

# **Vegetation Management in Ontario's Forests: Survey Research of Public and Professional Perspectives**

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## **A Decision Research Report**

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## Executive Summary

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### Overview

This study reports the results of a series of surveys conducted for the Ontario Ministry of Natural Resources. These surveys were conducted in order to investigate attitudes and opinions about the environment, risks to the environment, and options for forest vegetation management. The populations surveyed for this study included the general public in Ontario, residents of timber-dependent communities, and forest professionals (government foresters and biologists, and private-industry foresters). In addition, small pilot studies of environmentalists and aboriginal peoples were also conducted. All of the surveying took place between September and November of 1994.

Overall this study found that there was widespread general support for the protection and preservation of the natural environment of Ontario. There was also support for pragmatic uses of natural resources and for natural resource management. However, this support was tempered by resistance to management practices that use toxic agents, such as pesticides, or other forms of chemical or biologic control.

This study did not find many differences between the respondents from the general public<sup>1</sup> and from timber-dependent communities. There were, however, differences between these publics and forest professionals.

The results of each chapter in this report are outlined below.

### Chapter 1: Introduction

Chapter 1 provides an overview of the research project and discusses the methods used to collect data from a variety of samples.

### Chapter 2: Environmental Values

Chapter 2 defines the role of environmental values in human perceptions of forest management and describes the survey findings on this subject. Both the general public and members of timber-dependent communities supported environmental values, including majority support for reducing one's standard of living to ensure that "nature is not harmed." They also supported the idea of species egalitarianism, and "attraction to the spiritual qualities in nature."

Like these publics, OMNR foresters and biologists supported environmental values. OMNR biologists' support of species egalitarianism exceeded that of any other group. In contrast, private-industry foresters tended to be less supportive of environmental values than any other group.

Gender, age and income have some effect on environmental values: women, younger people, and those with lower incomes were generally more supportive of environmental values. A similar pattern was true in timber-dependent communities, although low income earners are (understandably) less willing to sacrifice their standards of living to protect nature.

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<sup>1</sup> "General public" refers to the entire Ontario public. See the Appendix for a description of sampling

Both the general public and members of timber-dependent communities supported economic and environmental goals which would appear to conflict with each other. The environmental values expressed above co-existed with the belief that natural resources are the basis of a strong economy, and that economic growth is necessary to improve the quality of one's life.

### **Chapter 3: Forest-Management Goals**

Survey respondents supported all four management goals (environmental protection, recreation, jobs, and wood products), although the support for the goal of environmental protection was overwhelming in the general public and among residents of timber-dependent communities. Timber-dependent respondents were more supportive of job creation in the wood-products industry than was the general public. Forestry professionals were much less supportive of recreation as a management goal.

All samples supported active vegetation management and were generally pragmatic about the need to control forest vegetation. However, one management technique, the use of herbicides, had very low public support.

### **Chapter 4: Risks to Health and the Environment**

Respondents were asked to rate the risks attributable to a number of health and environmental conditions. Those related to forest-management options were seen as somewhat risky by all respondents. Aerial and ground applied herbicides, as well as biological control agents, were seen as very risky by respondents from the general public and from timber-dependent communities.

On issues of risk management, the differences between forest professionals and the two sampled publics were most apparent. Forest professionals felt they had more control over risks to their health, were more supportive of pesticide use, and were less likely to believe in the notion of a risk-free environment.

### **Chapter 5: Trust in Information, Management, and Science**

Chapter 5 examines data on where people obtain their information about vegetation-management issues, how they judge these sources of information, and the trust and confidence they assign to different responsible parties. All survey respondents were generally supportive of science and scientists as sources of risk information and/or arbitrators of environmental disputes.

Respondents from the general public and from timber-dependent communities tended to trust public agencies (including Ontario Ministry of Natural Resources) as sources of information about the environment. They also viewed these agencies as responsible for the environment, yet were not equally satisfied with agency job performances. Interestingly, the general public was more satisfied with the job performance of private (forest) industry than were respondents from timber-dependent communities.

### **Chapter 6: Support for Vegetation Management**

Chapter 6 provides correlational analysis of vegetation-management options and goals with values, perceptions, and characteristics of the respondents. Those most supportive of environmental protection tend to resist pesticide use and endorse pro-environmental values, whereas those most supportive of employment as a primary management goal support pesticide use, clearcutting, and equate a robust economy with natural resource industries.

Chapter 6 shows how the public and professionals rated 22 specific forest-management practices. Practices supported by more than 50% of the general public include restorative management (e.g., stocking of streams with fish), and/or non-chemical vegetation control options (the exception being "natural plant toxins"). Conversely, less than 50% of the public supports herbicide use, biological control agents, viruses, etc. The timber-dependent community sample did not deviate significantly from the general public sample, except for a slight

increase in support for controlling purple loosestrife with herbicides.

Forest professionals were much more supportive of management practices than the general public and members of timber-dependent communities and gave higher support ratings to 15 of 22 practices. Use of herbicides, biological control agents, and microorganisms were much more acceptable to forest professionals than to other respondents.

### **Chapter 7: Modeling Support for Vegetation Management**

Chapter 7 presents the results of a structural-model analysis, which was based upon a causal model that related a set of latent variables to support for use of herbicides in vegetation management. The cause-and-effect relationships posited in the model were examined using the techniques of structural modeling analysis and a complex statistical program. The paths and degree of influence on vegetation-management support were measured. The factors (or latent variables) used in this model included environmental values, risk perceptions, and trust in forestry management as causal factors explaining support for (or opposition to) using herbicides for vegetation management.

Trust in managers was the strongest influence on the level of support for herbicide use. Risk perceptions and

forest-management goals have a small but significant influence. Environmental values had a strong influence on risk perception.

### **Chapter 8: A Decision-Pathway Experiment**

Chapter 8 constructs a number of decision pathways that apply to vegetation-management practices. Respondents answered increasingly detailed questions on a variety of management options.

The questions following the scenario statement began with responses to whether forest managers should control unwanted vegetation and whether the respondents support a professional recommendation of aerial herbicide spraying to implement the control. Subsequent questions are linked to the selection of answers. Altogether, 13 potential paths are provided to clarify and reconsider the respondent's position on the use of herbicides. A majority of pro-management respondents agreed to the use of herbicides, but one-third of these supporters fall away when exposed to information about the risks of pesticides, and the introduction of alternative vegetation-management strategies.

Those respondents who supported vegetation management but resisted herbicide use in all contexts are more supportive of environmental values than any other group including those who resist forest management generally.



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## Introduction

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### Background

North American forestry is changing rapidly (Gordon, 1994). In the 1950s and 1960s, the dominant goal of forest managers was to supply timber for commercial interests and, secondarily, to provide habitat for wildlife and facilities for recreationists. With the development of the environmental movement in the 1970s, protection of habitat for ecological reasons became more significant. By the late 1980s, Canadian and U.S. forest managers began to incorporate ideas of "sustainable development" into their planning and practices (Forestry Canada, 1990; Fri, 1991; Swanson & Franklin, 1992). In the 1990s another change emerged, from management by experts to management through a social decision process. Kimmins (1991) characterizes the motivation for this as movement from an expert stage of forest management to a social stage, based upon the need to achieve practices and results the public finds "socially acceptable."

The turn to socially acceptable decisions is the product of public controversy over forest-management objectives, strategies, and technologies during the past two decades. Public concerns are with the health and future of the forests, which are closely related in the public's view to the environment generally. This public scrutiny has generated numerous instances of controversy and highlighted distinct differences between public attitudes and opinions about forest management, and the strategies and procedures favored by forestry professionals.

The goal of simultaneously achieving forest-management objectives and public acceptance of those objectives presents a number of problems. One of the first is to understand the public's points of view, a complex

and difficult task since the public is made up of numerous groups and subgroups. A second and parallel task is to understand the perspective of forest managers whose job it is to provide the forest resources that serve these diverse interests.

The overall goal of public acceptability suggests that communication should take place among these various parties and that decisions should be arrived at through some interactive process. Survey research offers a way to listen to the public and, when properly targeted, to listen to special subgroups. In addition, a properly designed survey can address some of the decision process questions and issues that are important to the respondents. The challenge in designing an effective survey is to include questions that efficiently elicit information on a set of attitudes and opinions that, taken together, explain the preferences for alternative tradeoffs and outcomes.

The use of chemicals, especially herbicides for managing unwanted forest vegetation, has been particularly contentious, the subject of intense public scrutiny. Wagner (1994) identifies the need to develop specific definitions and objective measures of social acceptability so as to move toward integrated forest-vegetation management. Vegetation management, as part of overall forest-management practices, involves a diverse set of technical and social issues that can be studied by comparing public and forestry professionals' points of view. Preferences for vegetation-management approaches reflect personal attitudes about a number of underlying environmental, social, cultural, political, and economic issues, as well as their experiences, including education level, type of work, and preferred recreation.

The design of the survey reported here attempts to understand how these multiple influences might affect people's attitudes and opinions about forest-vegetation management and their preferences for basic management strategies. The survey asked respondents to answer questions about their: (1) environmental values; (2) forest management goals; (3) perceptions of risk from various strategies for vegetation management; (4) trust in forest managers and agencies; (5) and their support or opposition for specific vegetation management strategies. Respondents also provided personal, demographic, and household information.

### **Environmental Values**

Environmental values consist of beliefs about the basic conditions of nature and the proper role of human beings as they interact with the environment. Two contrasting views about nature are the "Cornucopian," which holds that nature is forgiving and can contain all aspects of human impact; and the "Catastrophic," which believes that nature is fragile and capable of suffering irreparable harm from human activities (Cotgrove, 1982; Thompson, Ellis, & Wildavsky, 1990). An intermediate view reflects both these perspectives—for example, that nature is resilient within a range of actions but can be damaged seriously by larger insults. Environmental values address the human psychological, social, and cultural relationships with nature. For example, nature can be seen as a force to be subdued and to produce resources for human use; it can be viewed as providing an important biological and psychological asset in its most natural and original form; or it can be seen as requiring modifications and management to become a source of beauty and sustenance to our larger society. An enthusiasm for science and technology also has been postulated as the source of support for technical and expert-based environmental management strategies.

### **Forest-Management Goals**

The public's forest-management goals tend to be closely tied to their environmental values, perhaps because the public is seldom asked to maximize competing values such as timber-related jobs or production. Complex tradeoffs also exist between the ecological and social goals of forest management. This combination of values creates a multifaceted structure of environmental values, attitudes toward science and management, and

the perceptions of modern technology that underlie expressions of forest-management goals.

### **Perceptions of Risk**

Perceptions of risk in forest management speak to concerns about modern technology. One concern is the potential for mechanized work in the forests to drastically change and shape the forest environment. This is accomplished to allow maximum efficiency in timber production (e.g., clearcutting, thinning) and to provide quick and pervasive transportation access. Second, the use of chemicals, biological agents, and the ability to target the growth (or inhibition) of specific plants also can be perceived as changing the character of the forest environment. While modern technology provides society with new ways to manage forests, it also introduces complex risks, many with uncertain short- and long-term effects. The use of chemicals, especially pesticides, is linked to public perceptions of health and environmental risks. Wagner (1994) points out that forest vegetation management has come to rely heavily on synthetic herbicides, which in turn have become the basis for many public concerns and controversies over the past two decades. This idea that risks to human health and the environment can come from the use of chemical pesticides has been a central tenet of public belief since Carson's publication of *Silent Spring* (1962).

### **Trust in Management**

The role of trust in technology managers has been shown to be extremely important in explaining public perceptions of risk and in understanding public support for management projects and programs (Flynn, Burns, Mertz, & Slovic, 1990; Kasperson, Golding, & Tuler, 1992; Slovic, 1993). Trust can be measured in terms of how the public understands the responsibilities of managers and how they rate their performance. Central to these evaluations are estimates of how well the managers represent the values and goals of the public.

### **Support or Opposition for Specific Vegetation-Management Strategies**

Public acceptability of vegetation management can be measured in terms of support for, or opposition to, specific vegetation-management strategies, projects, and

programs. Public support often reflects underlying environmental values and environmental risk perceptions. Support for vegetation management may differ when comparing the general public<sup>1</sup> to selected publics, such as residents of timber communities and forestry professionals. In addition, support for a specific management practice may be conditioned by circumstances in which need, benefits, or efficiency outweigh the perception of risk attached to the practice. In the design of this study we included both intuitive measures of support or opposition (attitudes and opinions) and, through decision pathway analyses, introduce more complex tradeoffs that might occur before an individual reaches a final decision.

### Administration of the Survey

The Vegetation Management Alternatives Program (VMAP), Ontario Ministry of Natural Resources (OMNR), commissioned Decision Research to design a study of the attitudes and opinions of the general public, special communities, and forestry professionals in Ontario on the subject of forest vegetation management. The study involved the development of a set of closely related survey instruments, which then were used systematically to collect data from these designated populations.

Surveys of the target populations were conducted by Goldfarb Associates, Inc., an Ontario firm that specializes in survey research. Stratified random samples were drawn for three populations: (1) a general population sample of Ontario residents ( $N = 1,500$ ); (2) the residents of Ontario timber dependent communities ( $N = 801$ ); and (3) public and private sector forestry managers and professionals ( $N = 204$ ). Small samples of additional populations were contacted: (4) an experimental group of First Nation respondents ( $N = 30$ ); and, (5) a small experimental set of outdoor interest group members ( $N = 14$ ). All data were collected between September and November, 1994.

For the general sample a total of 1,500 random telephone interviews were completed with Ontario residents 18 years of age and over. The frame for this population was the Statistics Canada Census of Households in Ontario. The surveyed population was stratified by

community size to ensure proportionate representation of all areas in the province.

The geographical location of potential timber-dependent communities was defined as those in northern Ontario. Information on northern Ontario's 374 communities was obtained from the 1993 SIC Manual for Canadian Business and from Census Canada (1991) employment records. One hundred thirty-three of these communities were anywhere from 5% to 66.7% timber-dependent; that is the percentage of a community's businesses and/or employees that are dependent on the timber industry. We separated communities according to low (5% to 9.9%), medium (10% to 19.9%) and high (20% to 66.7%) dependency. Two hundred fifty persons were randomly sampled from highly dependent communities, 251 subjects from moderately dependent communities, and 300 from minimally dependent communities. No significant difference was found between low-, medium-, and high-dependency communities. Thus, references herein to timber-dependent communities include the combined figures from low, medium, and high-dependency communities.

The Ministry of Natural Resources provided the researchers with a list of 308 private and public foresters, selected from all private timber-management companies in Ontario and all OMNR districts. Two hundred fifty-three members of this list were eligible (contact names and addresses were still valid); 204 agreed to complete the survey. Thus, except when otherwise specified, forest professionals refers to OMNR foresters, OMNR biologists, and private-industry foresters. OMNR foresters hold positions as Resource Technicians, Foresters, and Area Supervisors in district offices. Their responsibilities include design and implementation of forest-management plans, including timber management ( $n = 124$ ). OMNR biologists serve as area biologists with primary responsibilities for planning and implementation of wildlife management within the structure of district forest-management plans ( $n = 18$ ). Industry foresters work for private forest-products companies as foresters or managers. Their primary responsibilities include managing crown forest lands under Forest Management Agreements with the Ontario government ( $n = 59$ ).

<sup>1</sup> "General public" refers to the entire Ontario public. See the Appendix for a description of sampling.

First Nation people were sampled from three separate reserves in forested areas in Northern Ontario ( $n = 30$ ).

The small outdoor interest group ( $n = 14$ ) included members from several different organizations active in Ontario forest-resources issues.

The (telephone-administered) questionnaire included 140 questions and took 30 to 40 minutes to complete. A subset of respondents also completed the decisions-pathways survey, which is described in Chapter 8. A complete description of the survey administration, based upon a report from Goldfarb Consultants, is presented in Appendix A. Copies of the survey instruments are also included in Appendix A.

### **Overview of the Report**

Chapters 2 through 6 present a description and analysis of the substantive areas addressed in the study. Chapter 7 presents the results of the multivariate analysis conducted to understand the results of the survey.

This work includes a structural model analysis to test a causal model developed to describe the relationship between environmental values, environmental goals, risk perceptions, and support for vegetation-management practices.

Chapter 8 describes the design and shows the results of a "decision pathways analysis," a technique that was developed specifically for this survey, and which takes respondents through a network of structured questions that simulate a real-world decision about vegetation management. Through the use of Computer Assisted Telephone Interview (CATI) programming, respondents are routed through a unique sequence of questions based upon their responses to prior, related questions.

Overall, this report describes in considerable detail public attitudes and intentions about forest-management practices. The findings in these pages regarding what various publics value, fear, and endorse in the forest provides a rich basis for integrative forest-management policy decisions.

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## Environmental Values

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Environmental values were defined for purposes of this study as beliefs about the basic conditions of nature and the proper role of human beings as they interact with the environment. These beliefs span a wide range and incorporate ideas about the underlying conditions of nature, its importance to human life, the ability of humans to enhance or harm the environment, and the moral, ethical, and cultural constraints that should apply to human activities. A number of social scientists have argued that environmental values are important determinants for how people interpret the actions and plans of institutions, which are responsible for managing the human-nature relationship.

In this chapter we take a broad look at environmental values as expressed by the general public<sup>1</sup> and members of timber-dependent communities in Ontario. These two samples are compared to one another in terms of demographic differences that include age, gender, income, education, and region of residence. Environmental values also are examined in terms of the three smaller, special population samples: forest professionals, outdoor interest group members, and Native or Aboriginal people.

This material provides an intellectual or ideational context in which to understand the subsequent chapters pertaining to forest policy goals, support for specific management practices, and perceptions of environmental risks. Many of the environmental values discussed in this chapter will be reconsidered in later chapters as

additional results concerning forest-management goals and practices are introduced.

