry.

Nursery workers Sex distribution

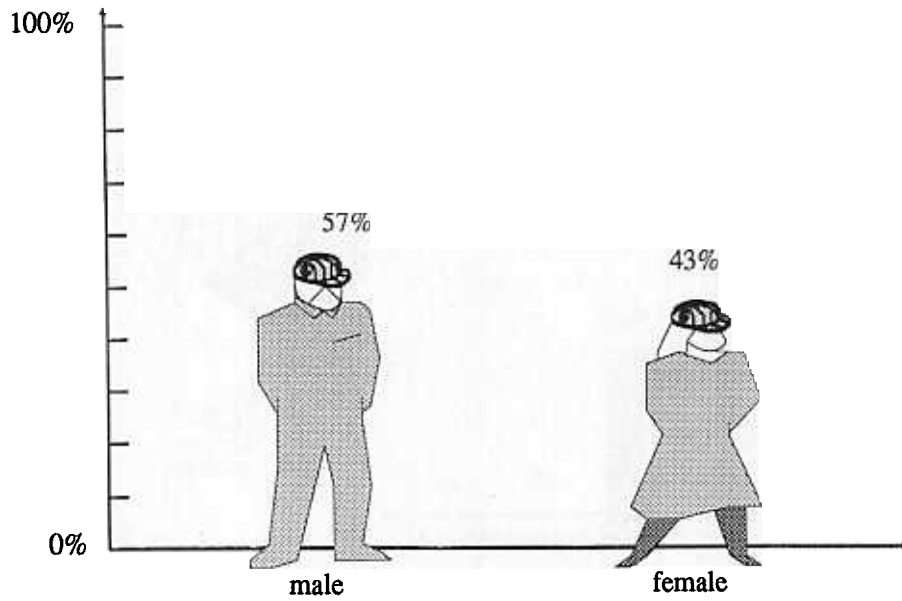
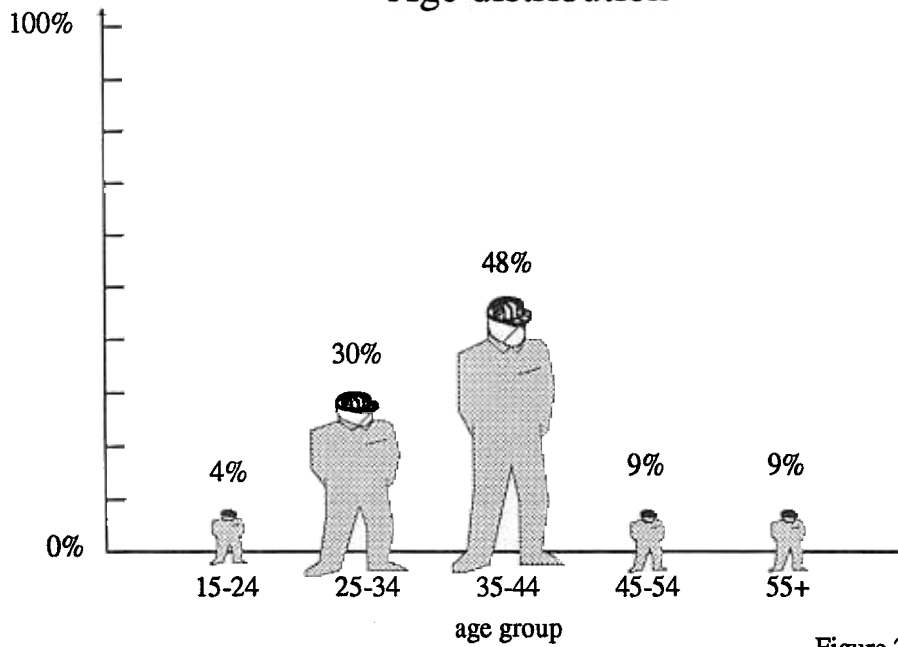


Figure 21

Nursery workers* Age distribution



*includes male and female workers.

Figure 22

Nursery workers

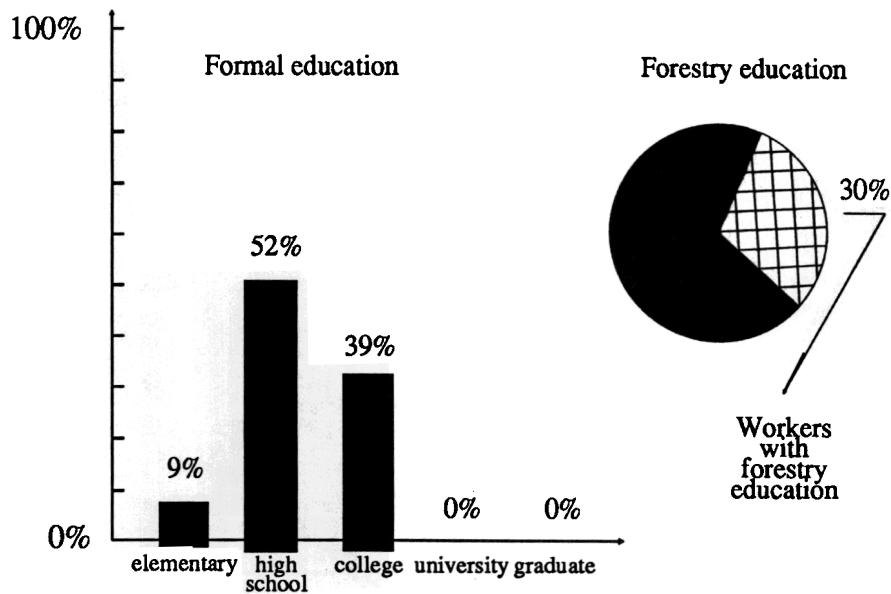


Figure 23

Proportion of nursery workers with nursery training

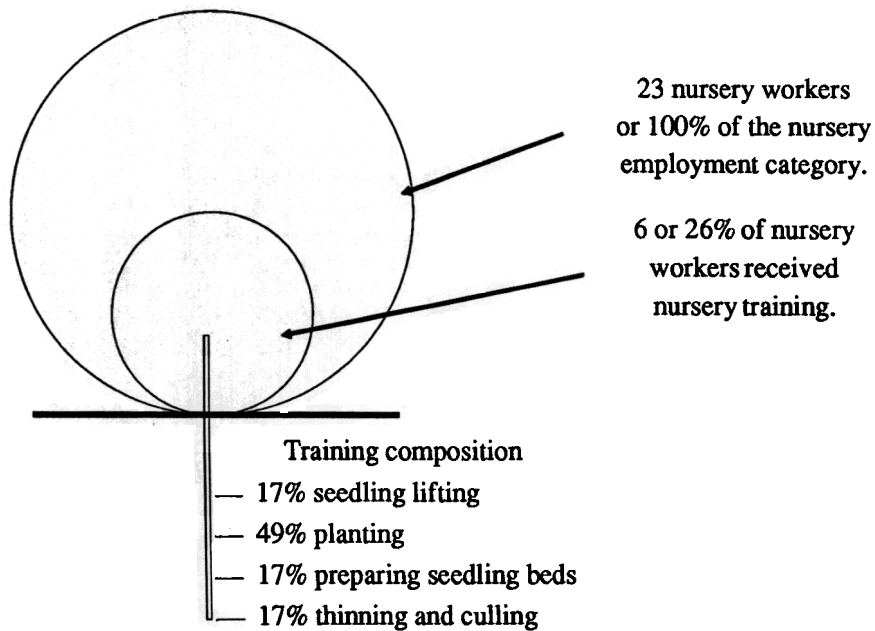


Figure 24

Nursery Training

Nursery workers were asked if they had received any nursery training after leaving school: 26% or six workers indicated they had. Of those workers, 49% were trained in planting seedling beds, 17% in preparing seedling beds, and 17% in thinning and culling, and 17% in seedling lifting (*figure 24*). Nursery workers rated their training as 'good' (50%), 'adequate' (28%) and 'exceptional' (22%). No workers rated their training as 'poor'.

Training for nursery workers can include instruction in proper dress to protect against inclement weather, injury from dirt and trees, insect bites and stings, and injuries associated with repetitive movements. All these workers obtained their training from the provincial government.