### 2.1. Environmental Values: General Public

Generally speaking, our survey results strongly support the conclusion that people in Ontario are very concerned about risks to the environment. Eighty-five percent of the Ontario respondents agreed or strongly agreed that they pay particular attention to environmental issues. Ninety-six percent agreed or strongly agreed that environmental problems are extremely important to them. In addition, 83% of respondents reported that they are bothered by changes in the natural world.

Substantial support was granted to fervent environmental values, which once might have belonged only to a small, extreme group of provincial residents. For example, 87% of respondents believed in species egalitarianism and agreed that all species, including humans, have “an equal right to coexist.” In addition, 67% of respondents defined themselves as attracted to the spiritual qualities in nature.

This pervasive concern for nature was not based on respondents’ immediate surroundings or their communities. Only 44% agreed that there are serious environmental problems where they live. Nonetheless, people in Ontario felt responsible for the environment and reported a willingness to reduce their living standards to help ensure that nature is not harmed (68% agreement).

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<sup>1</sup> “General public” refers to the entire Ontario public. See the Appendix for a description of sampling.

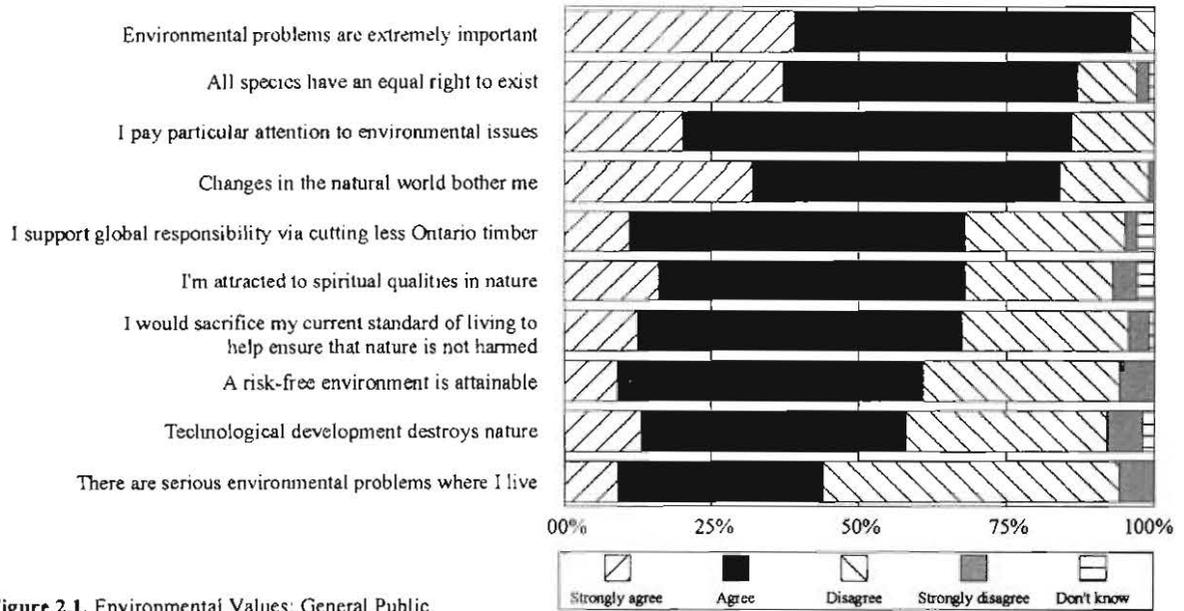


Figure 2.1. Environmental Values: General Public

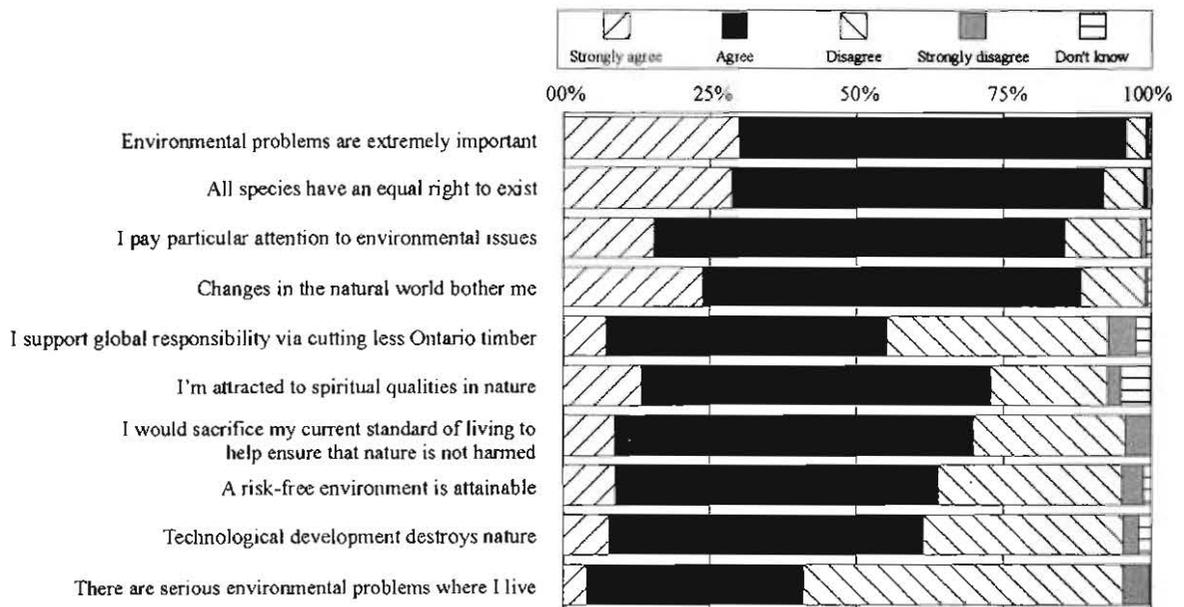


Figure 2.2. Environmental Values: Timber-Dependent Communities

This same high percentage of respondents (68%) thought Ontario should cut less timber to fulfill its global responsibilities toward the environment.

**2.2. Environmental Values: Timber-Dependent Communities**

Stereotypical assumptions about the differences between urban and rural residents predict that people in

timber communities will be less supportive of environmental values than is the general public. This does not appear to be the case. Our survey results show that concern for environmental issues in timber-dependent communities was often greater than for the Ontario general population. As seen in Figure 2.2, more people in timber communities (92%) than in the general public sample agreed with the right of all species to exist. Tim-

ber-community residents also were more concerned about changes in the natural world (by a margin of 5%) and were more attracted (also by a margin of 5%) to nature's spiritual qualities.<sup>1</sup>

The sole exception to timber-community residents' endorsement of environmental values occurred when considering the position most likely to affect them directly: the reduction of timber cutting in Ontario as an act of global responsibility (see Figure 2.2). On this item, timber-community residents were decidedly less supportive than the general public; 55% agreed with this idea compared to the 68% agreement expressed by the general public. This result suggests the importance of realistically facing tradeoffs when making management decisions of this type. It is easy to state support for positions as long as no adverse consequences are involved, but this support may decline once tradeoffs between the costs and benefits of management options are acknowledged. Still, a majority of the respondents in timber-dependent communities supported the statement, indicating a substantial willingness to protect nature and a general recognition of the multiple benefits derived from forests.

### 2.3. The Economy and the Environment

The strong support for environmental concerns expressed by both the timber and general samples was not always ideologically consistent with attitudes about the relationship between nature and the economy. Ontario residents are both pragmatic and idealistic. This apparent conflict between environmental ideals and economic pragmatism could be a potential source of difficulty for forest policy makers.

When asked about economic growth as it relates to natural resources, respondents in Ontario supported positions that appeared to conflict with each other. For example, 53% of public respondents agreed that economic growth will lead to a serious loss of natural resources. At the same time, 82% agreed that economic growth is necessary to improve one's quality of life, and 73% agreed that the natural-resource industries in the province are the basis of a strong economy. When these data are examined at the individual level (vs. aggregate), cross tabulations show that the same individuals really did support these apparently contradictory positions.

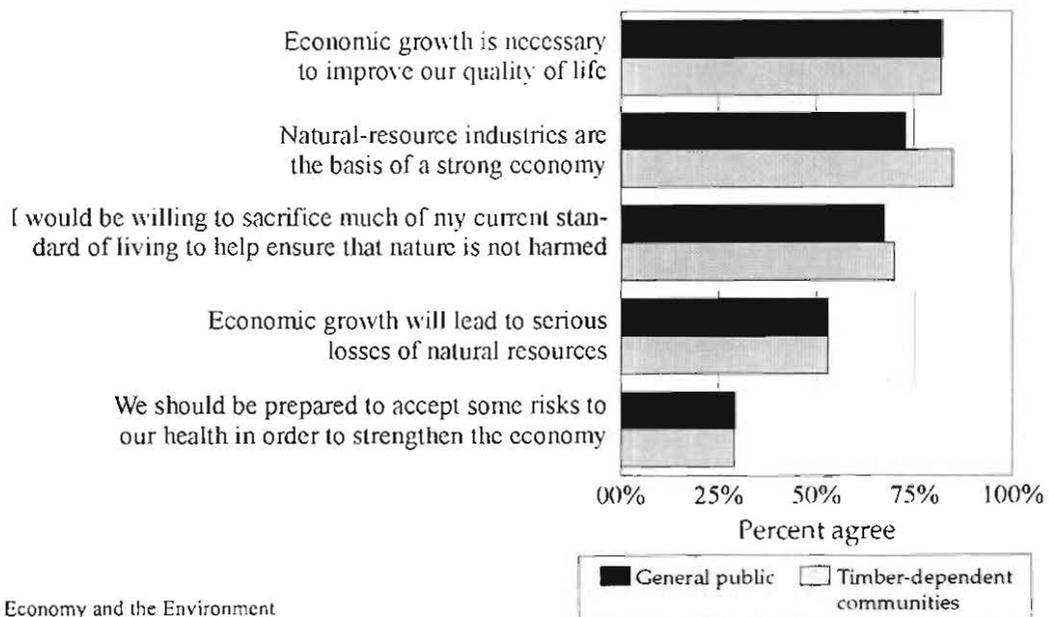


Figure 2.3. The Economy and the Environment

<sup>1</sup>For samples of the size used in this study, statistical significance generally occurs with differences as small as 5% ( $p < .05$ ), and when differences exceed 8% the probability of such a result occurring by chance is usually less than .001.

Similar contradictions were present among subjects from timber-dependent communities. Here, just as in the general public sample, 53% of respondents agreed that economic growth will lead to a loss of natural resources and 82% agreed that economic growth is necessary to improve the quality of one's life. The finding that 85% of timber-dependent residents (versus 73% of the general sample) believed that natural resource industries are the basis of a strong economy is not surprising in and of itself. These same timber respondents, however, also were more supportive of species egalitarianism, more bothered by changes in the natural world, and more likely to be attracted to the spiritual qualities in nature.

Whatever dissonance Ontario residents experience regarding the use and role of natural resources, there is one area in which there is little confusion—human health. When asked if we should be prepared to accept some risk to our health in order to strengthen the economy, 70% of both the general and timber-dependent community samples disagreed.

#### **2.4. Demographic Comparisons of Environmental Values**

Any survey, be it of timber-dependent communities or the Ontario public, mutes (by averaging) variations based on social and/or economic differences. The following discussion examines a subset of environmental values, with specific attention to more subtle differentiations based on geographic residence, age, gender, income, and education.

At the outset, we note that for many of these environmental values the level of general support in both the general sample and the timber-dependent communities sample is extremely high. For instance, 96% of the people interviewed in both surveys agreed about the importance of environmental problems. Eighty-seven percent (general sample) and 92% (timber-dependent communities sample) agreed with the right of all species to coexist with humans. Because of this widespread support, it is more useful to look at responses expressing strong agreement, rather than (collapsed) general agreement, with these values. Strong agreement was usually only a small fraction of the general agreement and may represent those who hold a deeper commitment to these environmental values.

However, one caveat should be kept in mind: there seems to be a tendency for people in the general sample

(vs. those in timber-dependent communities) to express strong support to almost any question. This is true even though levels of general support may be as high, or higher, in the timber communities. This difference in strongly supportive responses may represent a cultural reluctance in timber communities to hold extreme views, or it may provide evidence of a rural lifestyle characterized by understatement and reserve. Alternatively, this difference may represent a real distinction in the strength of opinion on most issues. In general, it is probably a good idea to not read too much into small differences among the strong-support responses of the general and timber samples. Instead, it makes sense to examine the demographics of each group and look for similar or dissimilar patterns.

For ease of presentation, the following sections of this chapter use only a subset of the environmental questions described above and presented in Figure 2.1. The six values used for the following demographic comparisons include only those items that specifically represent an environmental value, and set aside the four questions that relate to a general concern for the environment or to a specific case (such as the cutting of Ontario's timber or local environmental problems).

#### **Regional Differences in Environmental Values**

Given the large geographic and population differences extant in Ontario, it is often assumed that attitudes toward the environment vary according to one's location in the province. The assumption frequently holds true, with substantial differences (spreads of ten or more percentage points) observed across regions. Yet many of these variations occur only on individual items and the differences are not always in the same direction. Thus, a consistent logic or pattern of environmental attitudes is not evident across regions.

What was usually true was that Southwest and Northwest residents exhibited strong differences in environmental values. For example, Toronto-area respondents displayed substantial support for species egalitarianism (perhaps a more abstract concept for urban dwellers). Hamilton/Niagara and Toronto residents both perceive their respective regions as having serious environmental problems, a perception that is consistent with respondents' high scores on questions such as "it bothers me that the world's natural environment is changing so quickly." However, no one region dis-

	Southwest (n = 200)	Hamilton/ Niagara (n = 200)	Toronto (n = 400)	Central (n = 200)	East (n = 200)	Northeast (n = 150)	Northwest (n = 150)
It bothers me that the world's natural environment is changing so quickly	28.5%	37.1%	33.4%	32.4%	26.3%	26.6%	35.1%
I would be willing to sacrifice much of my current standard of living to help ensure that nature is not harmed	11.7	13.9	11.8	15.8	8.8	14.4	13.5
I am attracted to the spiritual qualities inherent in the natural world	14.7	14.6	18.1	16.1	13.8	10.5	17.0
All species, including humans, have an equal right to co-exist on the planet	29.7	30.3	39.4	39.8	36.9	33.4	42.4
Technological development is destroying nature	13.9	17.3	11.7	13.1	10.1	12.3	19.0
There are serious environmental problems where I live	9.0	15.2	11.3	4.3	5.9	1.9	8.6

Table 2.1. Regional Differences in Environmental Values (Percent Strong Agreement)

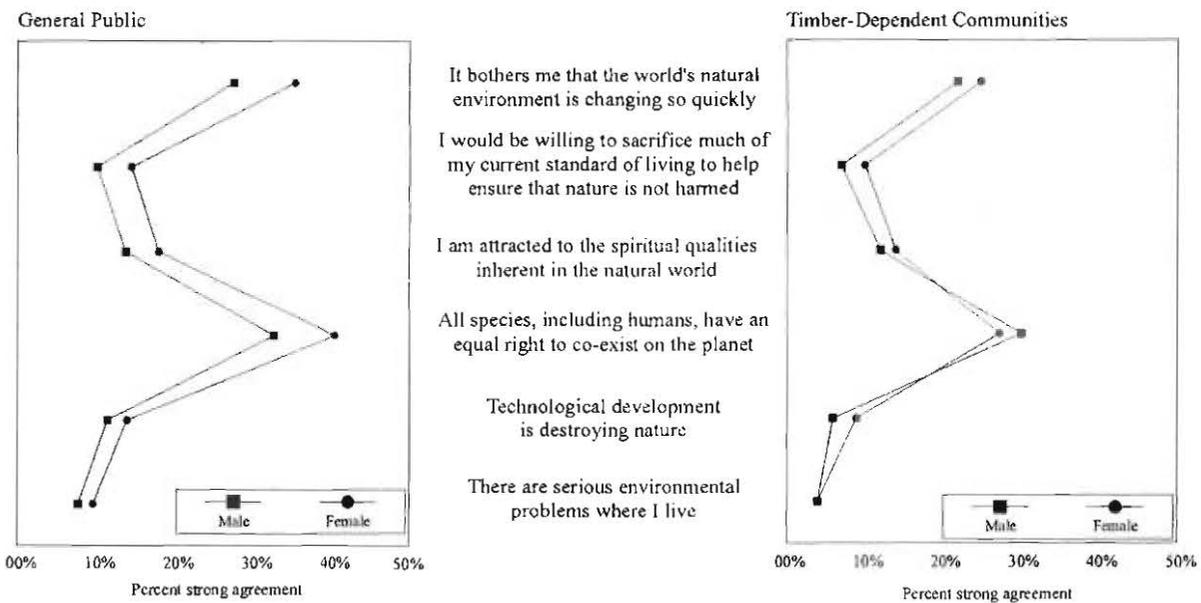


Figure 2.4. Gender and Environmental Values (General Public and Timber-Dependent Communities)

played a consistent overall “pro” or “anti” environmental pattern.

Residents of the Northwest—the most heavily forested region—displayed the one relatively consistent pattern. They tended to be near the top on environmental values with the exception of their lower willingness to sacrifice their standard of living to save the environment. Perceptions of environmental problems in their own back yard (“where I live”) were also relatively low. In contrast, residents of the heavily industrialized

Hamilton/Niagara region showed the highest scores on perceived severity of local environmental problems, the destructiveness of technology, and the degree of reported distress regarding changes in the natural world.

**Gender and Environmental Values**

Previous research has found that women tend to express greater concern for environmental problems than do men (Borden & Francis, 1978; Flynn, Slovic, & Mertz, 1994; McStay & Dunlap, 1983).

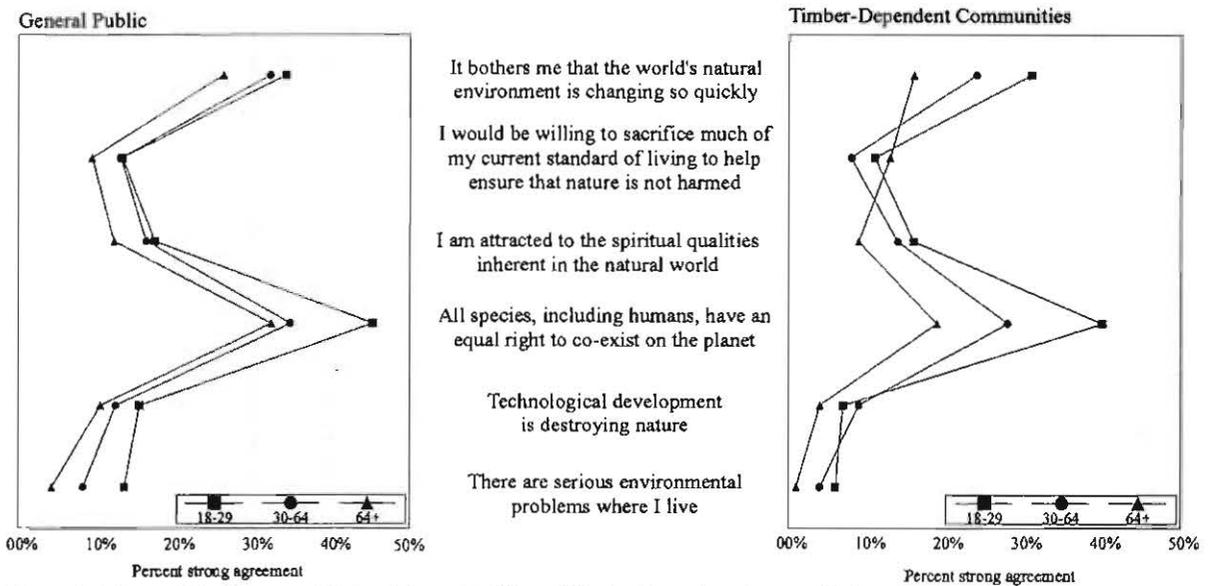


Figure 2.5. Age and Environmental Values (General Public and Timber-Dependent Communities)

Responses to questions in the general sample generally follow this pattern. In the Ontario case, differences between men and women regarding environmental concerns reach, at their highest, about nine percentage points: 35% of women strongly agreed they are bothered by changes in the natural world, compared to 26% of men.

In timber communities this same basic pattern holds true. For four of the six environmental values, a higher percentage of women reported strong agreement with the survey questions. On the fifth item, species egalitarianism, both men and women had similar scores (3% more men registered strong support than women). On the sixth item, the perception of environmental problems where respondents live, men and women had similar scores (less than 1% difference). In general, timber-community subjects were more likely to give strong support to environmental values than were participants from the general public. There was less differentiation in the opinions of men and women living in timber-dependent communities.

**Age and Environmental Values**

Some variation was observed when comparing environmental values across three age categories. Younger subjects were the most likely to strongly endorse environmental values and older participants were the least

likely. The spread, in the most extreme case (species egalitarianism), is about 15 percentage points.

This same pattern exists in the timber-dependent communities, although not as consistently. Here, the youngest age group showed the highest percentage of strong agreement on four of the six questions that we asked. Additionally, the gap that separates responses of strong agreement from the youngest and oldest groups is generally wider than the gap found in the public sample. The largest age-based difference occurred in response to species egalitarianism; 21% more support emerged from the youngest group when compared to support among older respondents.

**Income and Environmental Values**

For all six of the public survey questions regarding environmental values, income was directly related to the strength of participants' responses: the lower the income level, the more likely one is to agree strongly with pro-environment views of nature. The greatest difference between those with low incomes and those with high incomes is 14%, coinciding with the belief that technological development is destroying nature. In addition, those with higher incomes were considerably less likely to sacrifice their standard of living to benefit nature; the difference here is about 12%.

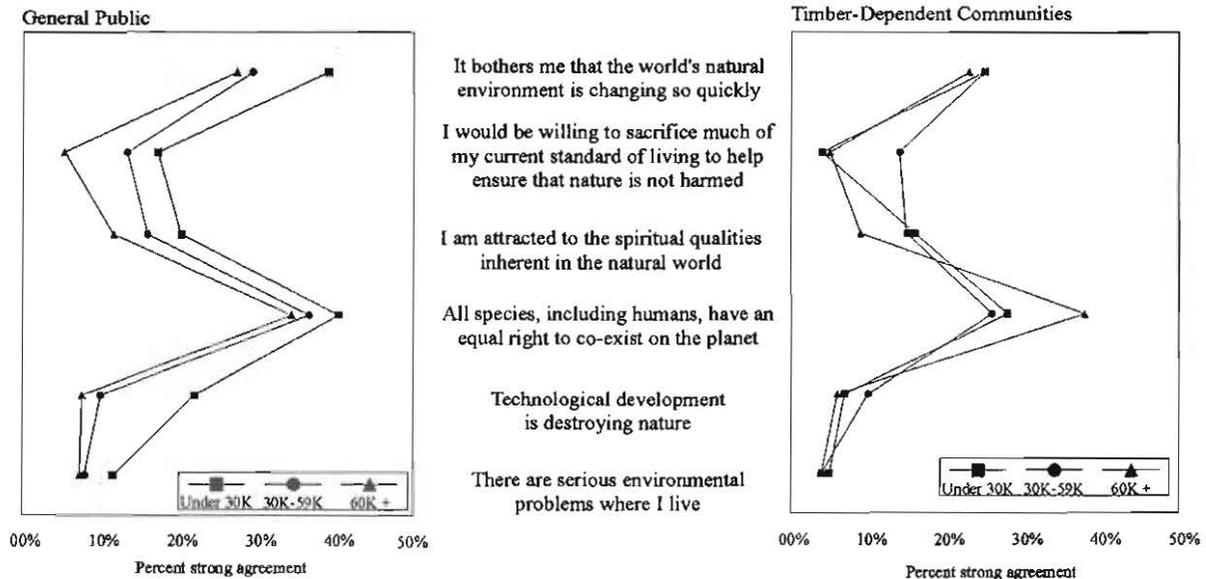


Figure 2.6. Income and Environmental Values (General Public and Timber-Dependent Communities)

These results are interesting and, at least initially, counterintuitive in the sense that environmental protection is often regarded as a “luxury good,” something that only the more well-to-do can afford. These results suggest a different picture and, combined with the age differences reported earlier, reinforce the finding that those with the strongest environmental values are likely to be both young and (relatively) less affluent.

In timber-dependent communities this pattern was not quite as reliable. Low income earners reflected the highest level of strong support for three of the six environmental values. The middle income level had the highest level of strong support for two values, while high income earners showed the strongest support (by a 10% margin) for species egalitarianism.

### Education and Environmental Values

It is hard to find a consistent relationship between the educational levels of the public and their expressed environmental values. Overall, college graduates were less likely to hold strong environmental values than were people with high school educations (or less) or people who have attended some college. On four of the six environmental value questions, those with some college education were most likely to express strong

agreement. For the other two questions, the highest percentage of strong agreement was held by those with no more than a high school education. However, the overall differences correlated with education are generally small: the largest difference between any two educational groups was 8%, and on three questions the difference was 5% or less.

Conversely, in timber-dependent communities college education was directly related to strength of support for environmental values. On four of the six questions, the highest percentage of strong agreement was held by those with college degrees. On the other two questions, those with college degrees were second in strong agreement, only one and two percentage points away from the educational group with the strongest agreement. The other two educational groups in the timber-community sample did not convey any discernable pattern. Again, differences between all educational groups were generally small.

### Forest Professionals and Environmental Values

In addition to the general public and timber-community samples, information was gathered from a sample of forest professionals ( $N = 204$ ), from members of

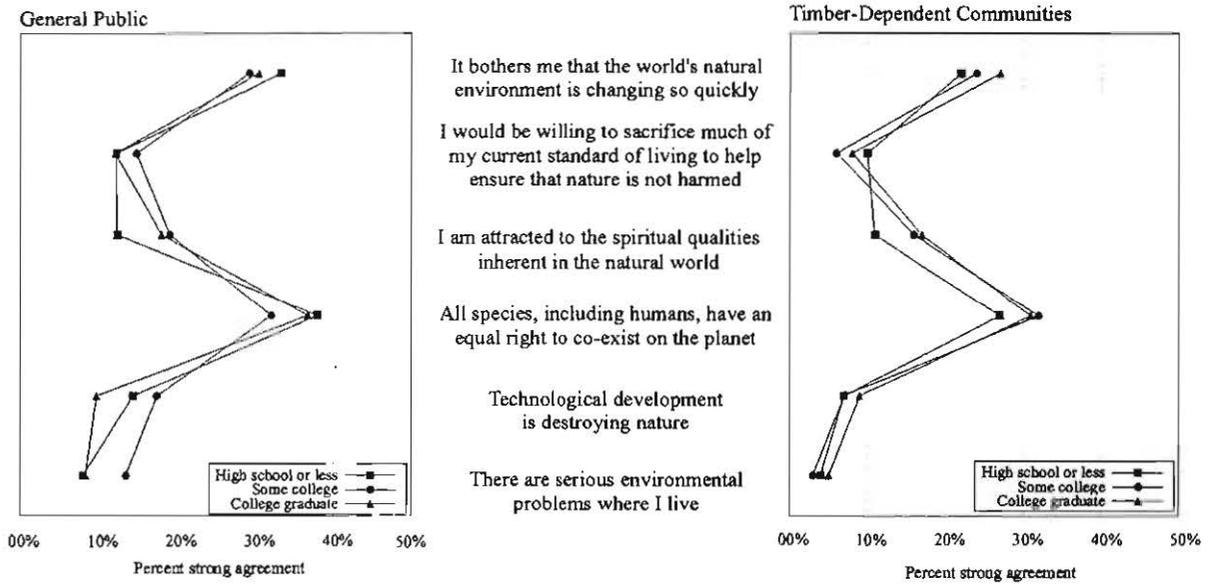


Figure 2.7. Education and Environmental Values (General Public and Timber-Dependent Communities)

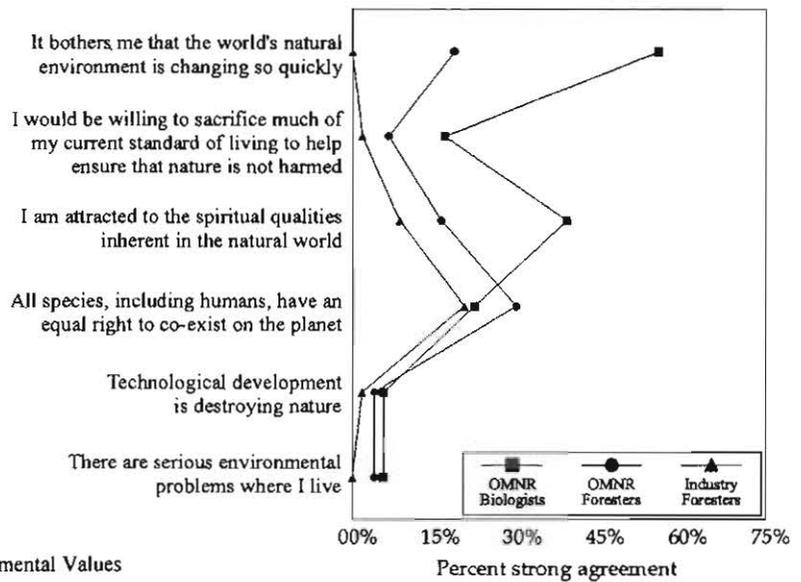


Figure 2.8. Forest Professionals and Environmental Values

environmental organizations ( $N = 14$ ) and from three Aboriginal groups from northern Ontario ( $N = 30$ ). (A more detailed description of this group is provided in the introduction.) The Aboriginal and outdoor interest group members were not randomly sampled and, consequently, no generalization can be made from these groups to a larger population. However, this information is useful, in the way that results from a focus group

are, as indicating the possible direction a larger sample might take.

Forest professionals endorsed some environmental values more strongly than either the general public or residents of timber communities. However, the pattern was not uniform across all categories; all forest professionals did not hold the same values. OMNR biologists, as

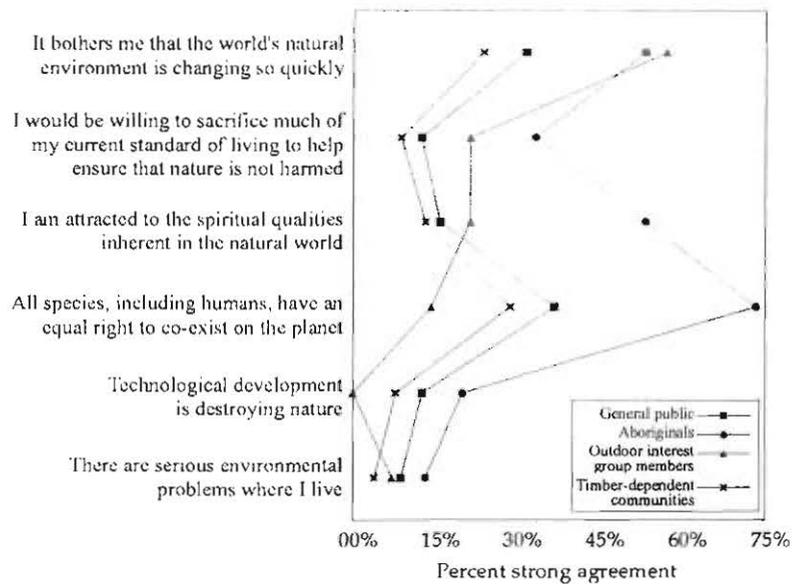


Figure 2.9. Environmental Values for General Public, Aboriginals, Outdoor Interest Group Members, and Timber-Dependent Communities

a group, demonstrated the strongest environmental positions. For example, 55% of biologists said they were strongly concerned about changes in the natural world. They expressed the strongest agreement with four of the six environmental-values questions and were tied on a fifth. The exception was species egalitarianism, where OMNR foresters registered stronger support.

Industry foresters, in contrast, recorded less support for environmental values than did biologists, OMNR foresters, or the general public. For two of the values (concern over changes in the natural world, and seeing environmental problems where they live), no private sector foresters agreed strongly. On two others (sacrificing one's standard of living to benefit nature, and the belief that technology is harming nature), only one industry forester agreed strongly.

The large differences observed between forest biologists and other foresters, especially industry foresters, have implications for forest-management practices in Ontario. These results suggest fundamental disagreements about priorities between those managing nontimber resources (represented by OMNR biologists) and those managing the timber resource (represented by OMNR and industry foresters).

**Environmental Values: Aboriginal People and Outdoor Interest Group Members**

In general, Aboriginals maintained a consistent pattern of strong environmental support. They were more emphatic about supporting environmental protection than were the general public, timber-community, forest professionals, or outdoor interest group members. On most environmental-values questions, their responses also were stronger than the biologists' discussed above. For example, over 50% of the Aboriginal sample strongly agreed with the statement: "I am attracted to spiritual qualities inherent in the natural world" (vs. 21% of outdoor interest group members and 39% of biologists). Nearly 75% of the Aboriginal sample agreed strongly with the idea of species egalitarianism (vs. 14% of outdoor interest group members), and 21% agreed strongly that there are spiritual qualities inherent in the natural world.

Outdoor interest group members do not appear to stand out when compared to these other samples, although this could be a product of their small sample size. They differed significantly from the general public sample on only two responses. Thirty-two percent of the general public agreed strongly that they were bothered by

changes in the natural world, whereas 57% of outdoor interest group members agreed strongly with this statement. This result is not unexpected; it may indicate why respondents became members of an outdoor interest group in the first place. On the other hand, outdoor interest group members were much less likely to voice strong agreement (14%) with the concept of species egalitarianism than was the general public (37%) and not one of the 14 outdoor interest group members strongly agreed with the idea that technological development was destroying nature.

These findings portray members of outdoor interest groups as having views similar to the general public. This finding reemphasizes the general strength of the public's support for environmental protection. Other questions included in the survey corroborate the public support of "green" behaviors. For example, 87% of the general public reported an avoidance of consumer products known to harm the environment, and 40% of the public have voted for candidates based on their environmental positions.

## 2.5. Conclusion

The people of Ontario place a very high value on the environment and its protection. An overwhelming majority of the people surveyed, both from the general public and from timber-dependent communities, agreed or strongly agreed that environmental problems are extremely important. Their concern for the environment did not stop with generalizations about the importance of the environment, but embraced domains that were once considered the province of committed environmentalists. Among such beliefs are the idea that all species have an **equal** right to exist and the belief in nature's **spiritual** dimension.

Although support for environmental values was high in Ontario, that support was not uniform across all groups of people. In particular, age, income, and gender influence how people view the environment; women, the young, and less affluent respondents were more likely to hold strong environmental values. Finally, and perhaps most interestingly, strong support for the environment did **not** translate into opposition to economic development or natural resource industries. This combination of idealism about the environment and pragmatism about economics presents forest managers with a unique set of challenges.

# 3

## Forest-Management Goals

This chapter covers two fundamental aspects of forest management. We first examine the Ontario public's priorities regarding forest management: what should forest managers in the province attempt to accomplish? We then ask about the kinds of forest intervention that the Ontario public might support and compare those opinions across demographic groups. In later chapters we discuss specific vegetation-management practices; here, the focus is on general objectives for forest management in Ontario.