Experience

The survey revealed that all workers had at least one season of experience in nursery-related activities. The lack of new workers in this category may be an exception, however, a low job turnover rate among these workers can provide some rationale.

Most nursery workers (74%) had four or more seasons of experience in nursery operations (*figure 25*). Over the long term this demonstrates the ability to retain an experienced pool of nursery workers.

Table 9 compares nursery experience in other silviculture fields. There were no 'absolutely new entrants' into the nursery employment category. Within this employment group there was a positive correlation ($r = 0.97$) between the number of workers with additional seasons of experience in nursery activities and the proportion of workers with experience in other fields. As the amount of nursery experience increased, the proportion with experience in other silviculture fields also increased. Workers with additive exposure in nursery work tended to branch out into other silviculture fields and gain more experience.

Most nursery workers (74%) had four or more seasons of experience in nursery operations (*figure 25*).

Human resource assessment

Table 10 compares all three forms of human resource investment. Seventeen percent of the workers surveyed had some forestry education, nursery training and experience. There were no workers who had no such education, training and experience. All others (83%) had some combination of each.

Residence

The survey revealed that 40% of respondents lived in a village, town or city. Sixty percent resided in a rural setting. Most (91%) reported their term of residence as being greater than five years. Nursery workers living in communities were mostly between 35 and 44 years of age. Those residing in a rural setting were mostly between the ages of 25 and 34 years.

Table 9. Proportion of nursery workers with and without experience in other silviculture fields

| Seasons of experience in nursery | Nursery workers % | Proportion of workers with no experience in other silviculture fields % | Proportion of workers with experience in other silviculture fields % |
|----------------------------------|-------------------|---|--|
| 0 | 0 | 0 | 0 |
| 1 to 3 | 26 | 4 | 22 |
| 4 to 6 | 35 | 9 | 26 |
| 7 to 9 | 9 | 0 | 9 |
| 10 or more | 30 | 0 | 30 |
| Total | 100 | 13 | 87 |

Most nursery workers were home owners (83%), 13% rented their dwellings, and 4% claimed 'neither' which can be interpreted as being dependent upon others for their accommodations (*figure 26*). Most workers within the 15 to 24 age group rented their dwellings, while the majority within the 25 to 44 age category owned their homes. Ninety-six percent used their personal vehicles as the means of transportation to and from their current residences to the nursery. The distance traveled for most workers was less than 20 km.

Gross income, silviculture income and additional income

Nine percent of all nursery workers reported their gross income in 1989 as less than \$10,000. Another 9% reported receiving a gross income of \$30,000 or more.

Four percent reported that none of their 1989 gross income was attributed to nursery employment. Thirty-five percent derived all of their gross income from employment in a nursery.

Nursery experience

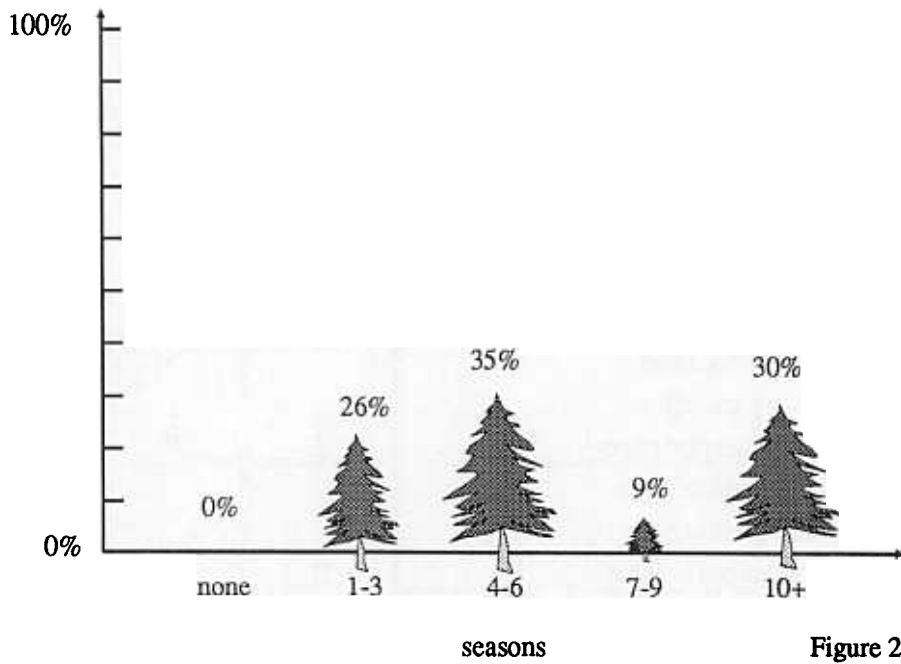


Figure 25

Nursery workers Residence status

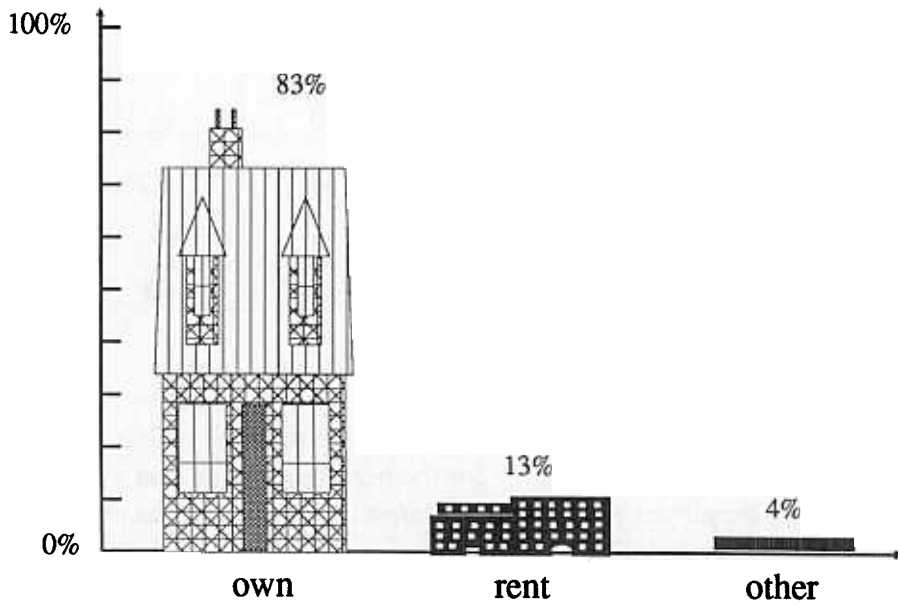


Figure 26

Table 10.

| | | % |
|---|-----------|------------|
| no nursery experience | 0 | 0 |
| no forestry education no nursery training with nursery experience | 14 | 61 |
| no forestry education with nursery training with nursery experience | 2 | 9 |
| with forestry education no nursery training no nursery experience | 0 | 0 |
| with forestry education with nursery training no nursery experience | 0 | 0 |
| with forestry education no nursery training with nursery experience | 3 | 13 |
| no forestry education with nursery training no nursery experience | 0 | 0 |
| with forestry education with nursery training with nursery experience | 4 | 17 |
| Total | 23 | 100 |

Sixty-one percent of nursery workers secured between 25% and 75% of their 1989 gross income from nursery employment. Income from other sources included 93% from public assistance such as unemployment insurance and 7% from farming activities. No workers derived any additional income from silviculture unrelated to nursery work (*figure 27*).

There are three plausible explanations for the high dependence on public revenue as a supplementary income to regular silviculture earnings. These explanations deal with the issues of demand deficit unemployment, seasonal unemployment and insurance induced unemployment. Frictional and structural unemployment may also account for some dependence on public revenue.

Wage types and frequency of pay

Seventy percent of all nursery workers were paid on hourly rates. The remaining 30% were paid on a salary basis. All nursery workers and staff were paid biweekly.

Work hours, days, and weeks

Sixty-nine percent of nursery workers reported a working day of 8 hours. Twenty-two percent reported working less than eight hours and the remaining 9% greater than eight hours. Approximately 65% reported working a 40-hour week. The work week was usually defined as Monday to Friday.

Normally, nursery operations within Prince Edward Island can be extended year-round, however, many individual activities are defined by biology and climate. Therefore, the length of nursery employment can vary, depending upon the specific nursery occupation. The majority of nursery workers (57%) were employed for 12 weeks or more and 43% between 9 and 12 weeks.