### 3.1. Forest Management and Attitudes Toward Intervention

The Ontario public was asked about forest-management priorities through a series of questions designed to identify their primary goals for forest management. Responses showed strong support for the environment and, secondarily, a recognition that maintenance of a healthy wood-products industry also is important. When asked if the first priority for forest management

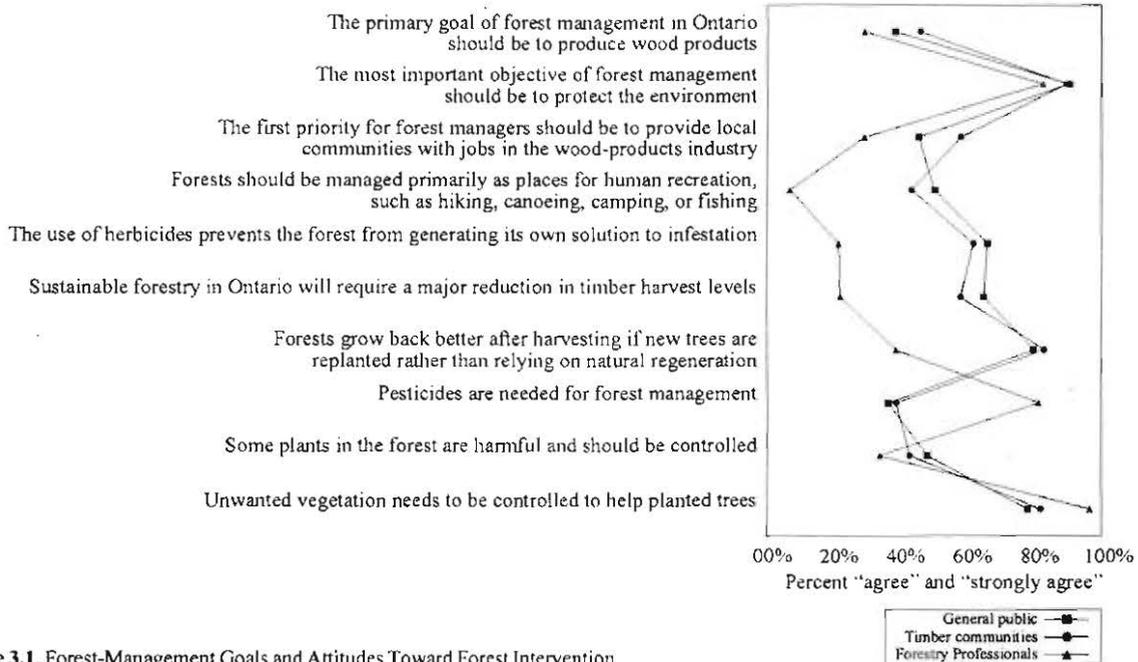


Figure 3.1. Forest-Management Goals and Attitudes Toward Forest Intervention

should be to protect the environment, 91% of participants in the general-public<sup>1</sup> sample agreed. When asked the same question about priorities regarding jobs, recreation and wood products, a significantly lower percentage of respondents agreed: 50% of those surveyed supported recreation as the primary goal of forest management, 46% supported jobs, and 39% supported wood-products production. Thus, all four of these uses of the forest received substantial support. However, these questions were painless for participants to answer in the sense that no tradeoffs or conflicts were addressed among management objectives. We therefore returned to this topic area later in the survey, asking participants to review their values and to directly address tradeoffs across management goals in a more realistic manner.

In timber communities, protecting the environment was seen as the most important objective for forest management; 90% of the people surveyed agreed with this goal. However, two economically-oriented goals (providing jobs and producing wood) also were seen as important by many people. Job provision was seen as a first priority by 58% of people in timber communities, 12% higher than in the general public. Wood production was seen as a primary goal by 46% of responses, vs. 39% in the general public. Recreation was not as important a goal for people in timber-dependent communities; agreement with this objective was lower (44% vs. 50%) than in responses from the general public. These responses fit well with intuition. It is not surprising that residents of timber communities viewed jobs as a cornerstone of forest-management policies and that recreational aspects were considered somewhat less important than for the general public.

All three groups of forestry professionals generally agreed with respondents from the general sample about specific forest-management goals. Environmental protection, again the clear priority, gathered support from 80% of respondents. Professional foresters also placed a priority on both jobs and wood production, although private-sector foresters supported (“agree” and “strongly agree”) wood production over jobs (90% vs. 46%). The position of private-sector foresters was thus opposite to that held by residents of timber-dependent communities, who expressed greater support for jobs than for wood production.

<sup>1</sup>“General public” refers to the entire Ontario public. See the Appendix for a description of sampling.

Forest professionals differed from the general public with regard to the importance of managing forests for recreation. The concept was supported by just over 50% of the general public; it was solidly opposed by all three groups of forest professionals. Only 7% of forest professionals endorsed recreation as the primary goal of forest management.

The public recorded strong support for protecting the environment and substantial support for active forest management. When asked if forest managers should control unwanted vegetation, 78% of the general-public participants agreed. Support was also high for some specific aspects of forest intervention. For example, 80% of respondents agreed that forests will grow back better after harvesting if trees are replanted, as opposed to relying on natural regeneration. On a more fundamental question, whether harmful plants exist and need to be controlled, about one-half (48%) of general-public respondents agreed that harmful plants should be controlled.

Although generally pragmatic in their support of forest management, the people of Ontario did resist some management practices. This is particularly true of pesticide use. Only 36% of the general public agreed that pesticides were necessary for forest management. Two-thirds thought that herbicides prevented the forest from generating its own solution to infestation. In addition to this resistance to pesticides, the people of Ontario were concerned about timber-removal practices; 65% agreed that sustainable forestry in Ontario would require a major reduction in the level of timber harvesting.

The views of residents of Ontario’s timber-dependent communities on forest intervention varied only slightly from those of the general public. The largest (but still minor) difference is the 5% decline in support for the idea that harmful plants need to be controlled.

On the subject of forest intervention, forestry professionals almost always differed from both the general public and residents of timber-dependent communities. Forest professionals were virtually unanimous (97%) in their support for the control of unwanted vegetation. Forestry professionals also strongly supported the use of pesticides as tools of forest management; 79% opposed the idea of allowing the forest to gener-

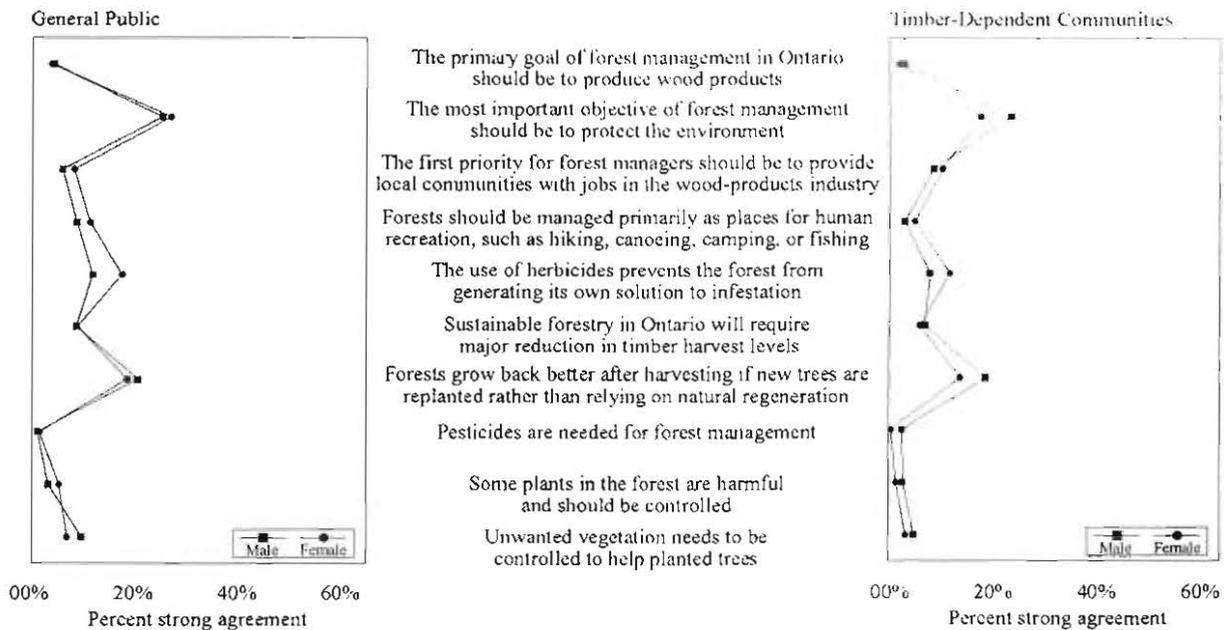


Figure 3.2. Gender and Forestry Goals (General Public and Timber-Dependent Communities)

ate its own solution to infestation; 81% supported the idea that pesticides are needed for forest management. On the other hand, forest professionals did not particularly think of plants as harmful and in need of control, or think of replanting as superior to natural regeneration. Less than 40% supported either of these ideas. Finally, most forestry professionals were satisfied with current timber-harvest levels, only 22% thought that levels needed to be reduced for sustainable forestry.

### 3.2. Demographic Variables and Support for Forestry Goals and Intervention

#### a) Gender, Forestry Goals, and Intervention

Men and women in the public sample generally responded the same to general forestry practices. The only substantive difference between men and women involved the use of herbicides, with women more likely than men to agree that herbicides can interfere with the forests' ability to generate solutions to infestation problems.

Responses by men and women in timber communities were similar to those of the general public including little evidence of gender differentiation. However,

women in timber communities were less likely than women in the general-public sample to view protection of the environment as the primary goal of forest management: 18% of women in timber communities, as compared to 26% of women from the general public, strongly agreed with making environmental protection the primary goal of forest management.

#### b) Age, Forestry Goals, and Intervention

When public support for forestry practices is examined by age group, a familiar pattern repeats itself: younger respondents were more likely to oppose forest management, **except** when managing for environmental protection. The only deviation from this pattern coincided with job creation as a management priority, with the youngest age group slightly (and logically) more supportive of that goal than the middle-age group.

In timber communities, the younger respondents were more supportive of environmental positions and more opposed to management's production initiatives. However, there were three exceptions: in timber communities the youngest age group was most supportive of job creation as a management priority; was almost as concerned about herbicide risks as was the second age group; and was twice as supportive as the oldest age

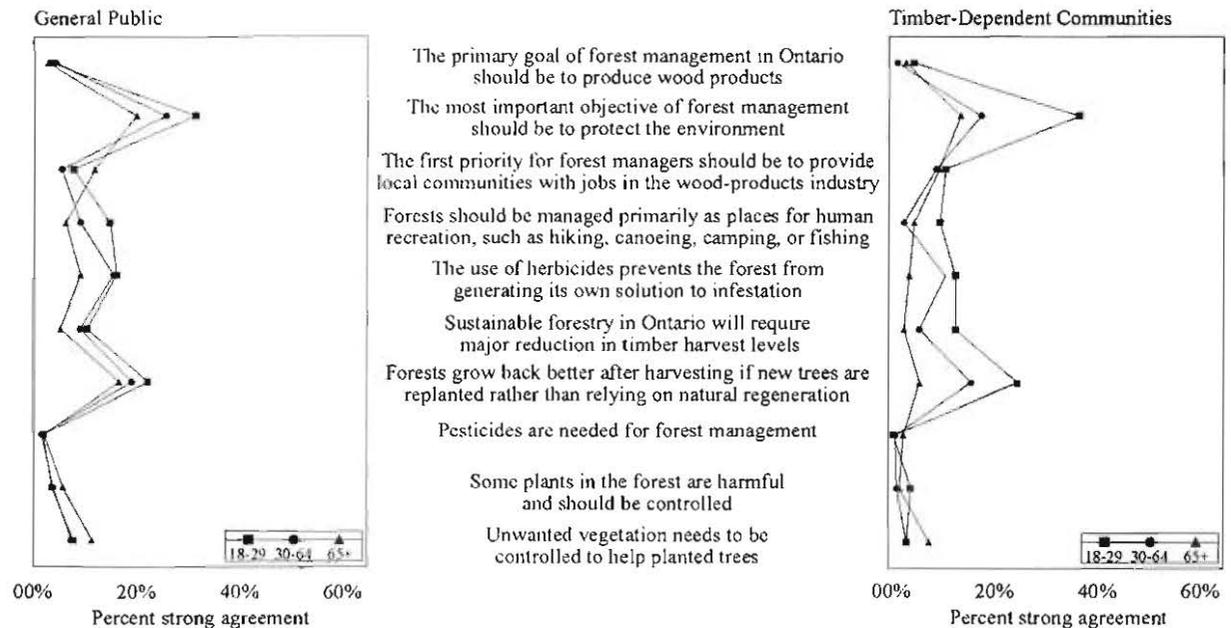


Figure 3.3. Age and Forestry Goals (General Public and Timber-Dependent Communities)

group of the idea that some plants in the forest are harmful and need to be controlled. In addition, all age groups in timber communities tended to believe that herbicides are less risky than does the general public.

### c) Income, Forestry Goals, and Intervention

In general, income differences among participants in the public survey have some effect on support for forest-management practices. However, this effect is not simple. People with low incomes were more supportive of environmental issues, such as management of the forests for environmental protection, and resistance to herbicides. At the same time, low-income respondents were more supportive of practices tied to jobs. People with low incomes were more supportive of managing forests for jobs, of the idea of controlling unwanted vegetation to help planted trees, and of the idea that some plants in the forest are harmful and need to be controlled. Presumably, this relationship between low income and support for a narrow range of specific labor-intensive management ideas was related to this group's likely employment needs.

In the timber communities income played a less decisive role, particularly between low-income and middle-

income respondents. The only income differences were between high-income respondents and everyone else. High-income respondents are both more supportive of pragmatic objectives, such as jobs and forest replanting, and of environmental objectives, such as resistance to herbicide use and support for timber-harvest reductions. In one instance, the issue of reducing timber harvests in Ontario, an appreciable difference (based on income) was found, with an 8% spread between those with low and high incomes, with higher-income participants more supportive of harvest reduction.

### d) Education, Forestry Goals, and Intervention

Educational attainment did not predict public support for forestry practices and goals. Among the three educational groups we selected for detailed investigation, the largest difference in the level of strong support for any forestry goal (providing local communities with jobs) was only five percent. For the other nine items, all differences were three percent or less.

In timber communities, education did a better job of predicting support for forestry practices and goals. Oddly, people with **some** college education were dis-

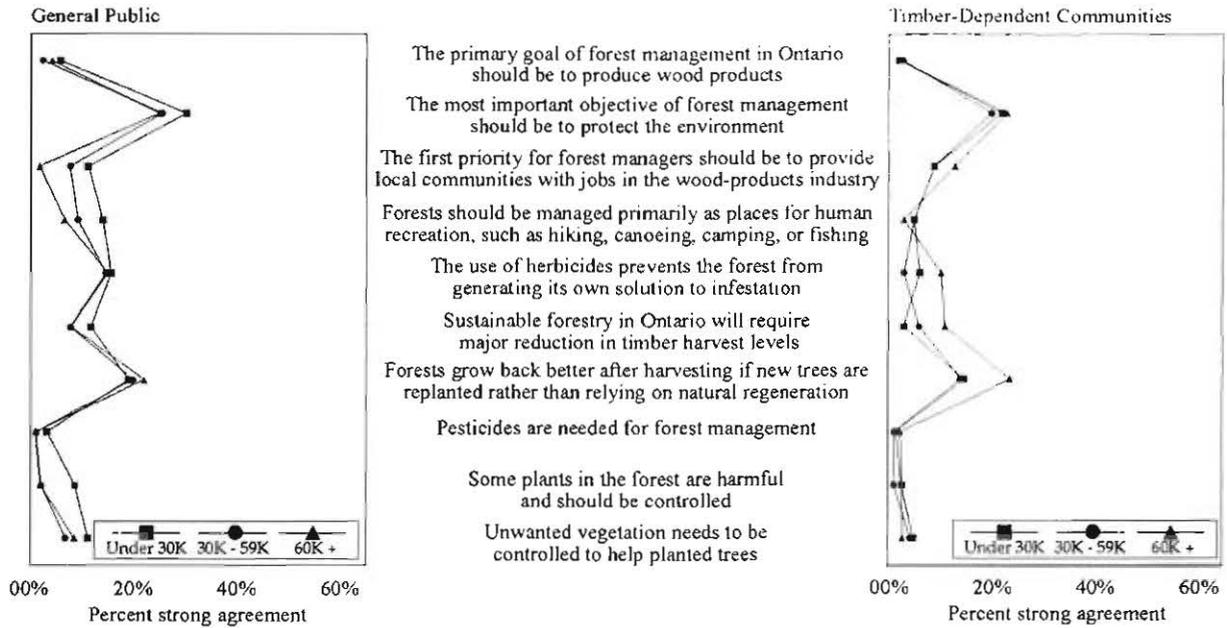


Figure 3.4. Income and Forestry Goals (General Public and Timber-Dependent Communities)