Silviculture labor migration

The survey reported that there were no 'absolutely new entrants' into the nursery employment category in 1990 (*figure 28*). Moreover, there were no 'new entrants' from other silviculture fields into this category. There was only one 'relatively new entrant' (who did not join the silviculture labor force in 1989 but returned to work in 1990). Finally, there were 22 'veteran workers' who were employed in nursery operations during 1989 and returned in 1990.

Employee aspirations

Overall, 82% of the nursery workers felt confident about being able to secure future employment in silviculture-related work, given their present skills and experience. Only 9% were uncertain about future employment opportunities.

Education or training demand

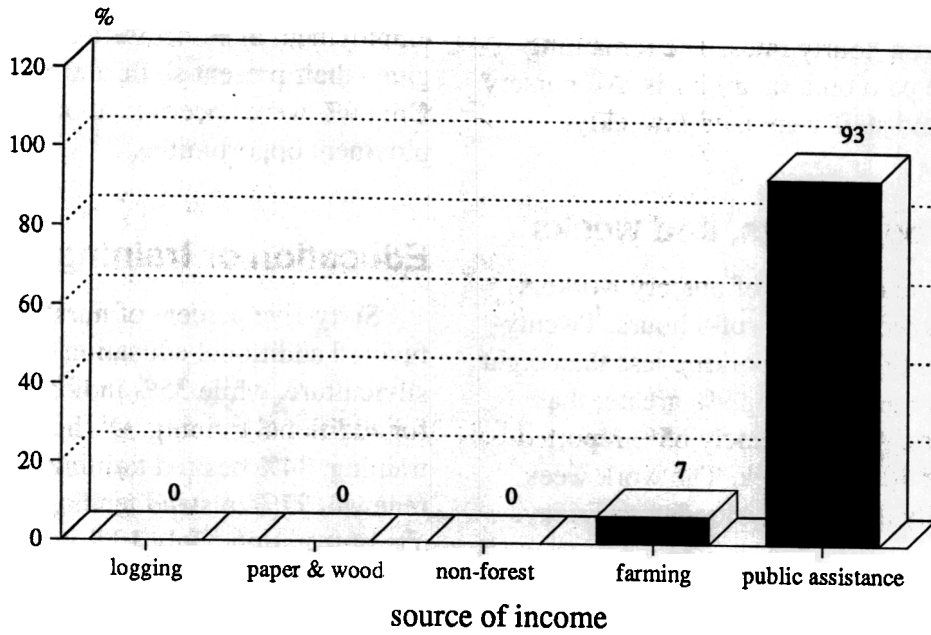
Sixty-five percent of nursery workers favored additional education or training in silviculture, while 35% indicated no need for additional training. Of those interested in training, 34% desired training in forest renewal, 27% in stand tending and 13% in site preparation. Only 13% wanted more nursery-related training. A remaining 13% indicated interest in the advanced silviculture worker training course offered through Holland College (*figure 29*).

Worker concerns

Respondents addressed topics ranging from working conditions to wages (*figure 30*). These responses provide a general indication of worker morale and problems that may need future attention.

The seasonal nature of nursery work ranked as the highest concern (35%). Concerns over wages being too low drew some disapproval from workers (26%). Nine percent complained that the work hours were too short and an additional 9% were concerned with the working environment such as having to work in the rain and warm temperatures, and contending with insect bites. Only 4% were concerned with the physical nature of the job. The remaining 17% drew attention to problems associated with labor-management relations.

Nursery workers* Additional income



* Additional income sources for those workers that derived 25%-75% of their gross income from silviculture employment.

Figure 27

Nursery workers Labor migration

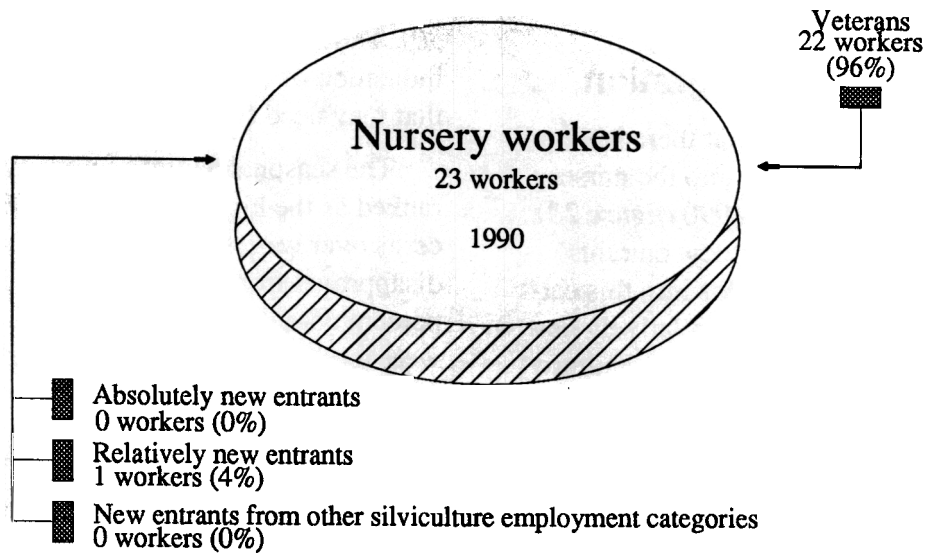


Figure 28

Nursery workers Education or training demand

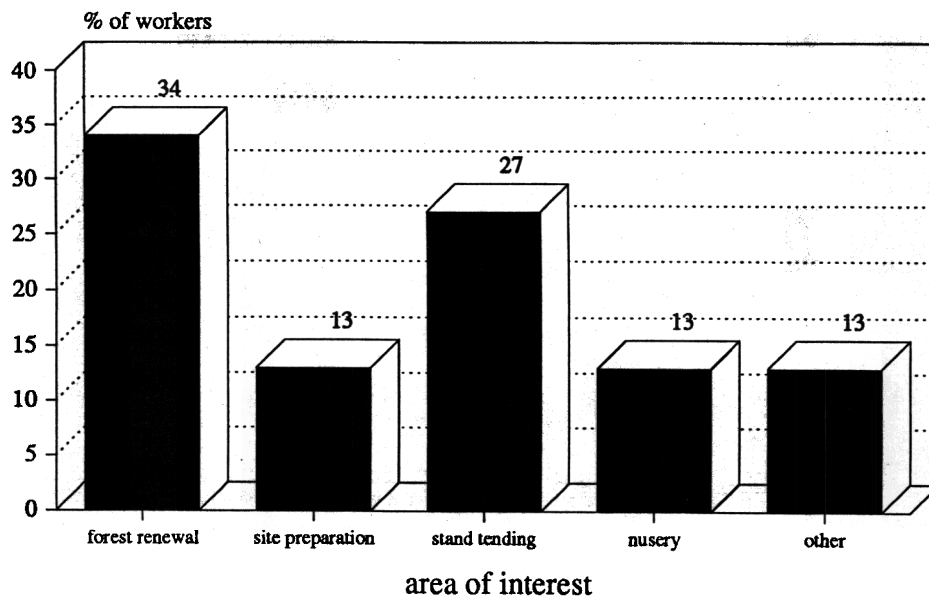


Figure 29

Nursery worker concerns

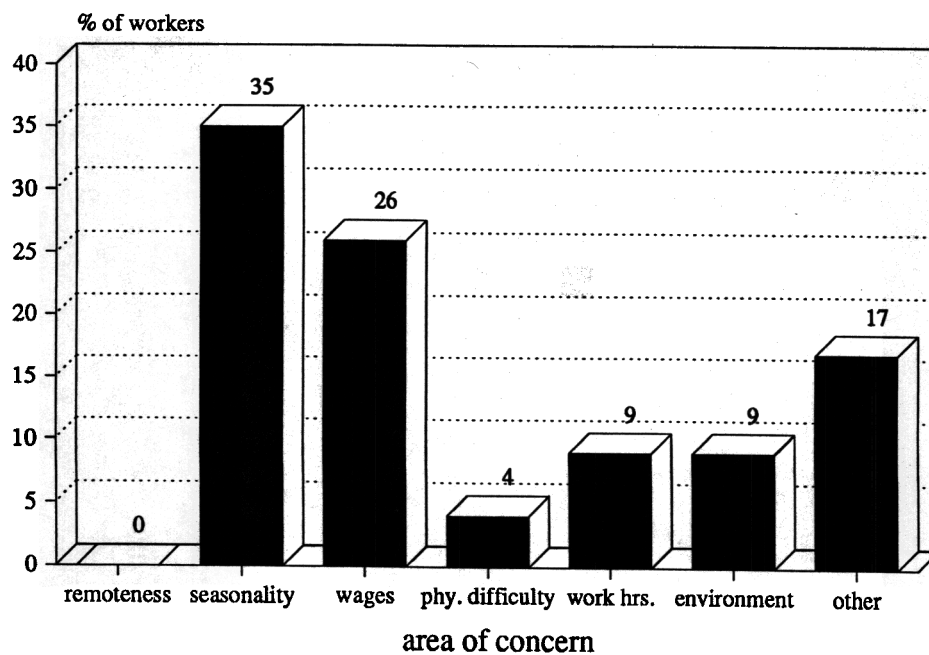
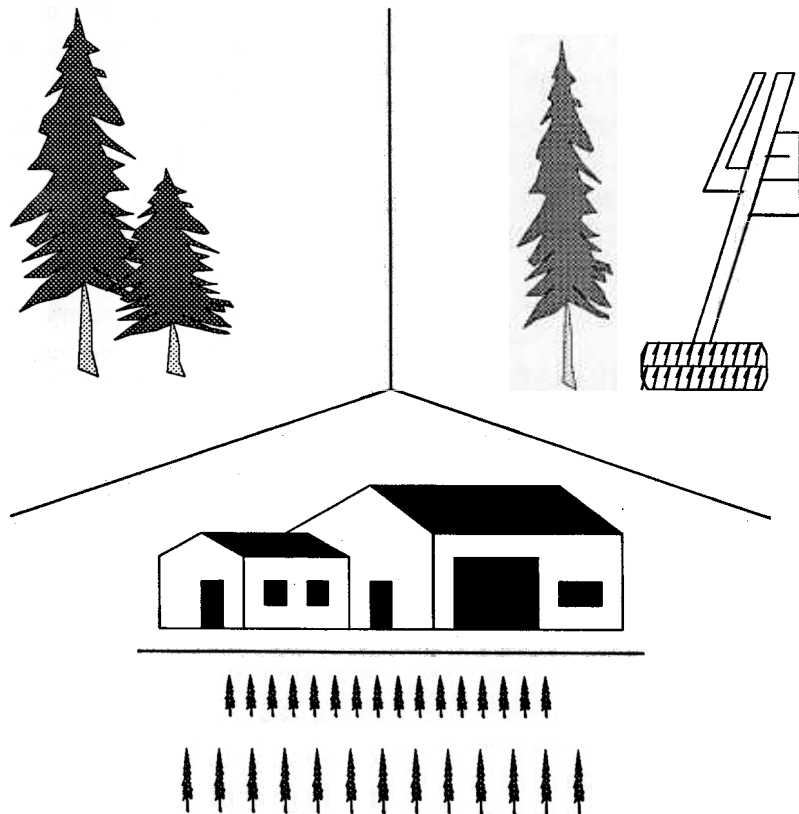


Figure 30

Chapter V

Summary and Comparison



Sex, age and marital status

Males dominated the silviculture labor force in all job categories except the nursery group, which was a split between male and female workers. Forest renewal and stand tending employment groups were inclined to attract younger workers between 15 and 24 years of age. In comparison, nursery workers were predominantly in the middle-aged group.

Forest renewal workers were virtually divided between married and single (never married) workers. Within the stand tending and nursery employment groups the majority were married.

Child dependencies

Over 50% of all silviculture workers supported children. Nursery workers reported the highest number of child dependencies. Of those, the majority supported from one to three children; the remainder supported four or more (*Table 11*).

Formal and forestry education

Table 12 compares the human resource assessment among the three silviculture employment groups. Silviculture workers in Prince Edward Island indicated that over half had completed high school. Forest renewal had the highest proportion of workers who had completed high school followed by the stand tending employment group. Those reporting some form of post-secondary education were mostly concentrated at the technical trade/college-level. Nursery workers reported having largest concentration of workers at the post-secondary level.

Stand tending and nursery workers had the highest proportion of silviculture workers with some form of forestry education. The dominant education was 'forestry general', a university-level program for stand tending workers, and forest technology, a college-level program, for nursery workers. Many supervisors and crew chiefs reported having had some forestry education. Forest renewal workers had the lowest proportion of individuals specifically educated in forestry programs. However, for those workers the dominant education type was 'forestry general'.

Silviculture training

Silviculture training appears to be the major form of human resource investment as opposed to formal forestry education among silviculture workers. One explanation for this could be that silviculture operations in the field require skills directly applicable to the task at hand. Theoretical and planning skills, acquired through forestry education programs, were necessary among individuals such as supervisors responsible for executing management plans or overseeing a planting or cutting block.

Stand tending workers had the highest percentage of workers with silviculture training, followed by the forest renewal employment group. Nursery workers had the lowest proportion of workers with silviculture training related to nursery work.

Among those who reported silviculture or nursery training, workers within the stand tending employment group had the highest percentage with occupation-specific training, followed by the nursery employment group.

Table 11- Labor demographics

| | Forest renewal worker | Stand tending worker | Nursery worker |
|-------------------------|------------------------------|-----------------------------|-----------------------------|
| Sex | male dominated | male dominated | split between male & female |
| Age | young work force | young work force | middle-aged work force |
| Marital status | 46% single (never married) | 38% single (never married) | 22% single (never married) |
| Child dependents | 51% support children | 54% support children | 61% support children |

Table 12- Human capital assessment

| | Forest renewal worker | Stand tending worker | Nursery worker |
|------------------------------|---|--|--|
| Formal education | 69% completed high school | 56% completed high school | 52% completed high school |
| Forestry education | 13% have forestry education. Dominant type: Forestry General | 30% have forestry education. Dominant type: Forestry General | 30% have forestry education. Dominant type: Forest Technology |
| Silviculture training | 31% received training. Training source split between public and private | 50% received training. Major training source: public | 26% received training and only training source: public |
| | Forest renewal training 23% received training | Stand tending training 46% received training | Nursery training 26% received training |
| Experience | 12% no seasons of experience and low job turn over. 44% four or more seasons of experience. | 8% no seasons of experience and low job turn over. 42% four or more seasons of experience. | 0% no seasons of experience and low job turn over. 74% four or more seasons of experience. |

Although stand tending workers had the highest percentage with occupation-specific training (46%), a need exists to increase the level of training in stand tending. Again, the abundance of over-mature softwood forest, such as white spruce, requiring a harvest level that evens out the age-class distribution, is the basis for increasing the ranks of workers with stand tending training.

The forest renewal employment group had the lowest percentage of workers reporting occupation-specific training. In Prince Edward Island the province's forest management plan calls for an evening of the forest age-class structure of their 'old forest' and the acceleration of the 'new forest'. Accelerating the 'new forest' necessitates undergoing forest renewal operations (artificial regeneration) among other silvicultural practices such as pre-commercial thinning. These activities are labor-intensive and requires workers both in quantity and quality. The quantity of forest renewal workers is not sufficient to carry out tree-planting projects and worker quality is low, with less than one quarter having had training in planting seedlings.

Worker quality is undoubtedly important because the first growing season following plantation is critical for seedling survival and mortality that is unrelated to competition. Critical factors include quality of planting stock, planting techniques, harshness of the planting site, weather, and planting quality. Although human involvement affects most of these mortality variables, planting quality is of particular interest

because it directly involves the forest renewal worker in planting the seedling. There are many attributes associated with planting quality that can lead to seedling mortality. These include freshness of seedling stock, shallow planting, vertical alignment, spacing, J, L, or U rooting and loose planting.

With increasing emphasis on plantation quality, the demand for quality forest renewal workers will most certainly rise. Therefore, a need exists to increase the number of workers with occupation-specific training in forest renewal.

Most silviculture workers who received training in silviculture or nursery-related training rated their training as being good. Some rated their instruction as exceptional. Very few thought their training courses were poor.