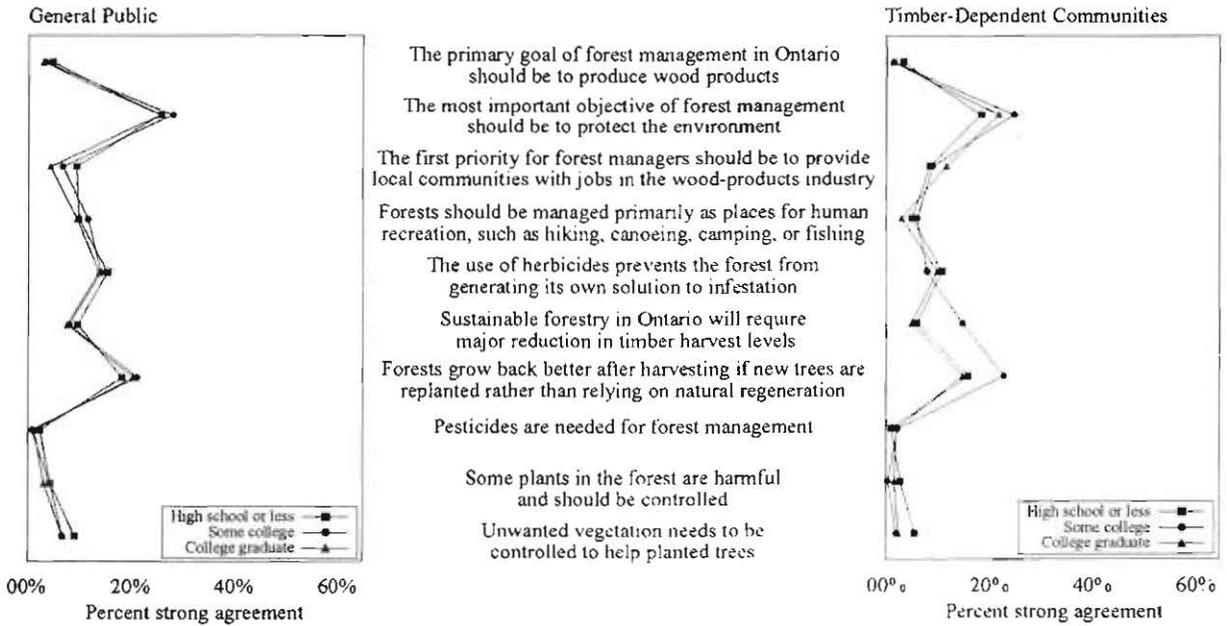


Figure 3.5. Education and Forestry Goals (General Public and Timber-Dependent Communities)

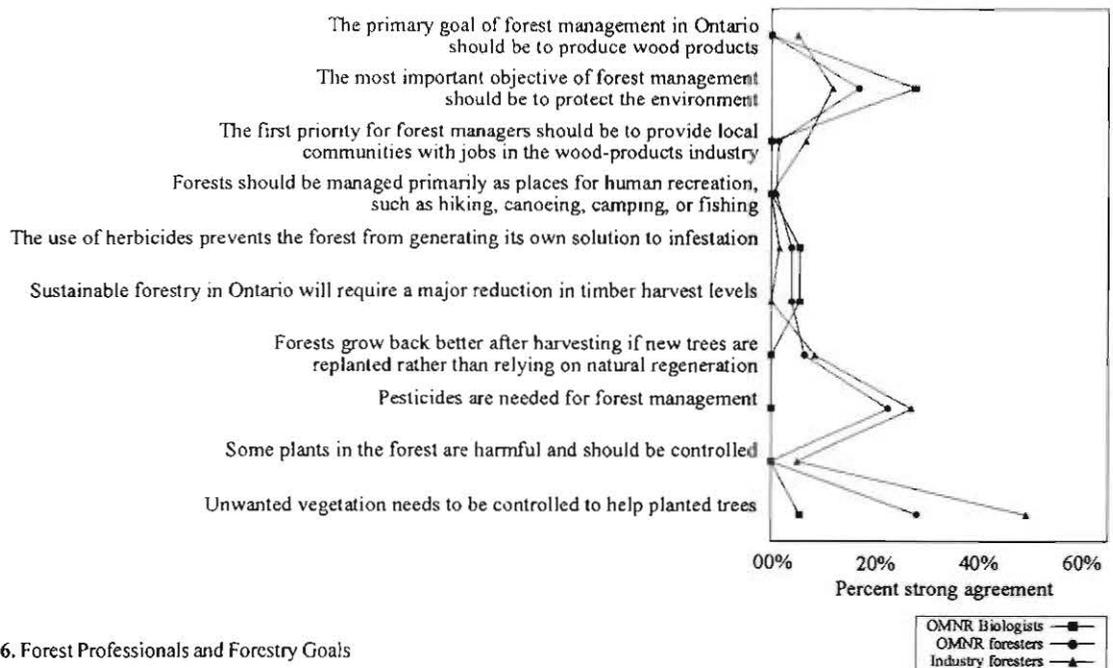


Figure 3.6. Forest Professionals and Forestry Goals

tinguishable from the other two educational levels. On six of the ten items used to measure forestry priorities, people with some college education took the strongest environmental position. This group was not supportive of job creation in forest management or of the production of wood products. Those timber-community residents with an educational level of high school or less, as well as those with college degrees, were less likely to support environmental protection and more likely to support job creation and other goals favoring a strong timber industry.

#### ***e) Forestry Professionals, Forestry Goals, and Intervention***

Biologists again recorded a response pattern that was distinct from both government and industry foresters, strongly supporting pro-environmental forestry practices and showing little support for industry jobs or timber production. These results are similar to those discussed in the previous chapter, where biologists frequently held stronger positions regarding environmental values than did the general public or timber-community residents. For example, nearly 30% of biologists strongly believed that forest management should emphasize environmental protection, compared to only 17% for OMNR foresters and 12% for industry foresters. Similarly, only 6% of biologists strongly agreed

that unwanted vegetation needed to be controlled to help planted trees, compared to 28% of OMNR foresters and 50% of private foresters.

Foresters employed by private industry took the strongest stands in favor of timber production and timber harvesting.

#### ***f) Aboriginals, Outdoor Interest Group Members, and Forestry Goals***

Among all groups surveyed, Aboriginals portrayed the greatest degree of support for forest practices that emphasize environmental protection. In chapter 2 we saw that Aboriginals held the strongest pro-environmental value positions; the same is true of forest-management practices and goals. In many cases, Aboriginals were more than 15 percentage points higher than any other group in support for environmental positions and in opposition to the use of herbicides. The few exceptions to this include: management of the forests for employment (Aboriginals were more supportive of this goal than any other group, suggestive of a strong need for additional employment opportunities); managing the forests for wood production, where Aboriginals were almost as supportive as the general public; and support for the idea of controlling unwanted vegetation, where Aboriginals were more supportive than resi-

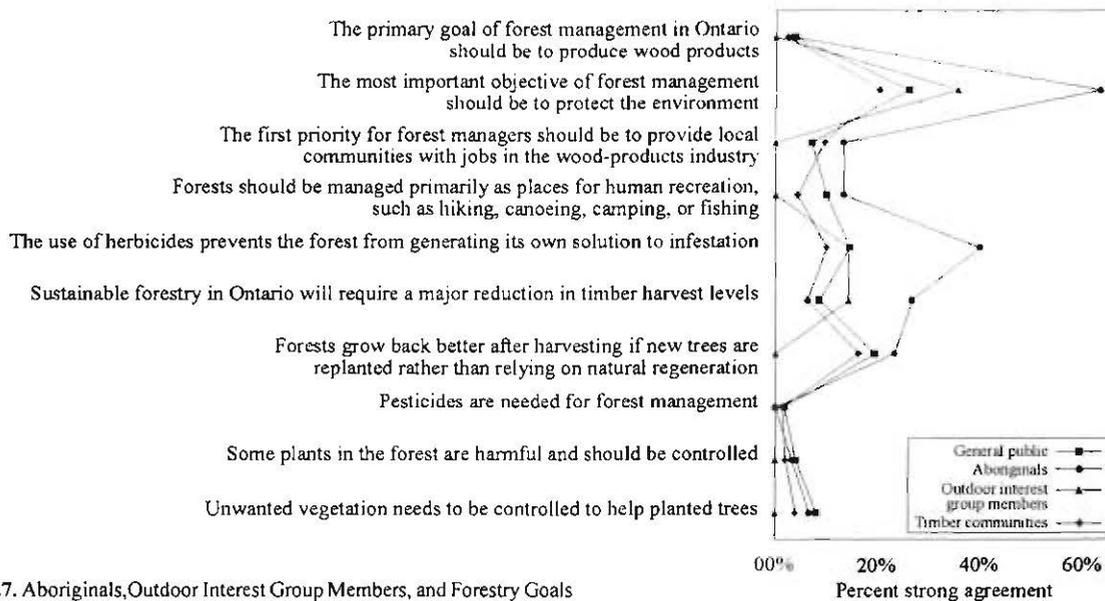


Figure 3.7. Aboriginals, Outdoor Interest Group Members, and Forestry Goals

dents of timber communities, but less supportive than the general public.

Outdoor interest group members tended to support environmentally oriented forest practices in a manner similar to the general public. However, a caution is in order here. The small number of outdoor interest group respondents ( $n = 14$ ) does not allow us to make useful comparisons with larger samples.

### 3.3. Conclusion

Most of the people and groups surveyed or interviewed for this study were highly pragmatic when asked about

forest-management practices and goals. Although there were very strong levels of support for environmental goals and related forest-use issues, levels of support for economic and commodity uses of the forest were also reasonably high. Job-creation in forest management was also recognized as important. This mix of management objectives was especially apparent in timber communities, where high levels of environmental support were coupled with high levels of support for management initiatives to increase jobs in the wood-product industries. The absolute levels of support for herbicide use by any group other than industry foresters were very low.

# 4

## Risks to Health and the Environment

People in Ontario view themselves as susceptible to a variety of health risks. In this chapter we investigate these perceptions of risks to find out where risks related to forest-management practices, as well as more general environmental risks, fit in an overall hierarchy of health concerns. We compiled this material by asking subjects to judge the severity of a wide variety of risk sources.

### 4.1. Risks to Public Health

Figure 4.1 illustrates what the general public<sup>1</sup> and residents of timber-dependent communities saw as high health risks from 22 different conditions, activities, or technologies.

The activity seen as most hazardous was cigarette smoking; 71.3% of the general public rated this a high

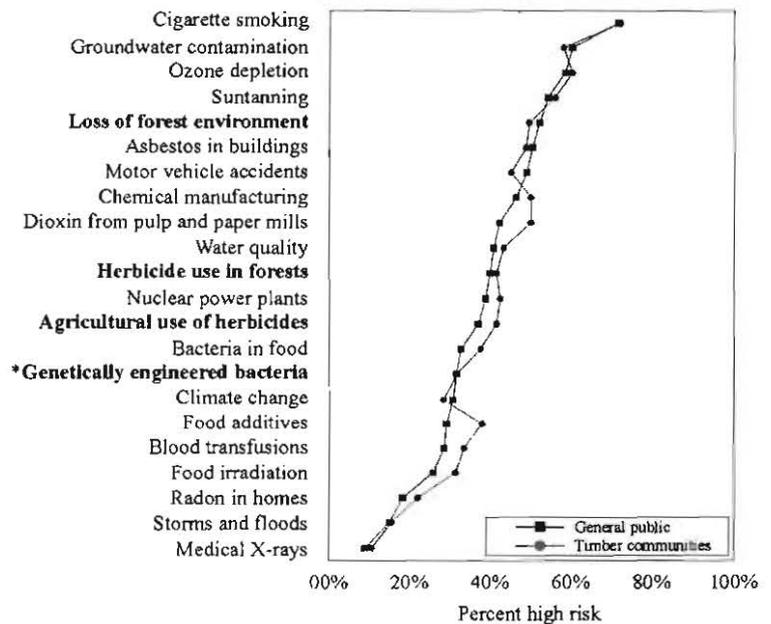


Figure 4.1. Perceived Health Risks to the Ontario Public

\*In the questionnaire, this stimuli referred to agricultural uses of engineered bacteria.

<sup>1</sup>“General public” refers to the entire Ontario public. See the Appendix for a description of sampling.

health risk. Medical X-rays were perceived as least risky, demonstrated by a 9.0% risk rating. Overall, subjects from the general sample and subjects from timber-dependent communities rated each health risk similarly. There are slight differences in the degree of perceived risk, but both samples ranked the same four hazards (smoking, groundwater contamination, ozone depletion, and suntanning) as having the greatest risks. Both groups also had the same activities in their respective “top 10” lists. A shared pattern also emerged at the low end of the rankings, with both samples viewing the same three hazards (X-rays, storms and floods, and radon) as least risky.

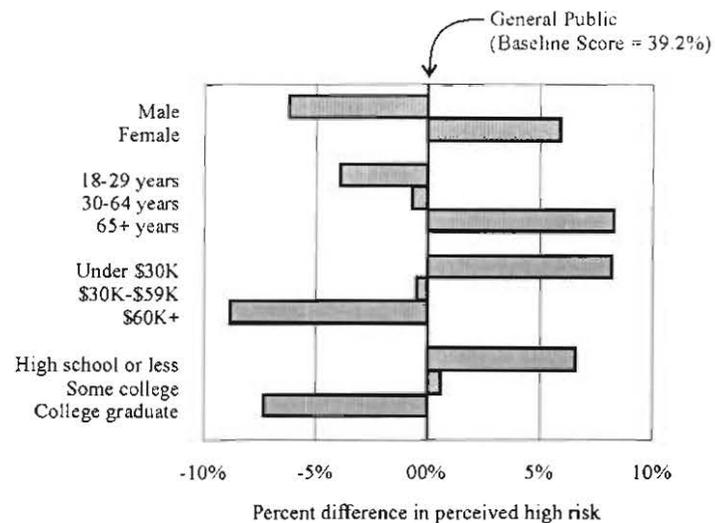
The only difference between the two samples was a slight tendency for the people in timber-communities to judge hazards as more risky than did those in the general sample. Timber-community residents had an average high-risk rating of 41.1% compared to a high-risk rating of 39.0% from the general public.

Of the 22 hazards subjects were asked to respond to, loss of forest environment (through timber harvesting) was seen as high-risk by a large percentage of both samples—52% of the general public and 49.4% of the timber-community sample.

Approximately 40% of both samples saw the use of herbicides in the forest as a high risk. The remaining six environmental items (ozone depletion, dioxin from mills, water quality, agricultural herbicides, genetically engineered bacteria in agriculture, and climate change) were seen as posing high health risks by many respondents. Ratings for these six hazards went from a low of 28% (timber-community residents on global warming) to a high of 60% (timber-community residents on ozone depletion).

### Demographic Variation

Within the general public, gender, age, income, and education appear to effect per-



Note: Scores are the average across 22 risk stimuli.

Figure 4.2. Demographic Differences in Perceived Health-Risk Scores (General Public)

ceptions of health and environmental risks. Women tended to view each of the 22 stimuli as more risky than did men. Similarly, the older one was, the more likely the perception of high risk. The higher one's income or education, the lower one's perception of risk. Figure 4.2 shows these demographic differences as a percentage change from the general public average perception of risk.

A similar pattern was recorded by respondents from the timber-dependent communities. Overall, large numbers of people saw health risks in each of the 22 hazards presented in the survey when the responses of “high health risk” were combined with “moderate health risk.” Although the general public and residents of timber-dependent communities rated many of these risks similarly, food additives and dioxin were perceived as substantially riskier by members of timber communities. Many vegetation-management techniques also received high-risk ratings as part of this broader hierarchy of risk. For example, loss of forest environment was clustered with other well-known and well-publicized hazards (e.g., suntanning and ozone depletion), and was seen as riskier than asbestos in buildings and motor vehicle accidents. Although not ranked quite as high, herbicide use in the forest also was perceived as a high health risk by a large number of people.

### 4.2. Risks from Vegetation Management

To address the concerns of forest managers, we explored perceptions of risks from forest- and vegetation-management practices in greater detail. Respondents were asked about their perceptions

of the risks of specific forest-management practices in terms of four dimensions that have proven useful in other risk-perception studies: the controllability of the practice; its potential for catastrophic results; the effects it might have on future generations; and their personal worries about the practice (Slovic, 1992).

The next set of Figures (4.3 through 4.6) capture these detailed perceptions of risk. The most striking result was the degree of risk seen in herbicides by the general public. When asked about the risks from the aerial spraying of herbicides, 83% agreed that herbicides were difficult to control, 73% saw the risks as potentially catastrophic, 87% thought the risks would be a problem for future generations, and 81% were personally worried about the risk of aerial spraying. Similar results occurred in response to questions about the ground application of herbicides and the use of biological agents to control unwanted vegetation. Other vegetation-management practices were seen as less risky, with the exception of the controllability of managed fires. All other possible management practices were considered less risky than herbicides or biological control

agents. However, the question of controllability for many practices remained, even for practices generally seen as benign, such as grazing and cover cropping.

Figure 4.3 shows the percentage of subjects in the general sample with strong opinions about the risks inherent in particular forest-management practices. That is, it incorporates those who “strongly agreed” that the risks of a listed practice were (a) difficult to control, (b) potentially catastrophic, (c) a problem for future generations, and/or (d) a source of personal worry. Herbicides (aerial and ground-applied) and biological control agents were seen as very risky on at least one dimension by 20 to 36% of the respondents. Everything else was perceived, at the level of strong agreement, as relatively benign.

This pattern did not hold for residents of timber-dependent communities (see Figure 4.4). Respondents here were much less likely to react “strongly” to vegetation-management risks. Even for that practice perceived to be the most risky, aerial application of herbicides, only two dimensions received more than 20% “strong agreement,” compared to 22 to 36% “strong

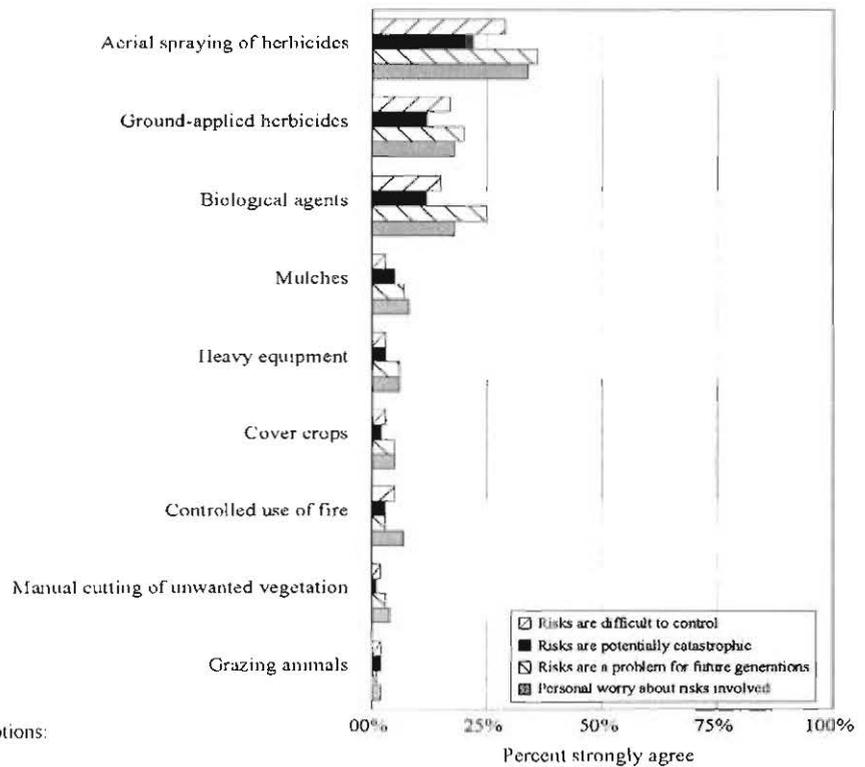


Figure 4.3. Vegetation-Management Options: Perceptions of Risk (General Public)

agreement” responses from the public on all four dimensions. In general, the only vegetation-management practices perceived as very (“strongly”) risky by more than 10% of timber-community residents were aerial herbicides, ground-applied herbicides, and vegetation control through biologic agents.