Training in stand tending was reported as having been obtained from government and company sources. Many workers were, in fact, trained through the formal program at Holland College referred to as the Silviculture Worker Training Course. Funding for this course, designed to develop skilled individuals for the Prince Edward Island silviculture industry, was provided by the Canada Employment and Immigration Commission (CEIC).

Training at Holland College provides skill development at both the entry and advanced levels. The entry-level course is targeted for 'new recruits' and the subject matter, although oriented toward chainsaw work, is centered around work safety, saw maintenance and repair. The 'how to' aspects of stem removal are also stressed.

To a large extent, forest renewal training throughout the province, whether offered by the province or the private sector, was taught through an informal approach such as learning by doing, observing others and being reprimanded for mistakes. Some have characterized tree planter training as a “short show and tell seminar” combined with a planting demonstration under ideal site conditions. At present, there are no plans for a formal program to train forest renewal workers in the province.

All nursery workers obtained their training from the government. Training varied from formal programs to the simplest demonstration, including instruction in proper dress, protection against inclement weather, injury from dirt and trees, insect bites and stings, and injuries associated with repetitive movements.

Most silviculture workers were in favor of additional training in silviculture or nursery operations. Although workers desired additional training within their present occupations, most wanted training in other fields—possibly to become multi-skilled silviculture workers.

Silviculture experience

All silviculture employment groups reported a low percentage of workers with no experience. Moreover, the nursery employment group reported that all workers had at least one season of experience in the production of seedlings and seed for new forest crops. The low number of ‘new’ nursery workers may be an exception, however, a low job turnover rate can provide some rationale.

The low number of ‘new’ forest renewal workers may be caused by the prevailing preference among contractors to hire tree planters with some experience in forest renewal operations. Finally, the low incidence of ‘new’ stand tending workers may be explained by the limited space available to train entry-level workers through the Silviculture Worker Training Course offered by Holland College.

Income sources

Table 13 compares income sources among the three silviculture groups. The survey indicated that approximately one quarter of all forest renewal workers had gross incomes (income from all sources) in 1989 of less than \$10,000. Nearly one third of stand tending workers had incomes of less than \$10,000. This is largely attributed to those workers being employed through job creation programs. Mainstream stand tending workers, those who derived all or some of their income in stand tending, earned between \$10,000 and \$19,999. In fact, many workers from this group had incomes closer to the \$20,000 mark. Very few nursery workers reported incomes below \$10,000. The number of silviculture workers earning above \$30,000 was minimal. The majority of silviculture workers’ gross 1989 incomes were between \$10,000 and \$19,999.

A large percentage of forest renewal workers had derived no income from working in silviculture in 1989. Some workers were 'absolutely new entrants' and others were 'relatively new entrants'. Few stand tending workers, and to a lesser extent nursery workers, derived no income from silviculture. Most workers within these two groups derived some or all their income from silviculture or nursery-related work.

Public assistance such as unemployment insurance was the major source of additional income for workers who supplemented their silviculture or nursery incomes. Non-forest employment was the second major source for forest renewal and stand tending workers. Farming was the only other additional income source for nursery workers. Additional income from forest production was non-existent.

Employment contribution

The silviculture labor force in Prince Edward Island has contributed to the provincial economy in terms of the number of jobs created. Stand tending was the largest employment group with 63 workers. Forest renewal was next with 40 workers and nursery contributed 24 jobs (*figure 31*).

Wages and hours of work

Table 14 compares the types of wages, length of work day, length of work week and employment duration among the three labor groups. The majority of forest renewal workers were paid piece wages according to the number of seedlings planted. Stand tending workers were largely paid piece wages although hourly rates existed. Nursery workers were mostly given hourly rates. An eight-hour day and 40-hour work week tended to be the norm for most silviculture workers. Nevertheless, forest renewal workers reported working a greater than 40-hour work week. Most stand tending or nursery workers had more than 12 weeks of work per season. In fact, some nursery workers remained employed in the same occupation for up to 40 weeks per year. Forest renewal workers had a limited employment season ranging from four to eight weeks.

Employee outlook and worker concerns

Most silviculture workers felt confident about being able to secure future employment in silviculture, given their present skills and experience. Forest renewal and stand tending workers reported that contending with rain, extreme temperatures and insects were major negative aspects of the working environment. Short-term or seasonal work was a concern among nursery workers.

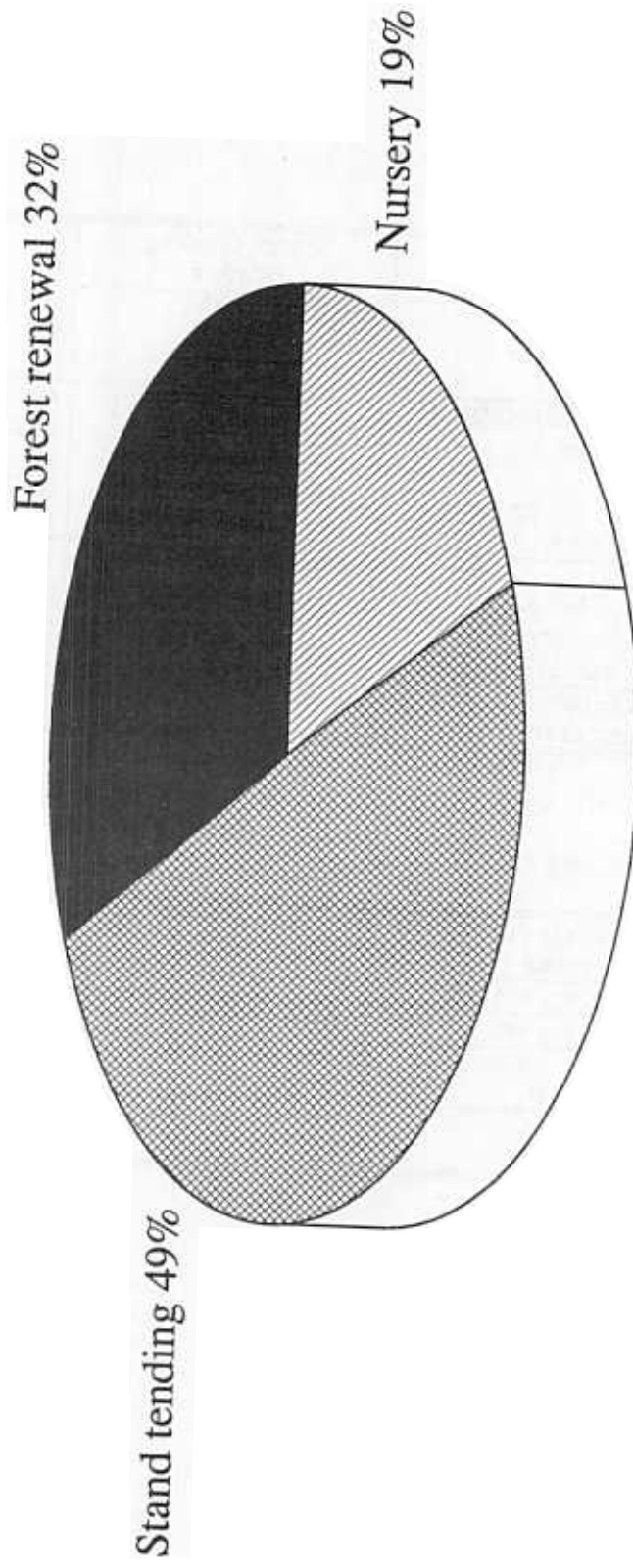
Table 13- Income sources

| | Forest renewal worker | Stand tending worker | Nursery worker |
|--|--|---|--|
| Gross income (all sources) 1989 | 26% < \$10,000 0% > \$30,000 | 31% < \$10,000 5% > \$30,000 | 9% < \$10,000 9% > \$30,000 |
| Percentage of gross income from work in silviculture 1989 | 41% no income from silviculture. 3% all income from silviculture. | 11% no income from silviculture. 15% all income from silviculture. | 4% no income from silviculture. 35% all income from silviculture. |
| Additional 1989 income source | public assistance: 40% non-forestry: 32% farming: 23% | public assistance: 85% non-forestry: 9% farming: 2% | public assistance: 93% non-forestry: 0% farming: 7% |
| Residence status | split between renting & owning | mostly own | mostly own |

Table 14- Hours of work and wages

| | Forest renewal worker | Stand tending worker | Nursery worker |
|----------------------------|-------------------------------|-----------------------------|-----------------------|
| Wage type | majority piece rate | majority piece rate | majority hourly rate |
| Work day | majority 8 hrs. | majority 8 hrs. | majority 8 hrs. |
| Work week | majority greater than 40 hrs. | majority 40 hrs. | majority 40 hrs. |
| Employment duration | 4 - 8 weeks | > 12 weeks | > 12 weeks |

Silviculture labor force by employment group



Glossary

Forest management services industry:

Those primarily engaged in silviculture, forest access, forest protection, and forest planning and development activities. Establishments engaged in the harvesting and refining of forestry benefits are excluded.

Forest management services labor force:

Those individuals, 15 years of age or over, employed in silviculture, forest access, forest protection, and/or forest planning and development activities during a specific forest management season. This includes those employed in any combination of these activities. Logging, pulp and paper, and other forest mill workers are excluded.

Forest renewal activities:

Those activities involved in establishing a tree crop on forest or other suitable lands through artificial reforestation such as sowing seeds or planting, and natural regeneration such as modified harvest practices.

Nursery work:

Producing seedlings, seed, and cuttings necessary to establish a new forest crop.

Silviculture:

The art of producing and tending a forest.

Silviculture labor force:

Those individuals, 15 years of age or over, employed in forest renewal, site preparation, stand tending, or nursery operations during a specific forest management season; including those employed in any combination of these activities. Logging, pulp and paper, and other forest mill workers are excluded.

Silviculture training:

Instruction in forest regeneration activities necessary to grow and tend a new tree crop. Training can be in site preparation, forest renewal, and/or stand tending.

Silviculture workers:

Publicly or privately employed individuals, 15 years of age or over, who receive pay or profit from providing services in forest renewal, site preparation, stand tending, or nursery operations during a specific forest management season. This includes those employed in any combination of these activities.

Site preparation:

Activities necessary to prepare the soil for a new crop of trees through the disposal of woody debris and the reduction of harvested vegetation.

Stand tending:

Those activities necessary to care for an established timber stand at any stage in its life.

Endnotes

Preface

Rugo, Lorenzo. *Understanding the Canadian Silviculture Labor Market*. Proceedings of the Silviculture Conference on Stewardship in the New Forest. Vancouver, British Columbia, November 18-20, 1991, p. 4.

Chapter I

Atlantic Canada Opportunities Agency. *Forestry in Atlantic Canada*. Prepared for Forestry Canada, 1987, p. 3.

3. Haley, David and Luckert, Martin K. *Forest Tenures in Canada: A Framework for Policy Analysis*. Forestry Canada, Information Report E-X-43, 1990.
4. Ibid. p. 97.

Chapter II

5. *Canada-Prince Edward Island Forest Resource Development Agreement*, 1988-93, p. 15.
6. Contractors have indicated a shortage of qualified planters in the Central District. For example, a total of 87 planters were hired during an eight-week period in an effort to keep enough workers to fill two six-man crews. *Woodland Gazette*. Forestry Canada, Spring 1990, p. 9.

7. Free-growing obligation refers to seedlings that have survived the initial five years after plantation or when crown closure has been achieved.
8. Murphy, Paul A. and Farrar, Robert M. *A New Mortality (Or Survival) Function For Longleaf Pine Plantations*. Proceedings of the Fifth Biennial Southern Silvicultural Research Conference. Memphis, Tennessee, November 1-3, 1988, p. 427.
9. Baldwin, Bruce L. *Making Every Tree Count: Secrets of Seedling Survival*. Proceedings of the Fifth Biennial Southern Silvicultural Research Conference. Memphis, Tennessee, November 1-3, 1988, p. 188.
10. McCarthy, Eric. "Tree Planting Contracts": *Woodland Gazette*. Forestry Canada and the Prince Edward Island Department of Energy and Forestry. Spring 1990, p. 9.
11. Ibid., p. 9.
12. *Report of the Cabinet Committee On Rural Development*. Prince Edward Island Rural Development Strategy, 1990, p. 3.
13. Prince Edward Island Department of Energy and Forestry. *Prince Edward Island Forest Industry Employment Study*, July 1990, p. 8.
14. Prince Edward Island Federation of Agriculture. *Report on Farm Labor Shortages*. Prepared by the Industrial Adjustment Committee, April, 1990. p. 1

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15. **Prince Edward Island Department of Energy and Forestry.** *Prince Edward Island Forest Industry Employment Study*, July, 1990, p. 20.
 16. **May, Douglas and Hollett, Alton.** *The Causes of Unemployment in Newfoundland.* Royal Commission on Employment and Unemployment, Newfoundland and Labrador, 1986, p. 184.
 17. **Verboom, Jim.** *The UIC Albatross.* The Silviculture Conference, Vancouver, B.C., November 19, 1991.
 18. **Canadian Pulp and Paper Association.** *Back to the drawing board: A Review of Unemployment Insurance policy.* Prepared for the Commission of Inquiry on Unemployment Insurance, January, 1986, p. 2.
 19. **Statistics Canada.** *Income Distribution by Size in Canada.* Catalogue 13-207, Minister of Supply and Services, 1989. p. 42.
 20. Workers employed in thinning operations, whether pre-commercial or commercial, are considered to be stand tending workers. However, in Prince Edward Island a considerable amount of effort is geared toward site reclamation, defined as the clearing of sites to create the conditions necessary for the establishment of a new and productive forest stand. Site reclamation in this context is site preparation that can imply salvage operations (that is, removal of trees that have been or are in imminent danger of being killed or damaged by injurious agencies) or sanitation operations (that is, elimination of trees that have been attacked or appear in imminent danger of attack by dangerous insects and fungi). Other forms of site preparation include the treatment of the forest floor and competing vegetation or the treatment of the mineral soil (Smith, D.M. 1986, p. 167).

Although stand tending and site reclamation may both involve the removal of trees, there are two distinguishing features that separate these activities. Stand tending operations and workers are engaged in the caring for an established timber stand at any stage of its life for the forest crop. Site reclamation consists of clearing a site to prepare the conditions necessary for the establishment of a new forest crop. The former emphasizes partial stem removal and the latter, total stem removal. In light of these differences, it is important to note that some workers in Prince Edward Island may be employed in both stand tending or site reclamation activities. If both groups are viewed as providing a 'cutting or harvesting' function, the combined total work group may approach 175 workers.

Chapter III

21. *Canada-Prince Edward Island Forest Resource Development Agreement*, 1988-93, p. 16.
22. *Ibid.*, p. 15.
23. *Ibid.* p. 19.
24. **Butler, Mark.** *Silviculture Worker Training in Canada.* Forestry Canada, 1991, p. 14.
25. **Bertrand, Larry.** "Silviculture Training Courses Purchased Since Fiscal Year 1981-82." Prince Edward Island Adult and Continuing Education, 1990.

Bibliography

- 1 **Atlantic Canada Opportunities Agency.** *Forestry in Atlantic Canada.* Canadian Forestry Service, 1987.
- 2 **Anderson, F.J.** *Natural Resources in Canada: Economic Theory and Policy.* Methuen, Toronto, Ontario, 1985.
- 3 **Bostrand, L.** *Job Satisfaction of Logging Machine Operators in Sweden.* Swedish University of Agricultural Science, 1980.
- 4 **Brinkman, Dirk.** *Economics of Tree Planting Industry.* WSCA Newsletter, Fall, 1989, p. 4.
- 5 *Canada-Prince Edward Island Forest Resource Development Agreement (1988-1993).*
- 6 *Canada-Prince Edward Island Forest Resource Development Agreement (1988-1993),* Annual Report, 1989/90.
- 7 *Canada-Prince Edward Island Forest Resource Development Agreement (1988-1993),* Schedule of Rates and Standards, (1991-92).
- 8 **Canadian Pulp and Paper Association.** *Back to the Drawing Board: A Review of Unemployment Insurance Policy.* Prepared for the Commission of Inquiry on Unemployment Insurance, 1986.
- 9 **Chinloy, Peter.** *Labor Productivity.* Abt Books, Cambridge, 1981.
- 10 **Connelly, Rachel.** "The Framework for Analyzing the Impact of Cohort Size on Education and Labor Earning". *Journal of Human Resources*, Volume 21, Number 4, Fall 1986.
- 11 **Corey, Richard H.** *An Atlantic Forestry Vocational Training Program: Solutions.* March 30, 1989.
- 12 **Deloitte Haskins and Sells.** *A Socio-Economic Impact Analysis of Silviculture Employment.* Canada-B.C. Forest Resource Development Agreement, British Columbia, March 1989.
- 13 **Ehrenberg, Ronald G.** *Modern Labor Economics.* Scott, Foreman, and Company. Illinois, 1982.
- 14 **Fields, G.** "Labor Force Migration, Unemployment and Job Turnover". *Review of Economics and Statistics*, November 1976.
- 15 **Forestry Canada.** "Prince Edward Island's Forestry Sector," *Forestry Report*, No. 5, December, 1987.
- 16 **Forestry Canada.** "Forestry Canada and the Prince Edward Island Department of Energy and Forestry," *Woodland Gazette*, Spring 1990.
- 17 **Forestry Canada.** "Forestry Canada and the Prince Edward Island Department of Energy and Forestry." *Woodland Gazette*, Autumn 1990.
- 18 **Forestry Canada.** "Forestry Canada and Prince Edward Island Department of Energy and Forestry," *Woodland Gazette*, Spring 1991.
- 19 **Forestry Canada.** "Forestry Canada and Prince Edward Island Department of Energy and Forestry," *Woodland Gazette*, Spring 1992.