This portrait of lower risk ratings from timber-community residents changed substantially when the “agree” and “strongly agree” figures were combined. The “strongly agree” responses represent the highest degree of anxiety about a particular practice. At the same time, it is important to analyze total agreement, which records the direction of evaluation and may indicate salient concerns under future conditions (Figure 4.5). For the general public, herbicides and biological control agents were *still* seen as the riskiest management practices. But other practices, which appeared benign in relation to “strongly agree” responses, revealed a fuller risk-perception potential. For example, consider the ratings on “risks to future generations” from heavy equipment use, manual cutting, and grazing animals. Concerns about the controllability also

increased markedly when “agree” and “strongly agree” figures were combined. Using this combined measure, almost all forest-management practices were thought to involve a noticeable level of risk. The only management option that was not perceived as risky by at least 50% of the public sample, on at least one dimension, was cover cropping. Even in this case, cover crops were seen as difficult to control by 42% of those sampled.

Respondents in timber communities also agreed that these practices were risky, despite the absence of “strongly agree” responses (noted above) from this sample. When “strongly agree” and “agree” responses were combined, residents of timber communities proved to be as concerned as the general public about the risks of vegetation-management practices (Figure 4.6). In fact, the collapsed “risk” figures from residents of timber communities were higher than the figures for the general sample. For example, note the perceived risks of cover crops, mulches, and controlled fire. Exceptions to this pattern can be found with manual cutting and managed fire; timber residents saw these as less risky than did the general public.

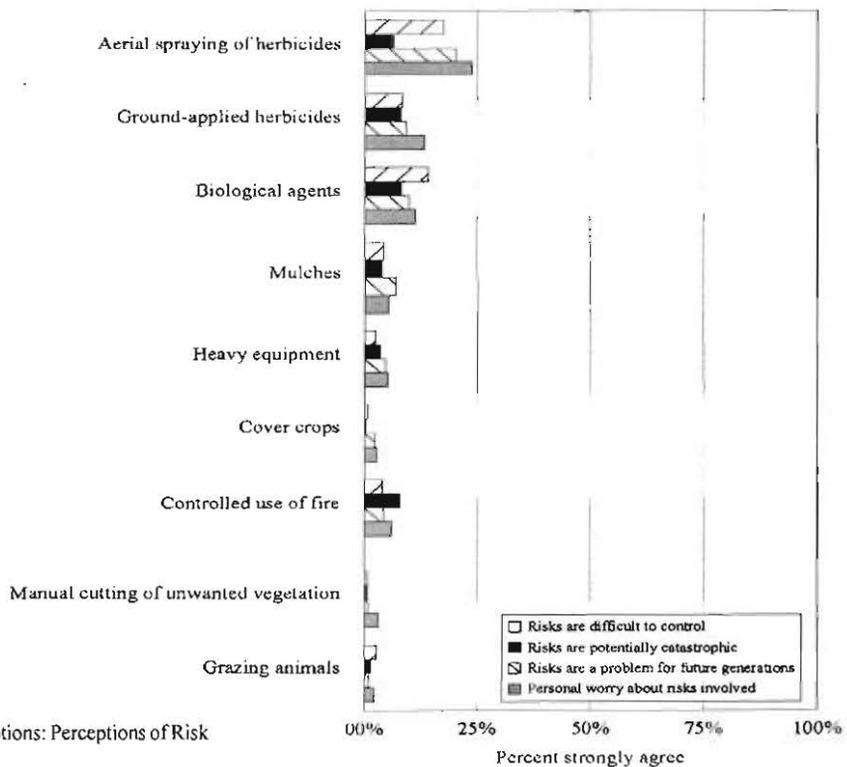
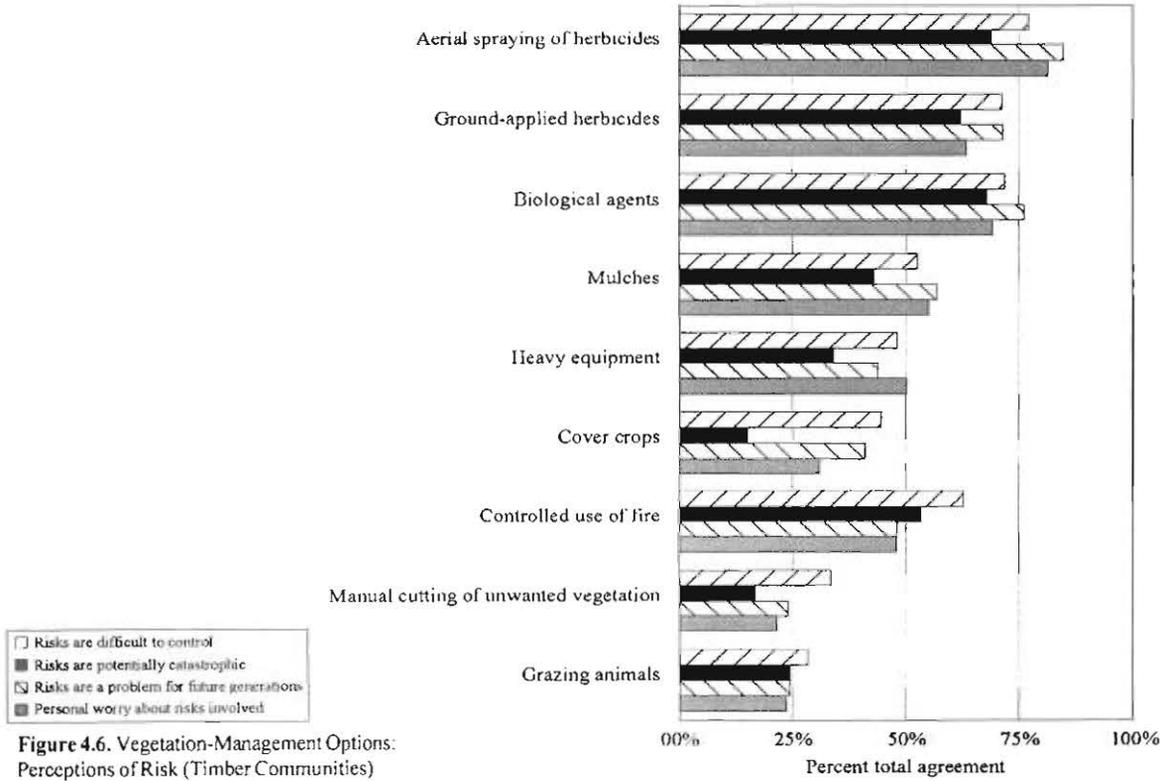
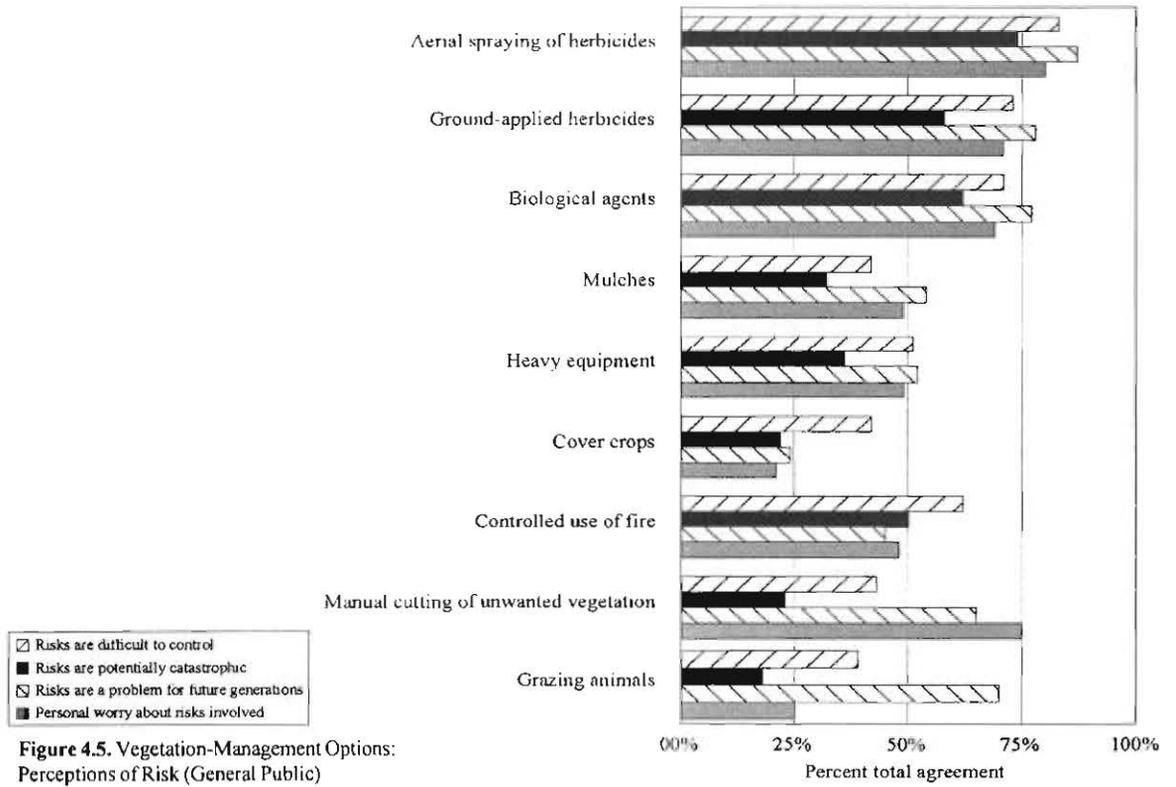


Figure 4.4. Vegetation-Management Options: Perceptions of Risk (Timber Communities)



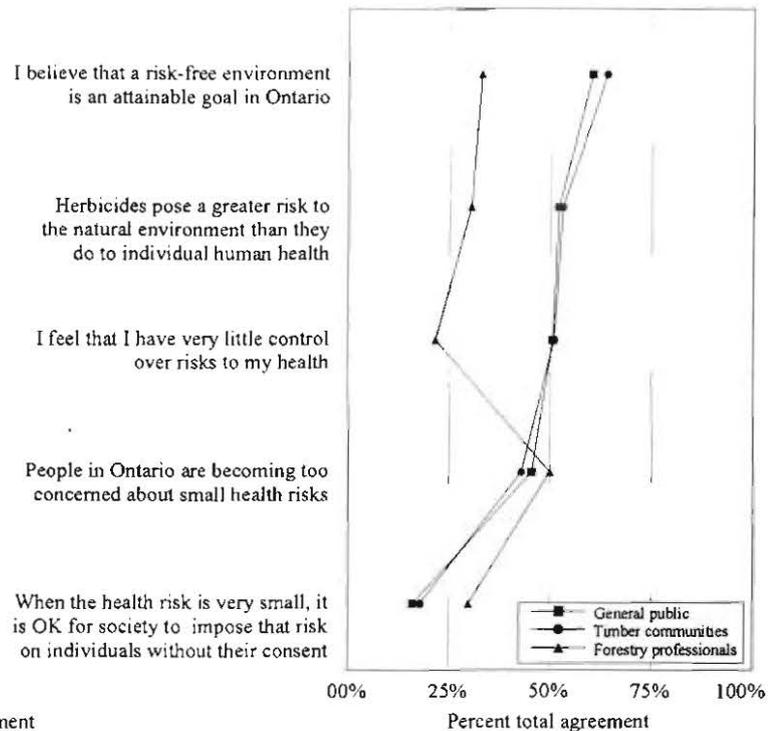


Figure 4.7. Perceptions of Health and the Environment

Small gender differences appeared; again some men were slightly less risk averse, but the remaining demographic variables (age, income, and education) failed to demonstrate consistent patterns of variation.

### 4.3. Health and the Environment

The relatively high levels of concern expressed about the riskiness of forest-management practices reflect the general public's worries about their own health and the well-being of the environment. When asked whether they feel in control of risks to their own health, about 51% of respondents from both samples stated that they do not have control (Figure 4.7). Consistently, the public was resistant to the idea of unknowingly (without consent) having even small risks imposed on them, despite the fact that this often occurs. Only 18% of the timber-community population agreed that it is acceptable for society to impose health risks on individuals, even when that health risk is very small. At the same time, about 60% of both samples believed that a risk-free environment is an attainable goal in Ontario. This combination of beliefs frame the risk perceptions we have previously seen with regard to

forest vegetation-management practices. If these practices carry any risks then it may be considered wrong for social institutions, acting without specific public consent, to expose the people of Ontario to those risks.

There were numerous small demographic differences in perceptions of health and the environment: women were slightly more concerned about health and environmental risks, age was not a factor, but perception of risk did appear to decline slightly with increased income and education. All of these demographic effects were relatively minor.

Once again, forestry professionals saw the world somewhat differently than the public. Forest professionals felt more in control of risks to their own health, were more willing to accept the imposition of health risks without individual consent, and did not believe that a risk-free environment was an attainable goal.

This pattern was most applicable to private-sector foresters, and least applicable to OMNR biologists (Figure 4.8). Biologists were as cautious, or in some cases more cautious, than the general public. For example, 39% of industry foresters agreed with the imposition of small health risks without consent, compared to only

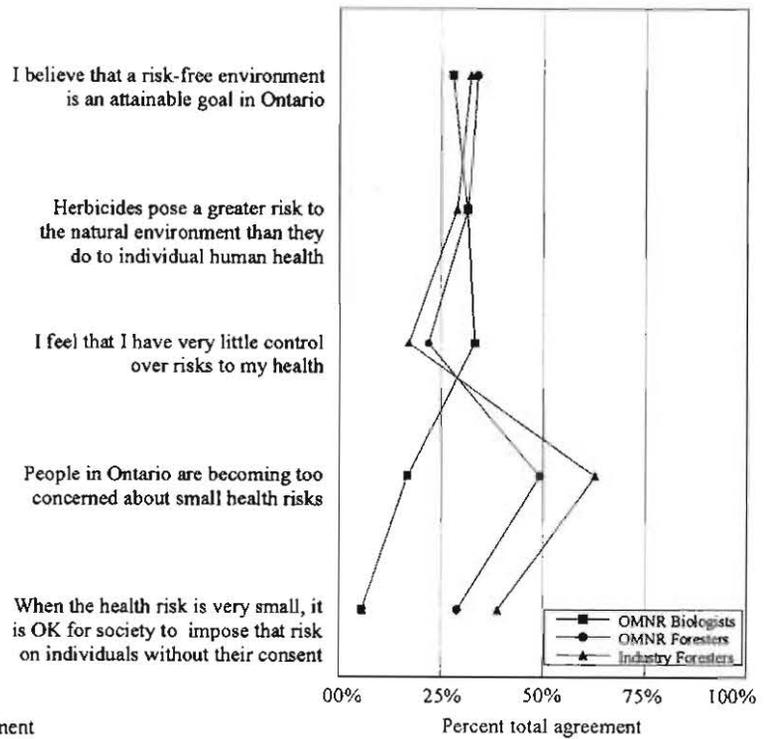


Figure 4.8. Perceptions of Health and the Environment

6% of biologists (and 16% of the general public who agreed with imposing small risks **without** consent). This gap between public (lay) opinions and foresters (experts) is a problem central to policy makers responsible for decisions involving health and/or environmental risks (Flynn, Slovic, & Mertz, 1993a). Understanding and/or “closing” the gap is essential to successful policy decisions.

#### 4.4. Conclusion

If successful vegetation management requires public acceptance of a practice, then the public’s perception of the risks associated with vegetation-management techniques is a critical issue. As shown here, the general public, including residents of timber communities were concerned about risks to the environment in general and risks from vegetation-management practices in particular. These concerns were widespread, applied to most management practices, and were deeply held. Successful vegetation-management programs must recognize these concerns and address them directly.

# 5

## Trust in Information, Management, and Science

In chapter 4 we recorded the degree of concern Ontario residents reported about health and environmental risks. This introduced three ancillary questions: Where do the people of Ontario receive their information about risky issues; how do they judge the sources of that information; and who do they trust to manage health and environmental risks?

### 5.1. Trust in Science and Management

Ontario respondents believed that the best way to understand and estimate risk was through the applica-

tion of science (see Figure 5.1). Two-thirds of respondents from the general sample thought environmental disputes should be decided on the basis of current scientific information and 70% thought that environmental health-risk decisions should be made by scientific experts. A 61% majority agreed that scientists are able to make accurate estimates of the risks from herbicides, and 79% agreed that differences of opinion about chemical risks should be decided by scientific methods.