-
20. **Fraser, G., Alex.** *Economic and Social Aspects of Tree Planting in British Columbia*. Canadian Forestry Service, 1987.
 21. **Fuchs, Victor R.** *How We Live*, Harvard University Press, Cambridge, 1983.
 22. **Galloway, L.** "Age and Labor Mobility Patterns," *The Southern Economic Journal*, Volume 45, Number 2, October 1969.
 23. **Garratt, G.** *Forestry Education in Canada*, Evergreen Press Ltd. Vancouver, B.C., 1971.
 24. **Goss, Ernst P.** "Age and Work Experience in the Decision to Migrate," *The Journal of Human Resources*, Volume 21, Number 3, 1986.
 25. **Gunderson, Morley.** *Labor Market Economics, Theory, Evidence and Policy in Canada*. Mcgraw Hill Ryerson Ltd., Toronto, 1980.
 26. **Hartwick, John M.** *The Economics of Natural Resource Use*. Harper and Row, New York, 1986.
 27. **Helfgott, Roy B.** *Labor Economics*. Random House, New York, 1974.
 28. *Report on Farm Labor Shortages in Prince Edward Island*. Industrial Adjustment Committee. Submitted to the Prince Edward Island Federation of Agriculture.
 29. **Kaliski, S.F.** *Labor Turnover in Canada*. Industrial Relations Center, Queen's University, Kingston, Ontario, Canada, 1981.
 30. **Ketcheson D.E. and Smyth, J.H.** "Labor: the Key to Ontario's Silvicultural Programs," *The Forestry Chronicle*, December 1977.
 31. **Lavin, Mary Jo.** *Managing People Managing Trees*. Faculty of Agriculture and Forestry, University of Alberta, 1987.
 32. **Maini, J.S.** *Sustainable Development and the Canadian Forest Sector*. Discussion Paper for the Canadian Council of Forest Ministers, Ottawa, November 1989.
 33. **May, Douglas, and Hollett, Alton.** *The Causes of Unemployment in Newfoundland*. Royal Commission on Employment and Unemployment, Newfoundland and Labrador, 1986.
 34. **Miller, E.** "Is Out Migration Effected by Economic Conditions," *The Southern Economic Journal*, Volume 39, Number 3, January 1973.
 35. **Munro, J. J.** *Labor's Role in Forest Resource Management*. Forest Industry Lecture Series No. 9: Forestry Program, University of Alberta, 1982.
 36. **Nautiyal, Jagdish C.** *Forest Economics, Principles and Applications*. Canadian Scholars' Press Inc., Toronto, 1988.
 37. **Prince Edward Island Department of Energy and Forestry.** *Prince Edward Island Twenty-Year Forest Development Plan*. April 1986.
 38. **Prince Edward Island Department of Energy and Forestry and Forestry Canada.** *An Evaluation of the Forest Resource Development Agreement*. November 1987.
 39. **Prince Edward Island Department of Energy and Forestry.** *P.E.I. Forest Industry Employment Study*. July 1990.

-
40. **Raimon, R.** "Labor Mobility and Wage Inflexibility," *American Economic Review*. Number 54, May 1964.
41. **Rees, Albert.** *The Economics of Work and Pay*. Harper and Row, New York, 1973.
42. **Reed, F.L.C. and Associates.** *Forest Management In Canada*. Canadian Forestry Service, Forest Management Institute Information Report, FMR-X-102, Vol. 1:1-155, 1978.
43. **Rugo, L.** *The Silviculture Labor Force in eastern Ontario: A Socio-Economic profile*. Information Report DPC-X-33, Forestry Canada, 1991.
44. **Rugo, L.** *The Silviculture Labor Force in Newfoundland and Labrador: A Socio-Economic Profile*. Forestry Canada and the Newfoundland and Labrador Department of Forestry and Agriculture, 1992.
45. **Rugo, L.** *Understanding the Silviculture Labor Market*. The Silviculture Conference on Stewardship in the New Forest, Vancouver, B.C., November 18-20, 1991
46. *Rural Development Strategy*. Report of the Cabinet Committee on Rural Development in Prince Edward Island, 1990.
47. **Safarian, A. E.** *Canadian Federalism and Economics Integration*. Imprimerie Stellar Inc., Quebec City, 1974.
48. **Statistics Canada.** *Income distribution by size in Canada*. Catalogue 13-207, Minister of Supply and Services, 1989.
49. **Silviculture Joint Adjustment Committee.** *Human Resource Issues in the British Columbia Silviculture Industry*. January 1989.
50. **Smith, David Martyn.** *The Practice of Silviculture*. John Wiley and Sons, New York, 1962.
51. **Sorensen, Jean.** *Hiring the Crew Worker*. Canadian Forest Industries, November, 1990.
52. **Steinnes, D.** "Causality and Immigration," *The Southern Economics Journal*, Volume 45, Number 1, July 1978.
53. **Stephenson, Stanley P.** *The Economics of Youth Job Search Behavior*. Toronto, April 6, 1985.
54. **Teikari, E.** *Methods for Measuring Job Satisfaction*. Proceedings IUFRO Seminar, 1980.
55. **Teegarden, D.E.** *Journal of Forestry*, April 1973.
56. **Verner, Coolie.** *Planning and Conducting a Survey*. University of British Columbia, October 1967.
57. **Williams, Glyn C.** *Labor Economics*. John Wiley and Sons Inc., New York, 1970.
58. **Wilson, J. F.** *Seasonal Unemployment in Newfoundland: Trends and Determinants*. Discussion paper No. 186, Economic Council of Canada, Ottawa, 1981.
59. **Woodbridge, Reed and Associates.** *Canada's Forest Industry: Volume V: Fiber Assumptions*. Prepared for Forestry Canada, July 1988.
60. **Verboom, Jim.** *The UIC Albatross*. The Silviculture Conference on Stewardship in the New Forest, Vancouver, B.C., November 18-20, 1991.