Timber communities were similar to the general pub-

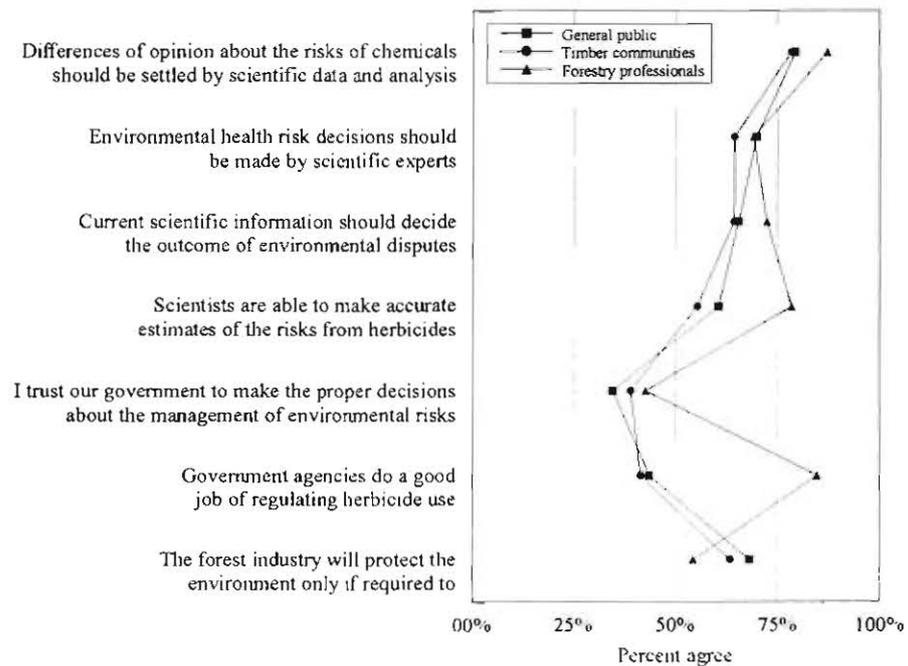


Figure 5.1. Trust in Science and Management

lic,<sup>1</sup> giving strong support to the use of science for resolving environmental problems and disputes. Slight differences emerged on only two issues. Sixty-five percent of timber-community respondents agreed that health-risk decisions should be made by experts, compared to 70% of the general public. And the same five-percent difference occurred on the question of whether or not herbicide risks could be determined by science, although here a majority of timber-community respondents (55%) continued to support science. No significant differences were noted when age, income, gender, and educational groups were compared.

The strength of public support for science can be seen by comparing the public's opinion with that of forest professionals, many of whom are either scientists or scientifically trained. Among forest professionals, support for science as the arbitrator of environmental disputes was only slightly higher than the already high level of public support. The average support for science among forest professionals was within 8% of the support level provided by the general public and the residents of timber communities. The lone exception occurred on the issue of risk estimates from herbicides. Here, support for science was much greater among forest professionals than among either of the two public samples. For this question, an average of 78% of forest professionals supported science as compared to 61% of the general public and 55% of respondents in timber communities.

A similar perceptual difference existed in attitudes toward management. Forest professionals were more likely to trust those managing environmental risks and somewhat less likely to distrust the actions of private industry. Forestry professionals were much more likely (by a margin of nearly 2:1) to trust governmental managers, not surprising given that most of the forestry sample members were also government employees. Nonetheless, forestry professionals should be aware of the difference between their own expressed confidence in government agencies versus the confidence of those not directly associated with governmental institutions responsible for the environment.

Different perspectives on the role of science also occurred among specific groups of forest professionals

(see Figure 5.2). The greatest disagreement among forest professionals applied to the question of estimating herbicide risk: 66% of OMNR biologists supported the "estimation" abilities of scientists, compared to 87% of industry foresters. The difference, repeated for other trust questions, was almost always the result of differences between the perceptions of biologists and the perceptions of industry and OMNR foresters. Biologists were more likely to agree that scientific evidence and/or scientists should direct environmental decisions, yet biologists were less optimistic about the current state of scientific knowledge. Biologists were at least 20% less supportive than industry foresters of the idea that science can accurately estimate herbicide risks, but from 7% to 11% more supportive than any other group of forest professionals of the idea that scientific information should decide environmental disputes. Recall, as well, that OMNR biologists held fast to a number of pro-environmental values (see chapter 2) and that they were critical of habitat depletion through, for example, timber harvesting.

The extraordinarily strong public support for science and for scientific experts has important implications for the conduct of forest policymakers in Ontario. Scientists probably have an unusually high potential to influence provincial debates about environmental risks and to shape solutions to environmental problems. However, this power carries a price. Scientists also must listen carefully and deal directly with public concerns about risk. Other experience has demonstrated that support can erode quickly if the public experiences science or scientists as unresponsive to their perceptions of risk (Flynn, Slovic, & Mertz, 1993b). Conflict is especially likely on issues that involve herbicides or toxins, because the public's support for the use of these techniques was lower despite the widespread belief in the ability of scientists to control and prevent hazards from the use of such agents. The public recognizes, however, that science advisors do not necessarily make the final judgments on public policies or programs.

Differences in the support allotted government and private groups responsible for environmental management emerged when the public was compared to foresters. Generally speaking, the public was less trusting of management than was any one group of forest

<sup>1</sup>"General public" refers to the entire Ontario public. See the Appendix for a description of sampling

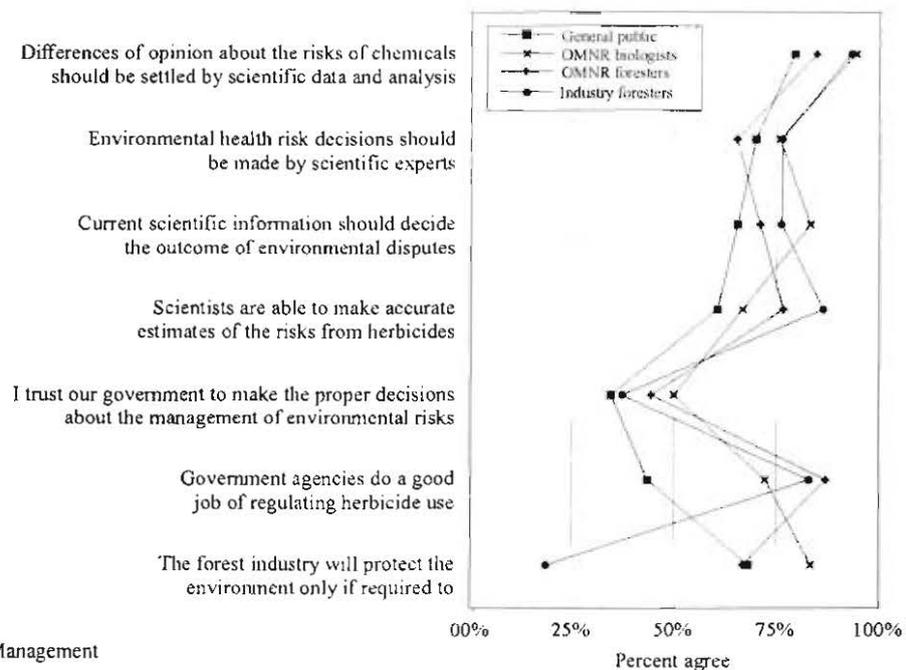


Figure 5.2. Trust in Science and Management

professionals. The lone exception occurred with OMNR biologists who recorded less trust of private industry than did the general public. The findings on trust and science should alert policymakers to the potential sources of conflict between forestry professionals, program managers, and the public.

## 5.2. Trust and Information Sources

Public opinions about health risks and environmental hazards are often shaped and molded by the information the public receives, and by their experiences with the messengers of that information. To learn more about where the public receives its information, and what faith it puts in that information, we asked a series of questions about sources of information and the confidence assigned to each one.

A quarter or more of respondents comprising the general sample reported receiving “a lot” of information from one of three sources: television and/or radio (35.6%), newspapers and magazines (33.3%), and environmental groups (27.4%). (See Figure 5.3. Note the presence of “environmental groups” in a source-cluster otherwise dominated by media.) Other sources in-

cluding government agencies, university scientists, and friends or relatives, each of whom provided a smaller proportion of information. Government agencies reported as the source of “a lot” of information included the Ministry of Natural Resources (16.6%) and Forestry Canada (9.9%). Very few people (2.6% to 4.1%) turn to their local or provincial elected officials or to private industry for information.

A similar pattern was evident in responses from members of timber-dependent communities (Figure 5.4). This population also got most of their information from the media, more in fact from radio, television and periodicals than is true of the general public. Forty-one percent of timber-dependent community residents, for instance, got “a lot” of their information from television and radio versus 35.6% in the general sample. As in the general sample, environmental groups were ranked third (22%) as the source of (“a lot” of) information, but the Ministry of Natural Resources came in a very close fourth with 21.1%. This is rather different from the general sample’s 10.8% spread between environmental groups as a source of information (27.4%) and the Ministry of Natural Resources (16.6%). The institutional and economic presence of the ministry in rural Ontario may account for some of this difference.

The only other comparison of note is that timber-community residents appeared slightly more dependent on local, elected officials for “a lot” of their information (7.9% versus 4.1% of the general sample).

An interesting finding on the questions of trust was the almost inverse relationship between sources of information and respondents’ confidence in that information. Respondents in both samples were much more confident about information from sources which provided only a small amount of their information. For instance, 35.6% of the general public turned to radio and/or television for their information but only 18.0% of the public is confident about that information. Conversely, university scientists were a source of information for only 10.9% of the public, but 24.8% of the public expressed confidence in this information source. This later pattern is true, though less dramatically so, when considering source versus confidence ratings for various government agencies (Ontario Ministry of Natural Resources, Environment Canada, Agriculture Canada, and Forestry Canada). In both samples, more people were confident about information from the Ministry of Natural Resources than actually use this agency as a source for that information. This suggests that the publics represented by both samples would be open to receiving more information directly from the agencies responsible for forest policy. However, the processes used for presenting and disseminating information must be carefully examined. It is quite possible that the public would respond with skepticism to a government information campaign on a controversial subject.

**5.3. Responsibility versus Job Performance**

Trust was also explored by comparing the responsibilities organizations have for the forest environment in Ontario versus the extent to which those organizations were seen as doing an adequate job. The two graphs below (Figures 5.5 and 5.6) compare the degree of responsibility (for protecting the forest environment) assigned by respondents to the respective organizations to judgments about the quality of job performance enacted by these organizations.

The general public clearly placed responsibility for protecting the forest environment in the hands of government agencies. Three organizations were said to have “major responsibility” by at least 70% of the public: the Ministry of Natural Resources (74.5%), Envi-

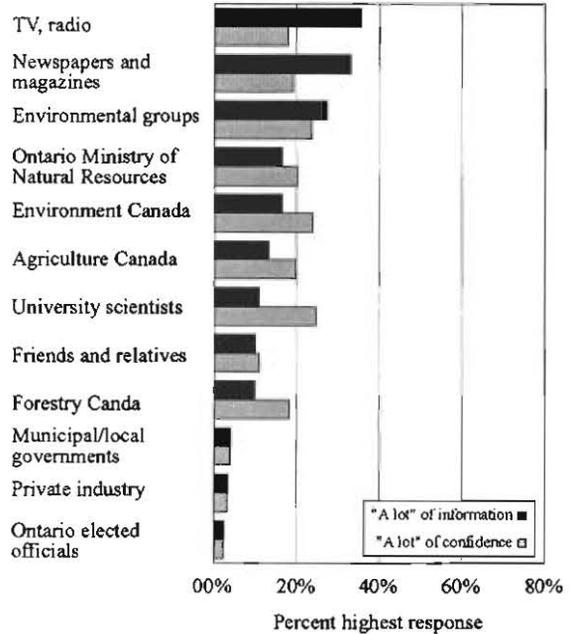


Figure 5.3. Sources of Information vs. Confidence in Information (General Public)

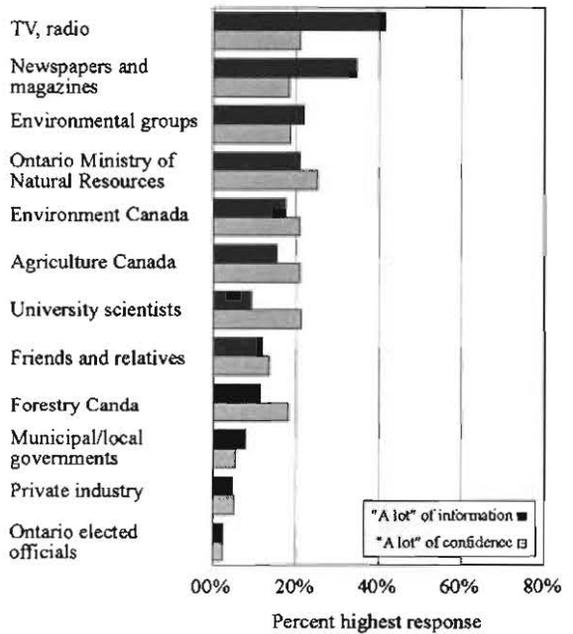


Figure 5.4. Sources of Information vs. Confidence in Information (Timber-Dependent Communities)

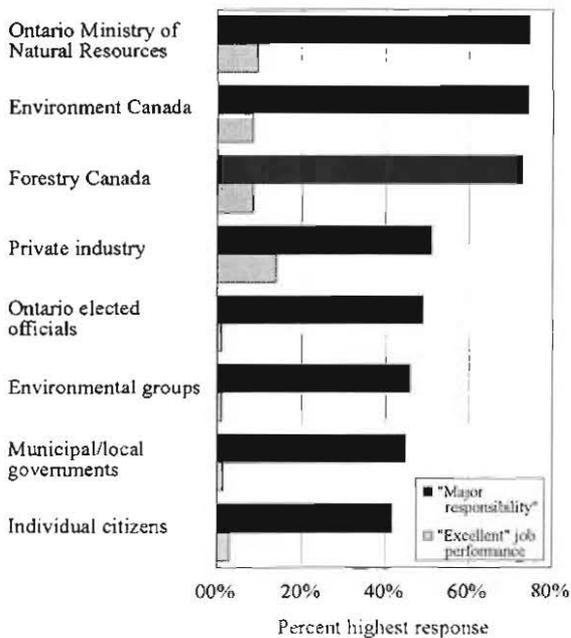


Figure 5.5. Organizational Responsibility vs. Quality of Performance (General Public)

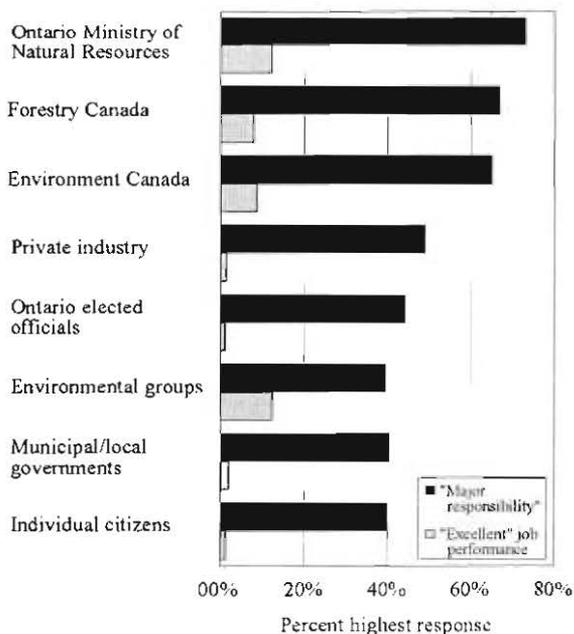


Figure 5.6. Organizational Responsibility vs. Quality of Performance (Timber-Dependent Communities)

Environment Canada (74.1%) and Forestry Canada (72.7%). The next (closest) assignment of responsibility falls to private industry (51.0%), but its responsibility rating is fully 23 percentage points less. All other groups were assigned a "major responsibility" rating within ten points of that given private industry (from 41% for individual citizens through 49% given Ontario's elected officials).

The general public's assessments of responsibility for the forest environment were markedly different than their judgments of job performance. Very few respondents saw the listed groups as doing an "excellent job" of fulfilling their responsibilities. Surprisingly, private industry was accorded the highest ranking: 13.9%. The Ministry of Natural Resources was rated second (9.5%), Forestry Canada third (8.5%), and Environment Canada fourth with 8.4%.

Residents of timber-dependent communities convey similar attitudes when comparing responsibility for the forest environment to opinions about related job performance.

There are, however, three differences worth noting between the timber-dependent community sample and the general sample. First, timber residents were a little less likely to assign "major responsibility" for the forest environment to Forestry Canada and Environment Canada (67% percent of timber-community respondents vs. 73% of the general public). Second, the Ministry of Natural Resources was ranked first with regard to responsibility by both samples, although timber respondents were a little more favorable (about three percentage points) toward the ministry on the question of job performance.

Third (and more interestingly), timber-community residents were more critical of private industry and less critical of environmental groups than were the general public. Only 1.5% of residents of timber communities thought that private industry was doing an "excellent job" protecting the environment, whereas 13.9% of respondents in the general sample credited private industry with doing an "excellent job." Conversely, 12.4% of timber-community residents thought environmental groups were doing an "excellent job," whereas only 1.0% of the general sample thought the same thing. These different ratings may reflect the fact that the presence of private industry is more strongly felt in rural areas, where the same can be said of environmental groups' presence in urban areas.

In general, both organizations and individuals were seen as responsible for protecting the forest environment, and no one was seen as performing that job particularly well. This is, however, consistent with the extent to which Ontario's residents saw the environment as important and believed it to be subject to great risks.

#### **5.4. Conclusion**

Overall, public agencies were seen as a significant source of information and the public recorded considerable confidence in their messages. This is a strong

base for responding to public issues about forest and vegetation management. An area of caution was recorded in the gap between the major responsibilities assigned to these agencies and the ratings of excellent performance and of trust. These findings suggest that careful attention should be given to building on the existing role of these agencies as information sources but in a manner that maintains or increases trust. Closing the gap between public perceptions of responsibility and performance in managing Ontario's forests should be a key component in publicly defensible forest policy.