Summary Tables

The silviculture labor force in Prince Edward Island
- A socio-economic profile - (1990)

Sex distribution

| Sex | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|--------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Male | 30 | 77 | 60 | 98 | 13 | 57 |
| Female | 9 | 23 | 1 | 2 | 10 | 43 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Age distribution

| Age group | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|-----------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| 15 - 24 | 15 | 38 | 18 | 30 | 1 | 4 |
| 25 - 34 | 18 | 47 | 27 | 44 | 7 | 30 |
| 35 - 44 | 6 | 15 | 14 | 23 | 11 | 48 |
| 45 - 54 | 0 | 0 | 2 | 3 | 2 | 9 |
| 55 + | 0 | 0 | 0 | 0 | 2 | 9 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

The silviculture labor force in Prince Edward Island
 - A socio-economic profile - (1990)

Marital status

| Status | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|-------------------|-----------------------------|------------|----------------------------|------------|----------------------|------------|
| | # | % | # | % | # | % |
| Married | 19 | 49 | 36 | 59 | 17 | 74 |
| Widowed, divorced | 2 | 5 | 2 | 3 | 1 | 4 |
| Single | 18 | 46 | 23 | 38 | 5 | 22 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Dependant children

| Children | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|--------------|-----------------------------|------------|----------------------------|------------|----------------------|------------|
| | # | % | # | % | # | % |
| none | 19 | 49 | 28 | 46 | 9 | 39 |
| 1 | 7 | 18 | 12 | 20 | 1 | 4 |
| 2 | 7 | 18 | 10 | 16 | 6 | 27 |
| 3 | 5 | 12 | 9 | 15 | 3 | 13 |
| 4 or more | 1 | 3 | 2 | 3 | 4 | 17 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

The silviculture labor force in Prince Edward Island
 - A socio-economic profile - (1990)

Residence location

| Location | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|----------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Village | 5 | 12 | 15 | 25 | 5 | 22 |
| Town | 4 | 10 | 9 | 15 | 2 | 9 |
| City | 8 | 21 | 4 | 7 | 2 | 9 |
| Rural | 21 | 54 | 27 | 43 | 12 | 51 |
| Farm | 1 | 3 | 6 | 10 | 2 | 9 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Formal education

| Education | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|-------------------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Elementary | 1 | 3 | 10 | 16 | 2 | 9 |
| High school | 27 | 69 | 34 | 56 | 12 | 52 |
| Tech., trade or college | 7 | 18 | 11 | 18 | 9 | 39 |
| University | 4 | 10 | 6 | 10 | 0 | 0 |
| Graduate studies | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

The silviculture labor force in Prince Edward Island
 - A socio-economic profile - (1990)

Source of silviculture training

| Source | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Government | 5 | 42 | 26 | 84 | 6 | 100 |
| Company | 5 | 42 | 5 | 16 | 0 | 0 |
| At Home | 1 | 8 | 0 | 0 | 0 | 0 |
| Other | 1 | 8 | 0 | 0 | 0 | 0 |
| Total | 12 | 100 | 31 | 100 | 6 | 100 |

Seasons of experience

| Seasons | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| none | 5 | 12 | 5 | 8 | 0 | 0 |
| 1 to 3 | 17 | 44 | 30 | 50 | 6 | 26 |
| 4 to 6 | 13 | 33 | 13 | 21 | 8 | 35 |
| 7 to 9 | 3 | 8 | 7 | 11 | 2 | 9 |
| 10 or more | 1 | 3 | 6 | 10 | 7 | 30 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

The silviculture labor force in Prince Edward Island
 - A socio-economic profile - (1990)

Residence status

| Status | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|--------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Own | 19 | 49 | 38 | 62 | 19 | 83 |
| Rent | 16 | 41 | 18 | 30 | 3 | 13 |
| Other | 4 | 10 | 5 | 8 | 1 | 4 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Gross income in 1989 from all sources.

| Income \$ | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|-----------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| less than 5,000 | 2 | 5 | 8 | 13 | 0 | 0 |
| 5,000-9,999 | 8 | 21 | 11 | 18 | 2 | 9 |
| 10,000-19,999 | 21 | 53 | 30 | 49 | 13 | 56 |
| 20,000-29,999 | 8 | 21 | 9 | 15 | 6 | 26 |
| 30,000 or more | 0 | 0 | 3 | 5 | 2 | 9 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

**The silviculture labor force in Prince Edward Island
- A socio-economic profile - (1990)**

Percentage of gross income in 1989 attributed to working in silviculture.

| Percentage | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| 0% | 16 | 41 | 7 | 11 | 1 | 4 |
| 25% | 12 | 31 | 12 | 20 | 11 | 48 |
| 50% | 6 | 15 | 18 | 29 | 1 | 4 |
| 75% | 4 | 10 | 15 | 25 | 2 | 9 |
| 100% | 1 | 3 | 9 | 15 | 8 | 35 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Major source of supplementary income in 1989.

| Source | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|----------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Logging | 1 | 5 | 2 | 4 | 0 | 0 |
| Paper and wood | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-forest | 7 | 32 | 4 | 9 | 0 | 0 |
| Farming | 5 | 23 | 1 | 2 | 1 | 7 |
| Public funds | 9 | 40 | 39 | 85 | 13 | 93 |
| Total | 22 | 100 | 46 | 100 | 14 | 100 |

Columns(1,2) * Additional income sources for those workers that derived between gross income from silviculture employment.

Columns(3) * Additional income sources for those workers that derived between gross income from nursey employment.

**The silviculture labor force in Prince Edward Island
- A socio-economic profile - (1990)**

Wage type

| Type | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|--------------|-----------------------------|------------|----------------------------|------------|----------------------|------------|
| | # | % | # | % | # | % |
| Hourly rate | 9 | 23 | 18 | 30 | 16 | 70 |
| Piece rate | 29 | 74 | 34 | 55 | 0 | 0 |
| Salary | 0 | 0 | 9 | 15 | 7 | 30 |
| Combination | 1 | 3 | 0 | 0 | 0 | 0 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Frequency of pay

| Frequency | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|--------------------|-----------------------------|------------|----------------------------|------------|----------------------|------------|
| | # | % | # | % | # | % |
| Weekly | 0 | 0 | 29 | 48 | 0 | 0 |
| Bi-weekly | 34 | 87 | 29 | 48 | 23 | 100 |
| Monthly | 3 | 8 | 0 | 0 | 0 | 0 |
| Termination of job | 2 | 5 | 3 | 4 | 0 | 0 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

The silviculture labor force in Prince Edward Island
 - A socio-economic profile - (1990)

Hours of work

| Hours | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|-----------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| less than 8 hrs | 7 | 18 | 3 | 5 | 5 | 22 |
| 8 hrs | 25 | 64 | 41 | 67 | 16 | 69 |
| more than 8 hrs | 7 | 18 | 17 | 28 | 2 | 9 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Work week

| Hours | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|------------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| less than 40 hrs | 3 | 8 | 6 | 10 | 6 | 26 |
| 40 hrs | 15 | 38 | 38 | 62 | 15 | 65 |
| more than 40 hrs | 21 | 54 | 17 | 28 | 2 | 9 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

**The silviculture labor force in Prince Edward Island
- A socio-economic profile - (1990)**

Length of employment

| Length | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|------------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| less than 4 wks | 1 | 3 | 8 | 13 | 0 | 0 |
| 4 to 8 wks | 34 | 87 | 6 | 10 | 0 | 0 |
| 9 to 12 wks | 2 | 5 | 17 | 28 | 10 | 43 |
| more than 12 wks | 2 | 5 | 30 | 49 | 13 | 57 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

Desire for further education or training in silviculture

| | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|-------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Yes | 26 | 67 | 39 | 64 | 15 | 65 |
| No | 13 | 33 | 22 | 36 | 8 | 35 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |

The silviculture labor force in Prince Edward Island
 - A socio-economic profile - (1990)

Primary area of interest for further education or training in silviculture.

| Activity | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|------------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Forest renewal | 7 | 27 | 13 | 33 | 5 | 34 |
| Site preparation | 12 | 46 | 4 | 10 | 2 | 13 |
| Stand tending | 5 | 19 | 12 | 31 | 4 | 27 |
| Nursery | n/a | n/a | 10 | 26 | 2 | 13 |
| Other | 2 | 8 | 0 | 0 | 2 | 13 |
| Total | 26 | 100 | 39 | 100 | 15 | 100 |

Worker concerns

| Concern | Forest renewal worker (FRW) | | Stand tending worker (STW) | | Nursery worker (NUW) | |
|--------------------------|-----------------------------|-----|----------------------------|-----|----------------------|-----|
| | # | % | # | % | # | % |
| Remoteness | 0 | 0 | 3 | 5 | 0 | 0 |
| Seasonality | 5 | 13 | 9 | 15 | 8 | 35 |
| Wages | 2 | 5 | 14 | 23 | 6 | 26 |
| Phys. Difficulty | 2 | 5 | 3 | 5 | 1 | 4 |
| Hours of work | 0 | 0 | 1 | 2 | 2 | 9 |
| Environmental conditions | 24 | 62 | 29 | 47 | 2 | 9 |
| Other | 6 | 15 | 2 | 3 | 4 | 17 |
| Total | 39 | 100 | 61 | 100 | 23 | 100 |