# 6

## Support for Vegetation Management

In previous chapters we described the concerns that different groups of people in Ontario had about the environment and the degree to which they were concerned about environmental hazards. In addition, we discussed the extent to which people in Ontario trust science and support the provincial ministries that regulate natural resources. Now we turn to the interests and concerns that people in Ontario have about the environmental impact of specific forest vegetation-management practices.

In chapter 3 on “Forest-Management Goals,” we discussed the support for four forest-management priorities. The range of this support was quite broad, running from 39% support for wood production (as the primary goal of forest management) to 91% support for environmental protection (see Figure 6.1). However, many people agreed that two, three, and even four of these goals should be given the highest priority for forest management. (Very few people supported one, and only one, goal.) This broad range of support for single and multiple forest-management goals as priorities is illustrated in Figure 6.2 (next page), which presents all positive responses (“agree” and “strongly agree” combined) in rank order.

Nearly half (48%) of the general sample agreed (or strongly agreed) that the primary goal of forest management should be both protecting the environment and managing for recreation.

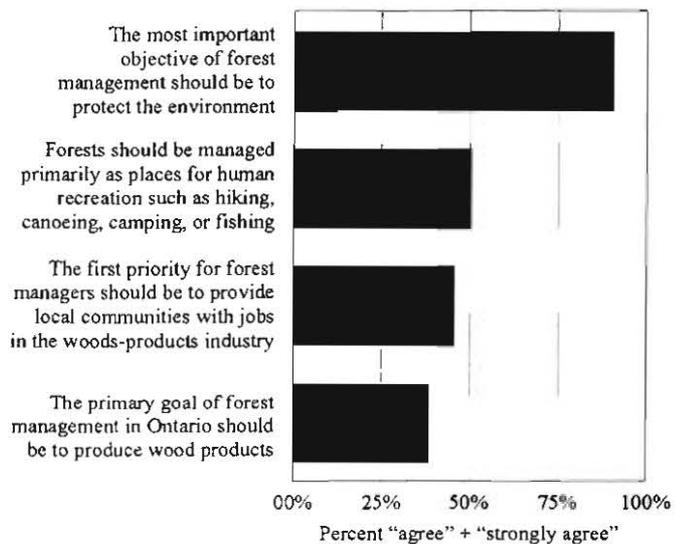


Figure 6.1. Forest-Management Priorities (General Public)

Only 20% of the general sample agreed that both the production of wood products and managing for recreation were primary goals. In fact, even more people, 25% of the general sample, support three of four goals when that combination includes wood production, environmental protection, and job creation. Sixteen percent of the sample supported all four goals.

### 6.1. Correlations with Forest-Management Goals

Further analysis shows that the strength of support for each management priority was representative of beliefs about nature, the environment, and forestry practices.

Data for analysis of these conditions are shown in Table 6.1. A set of positions and opinions from the general public<sup>1</sup> that have statistically significant relationships (correlations) with each of the four major management priorities are shown. The first portion of the table (Table 6.1.1) shows that beliefs in support of environmental protection as the primary objective of forest management are related to concerns with other environment issues. These respondents were concerned with a wide range of environmental problems, expressed a personal willingness to sacrifice their own standard of living to benefit nature, and perceived a variety of risks from herbicide applications.

This constellation of beliefs was quite different from those related to jobs as the primary goal of forest management (Table 6.1.2). Beliefs associated with jobs included support for natural-resource industries, private industry, chemical and biological forms of pesticides and herbicides, and tolerance of some risks in order to strengthen the economy (a position that was opposed by 71% of the Ontario public).

Support for wood production as the primary goal (Table 6.1.3) is related to perceptions of the economic benefits and the desire for forest-resource development. It is also correlated with the beliefs that people are too concerned about small risks and that acceptance of some risk for wood production is necessary.

Support for recreation as the primary goal of forest management correlated with concern about the physical environment and concerns that risks of cancer and losses to the environment can result from human activities that exploit forest resources (Table 6.1.4).

In the timber-dependent communities the beliefs held by those promoting support for environmental protection as the primary goal of forest management were very similar to the beliefs of the general public (see Table 6.2). Eight of the 15 beliefs associated with support for environmental protection among the general-sample respon-

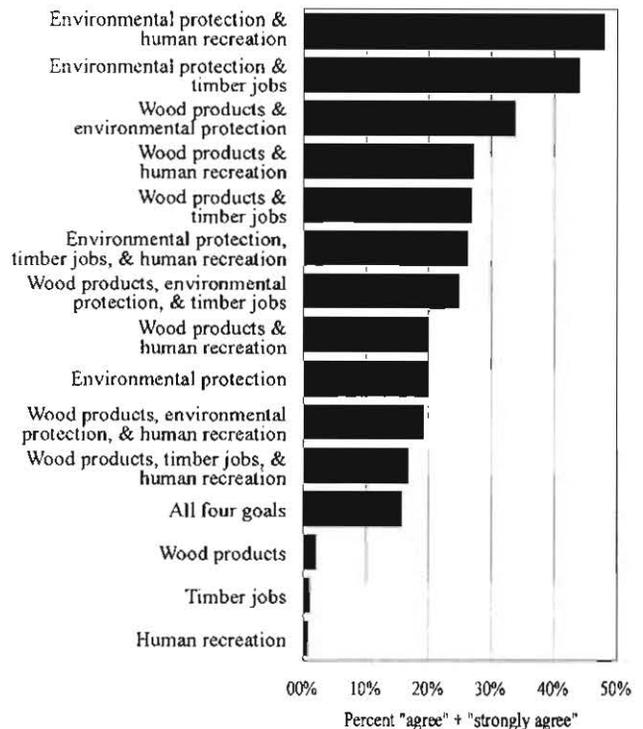


Figure 6.2. Support for Single and Multiple Forest-Management Priorities (General Public)

ents were also held by respondents from timber communities (Table 6.2.1). The remaining beliefs closely resembled those held by respondents from the general public. As an example, the timber-community respondents were concerned about the catastrophic risks of aerial herbicides, whereas both groups of respondents were concerned about the catastrophic risks of ground herbicides. Similarly, the timber-community respondents were concerned about damage to the forest environment, while the general-sample respondents saw loss of forest environment as a high health risk. The only important difference was the lack of personal concern about the risks of herbicides, both ground and aerial, on the part of the timber-dependent respondents. This difference may reflect the fact that most general-sample respondents are not from areas where herbicides are used for forest-vegetation management and, consequently, they are less familiar with herbicides than timber-dependent respondents. Interestingly, timber-dependent residents were still very concerned about the other risk characteristics of herbicides.

<sup>1</sup>"General public" refers to the entire Ontario public. See the Appendix for a description of sampling.

<b>6.1.1. The most important objective of forest management should be to protect the environment</b>	
	<i>r</i>
Ground-applied herbicides are potentially catastrophic	0.34
Environmental problems are important	0.32
Ground-applied herbicides are difficult to control	0.31
Ground-applied herbicides threaten future generations	0.30
Cover crops are difficult to control	0.29
Reduce timber harvest for global health	0.29
Belief in species egalitarianism	0.28
Natural world changes bother me	0.28
Sustainability requires reduced timber harvest	0.28
Willingness to sacrifice for nature	0.26
Loss of forest environment seen as high health risk	0.25
Pays attention to environmental issues	0.25
Worries about risks of controlled fires	0.25
Worries about risks of ground-applied herbicides	0.25
Natural world has spiritual qualities	0.23
<b>6.1.2. The first priority for forest managers should be to provide local communities with jobs in the woods products industry</b>	
	<i>r</i>
Public understands risk of biological control organisms	0.40
Biological control agents do not threaten future generations	0.32
Natural resource industries equal a strong economy	0.30
Support clearcuts to harvest timber	0.27
Some plants are harmful	0.26
Environmental groups interfere	0.25
Scientists understand herbicide risks	0.24
Low education equals belief in job priority	0.23
Pesticides needed for forest management	0.23
Private industry protects the environment	0.23
<b>6.1.3. The primary goal of forest management in Ontario should be to produce wood products</b>	
	<i>r</i>
Pesticides needed for forest management	0.29
Biological agents do not threaten future generations	0.28
Natural resource industries equal strong economy	0.25
Environmental groups interfere	0.24
People too concerned over small risks	0.24
Public understands biological-agent risks	0.24
Accept risks to strength economy	0.23
Economic growth improves quality of life	0.23
Private industry protects the environment	0.22
<b>6.1.4. Forests should be managed primarily as places for human recreation, such as hiking, canoeing, camping, or fishing</b>	
	<i>r</i>
Cover-crop risks hard to control	0.26
Exposure to a carcinogen equals cancer	0.24
Economic growth equals loss of resources	0.23

Note: All correlations in this table are significant at  $p < .001$ .

**Table 6.1.** Associations with Specific Forest-Management Priorities (General Public)

Timber-community residents who saw jobs as the primary goal of forest management held beliefs very similar to those of like-minded people in the general sample (Table 6.2.2). Of the seven beliefs associated with support for jobs among the timber sample, only “natural resource industries are the basis of a strong economy” and “support for clearcuts” were held solely by timber-community residents. The remaining beliefs were similar in both samples. For instance, timber-community respondents felt that the public understood the risks of ground-applied herbicides, whereas the general-sample respondents felt that the public understood the risks of bioagents and microorganisms. The attitudes and beliefs of those supporting wood-products production are similar to those supporting jobs in the forest industry. There is support for clearcutting, acceptance of herbicide risks, and a practical evaluation of heavy equipment or manual work in the forests. Both sets of underlying attitudes believed the public understood herbicide risks even though the larger groups of public evaluations were much less accepting of herbicide risks.

On the final management priority, recreation, the number of correlations from timber-community respondents was higher than the number of associations generated by the general sample (Table 6.2.4). In both cases the correlations were primarily about concerns for the forest and damages from management practices. But there were only three associations for the general sample, whereas timber-dependent respondents produced 16 such associations. Perhaps their proximity to the forests made this issue more salient for timber-community residents than it was for the urban-influenced general population.

## 6.2. Support for Specific Forest Vegetation-Management Practices

*General public.* The Ontario public supported a wide variety of forest-management practices. Respondents were given 22 separate management options to judge as acceptable or not acceptable (see Figure 6.3). Of these 22 practices, 11 were found to be either acceptable or very acceptable by over 50% of the public and another 9 practices were judged to be acceptable or very acceptable by 25 to 49% of respondents. Practices viewed as most acceptable avoided the use of herbicides, micro-organisms, or viruses, yet included the use of “natural plant toxins.” The third most acceptable practice, “controlling growth of unwanted vegetation to improve survival of planted trees,” did not

<b>6.2.1. The most important objective of forest management should be to protect the environment</b>		<i>r</i>
I think environmental problems are extremely important		0.37
I do not worry about the risks of using mulches such as plastic or paper as a vegetation-management tool		0.34
All species, including humans, have an equal right to co-exist on the planet		0.34
Timber harvests in Ontario forests should be reduced in light of global pressures on environmental resources		0.29
In a dispute between an industry group and an environmental interest group, would support the environmental group		0.28
I do not worry about the risks of ground-applied herbicides		0.28
Loss of forest environment		0.28
It bothers me that the world's natural environment is changing so quickly		0.28
Damage to forest environment		0.27
It is difficult to control the risks of using ground-applied herbicides, even if the herbicides are carefully applied		0.25
I do not worry about the risks of herbicides applied from helicopters or airplanes		0.25
The risks of herbicides applied from helicopters or airplanes are potentially catastrophic		0.25
I would be willing to sacrifice much of my current standard of living in order to help ensure that nature is not harmed		0.24
Technological development is destroying nature		0.24
I am attracted to the spiritual qualities inherent in the natural world		0.24
The risks of ground-applied herbicides are potentially catastrophic		0.23
Loss of animal and plant species		0.23
<b>6.2.2. The first priority for forest managers should be to provide local communities with jobs in the wood products industry</b>		<i>r</i>
The risks of herbicides applied from helicopters or airplanes are not potentially catastrophic		0.37
The risks of using manual cutting as a vegetation-management tool are potentially catastrophic		0.28
Natural resource industries (e.g., mining, wood products, oil, etc.) are the basis of a strong economy		0.27
It is difficult to control the risks of using manual cutting as a vegetation-management tool		0.23
The public understands the risks of ground-applied herbicides		0.23
Using clearcuts to harvest timber in Ontario		0.23
I don't worry about the risks of ground-applied herbicides		0.23
<b>6.2.3. The primary goal of forest management in Ontario should be to produce wood products</b>		<i>r</i>
Aerial herbicides are not potentially catastrophic		0.43
The risks of aerial herbicides are not a problem for future generations		0.32
I do not worry about the risks of using cover crops in vegetation management		0.31
I do not worry about the risks of aerial herbicides applied from helicopters or airplanes		0.31
The public understands the risks of heavy equipment use in vegetation management		0.27
Support for using clearcuts to harvest timber in Ontario		0.26
Environmental groups interfere with government efforts to solve environmental problems		0.25
Bulldozers and heavy equipment use in vegetation management are not a problem for future generations		0.23
The public understands the risks of aerial herbicides		0.23
<b>6.2.4. Forests should be managed primarily as places for human recreation, such as hiking, canoeing, camping, or fishing</b>		<i>r</i>
It is too difficult to control the risks of using manual cutting as a vegetation-management tool		0.36
The risks of using manual cutting as a vegetation-management tool are potentially catastrophic		0.35
Timber harvests in Ontario forests should be reduced in light of global pressures on environmental resources		0.32
Sustainable forestry in Ontario will require a major reduction in timber harvest levels		0.30
In a dispute between an industry group and an environmental interest group, would generally support the environmental group		0.29
The public understands the risks of ground-applied herbicides		0.29
The risks of ground-applied herbicides are potentially catastrophic		0.28
Economic growth will lead to serious losses of natural resources		0.28
Technological development is destroying nature		0.28
The public understands the risks of prescribed and managed fires		0.27
I believe that a risk-free environment is an attainable goal in Ontario		0.26
Scientists understand the risks of using bulldozers and other heavy equipment as a vegetation-management tool		0.25
If a person is exposed once to a chemical that can cause cancer, that person will probably get cancer some day		0.24
The risks of using cover crops such as grasses or clover as a vegetation-management tool are not a problem for future generations		0.23
Loss of forest environment		0.23
I would be willing to sacrifice much of my current standard of living in order to help ensure that nature is not harmed		0.23

All correlations in this table are significant at  $p < .01$ .

**Table 6.2.** Associations with Specific Forest-Management Priorities (Timber-Dependent Communities)

specify the method of control. In any case, the support granted this option indicates that controlling unwanted vegetation was generally accepted.

However, it is clear that a majority, and usually a large majority, of the Ontario population did not find the use of herbicides to be an acceptable vegetation-management practice. Even the case designed to gather the most public support, the use of herbicides to control purple loosestrife (a foreign weed destroying natural wetlands), was acceptable to under 50% of the sample. Other forms of herbicide use were less acceptable; aerial herbicides, for instance, received a 17.6% acceptability rating (and only 1.6% of those sampled found aerial herbicides very acceptable). The practices seen as acceptable tended to be chemically or technologically simple, yet labor intensive. These practices included the manual clearing of brush; restoration activities such as stream stocking or road replanting; or activities seen as natural, such as grazing or cover cropping.

*Demographic differences.* Education and age did not affect support for vegetation-management practices, while support for 17 of 22 practices increased slightly as income increased. Gender was the only variable that produced a marked difference in levels of support for vegetation-management practices. Women were more supportive than men of stocking streams, but less supportive of all herbicide use, genetically engineered bacteria, microorganisms and viruses (see Figure 6.4).

*Timber communities.* In timber-dependent communities the public acceptability of forest-management practices was similar to that of the general public (see Figure 6.5). Of the 22 forest-management practices surveyed, 11 were more acceptable in timber-dependent communities and 11 were less acceptable (see Figure 6.6). However, the differences in acceptability were very small. The most extreme differences were the greater acceptability of clearcutting for timber harvest and using managed fire to control vegetation. In these cases, the acceptability ratings given by timber-community respondents were, respectively, 12% and 11% greater than the general public's acceptability

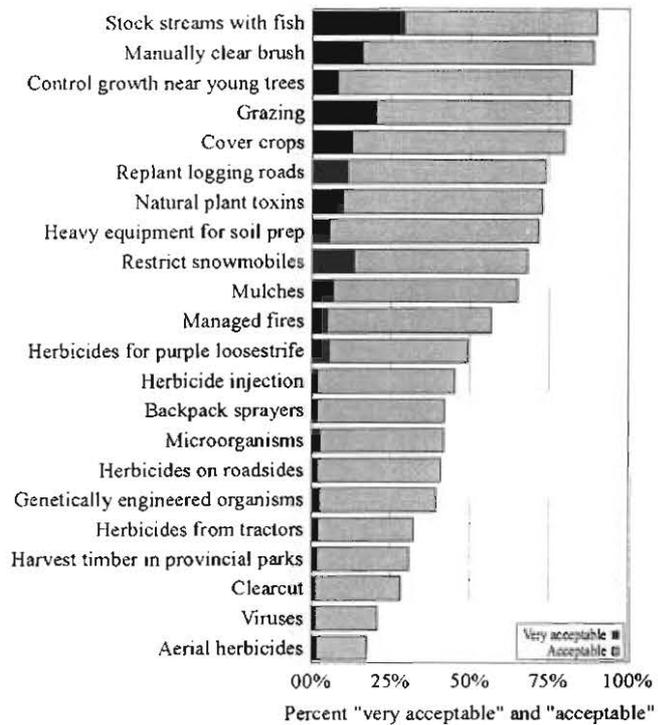


Figure 6.3. Acceptability of Forest-Management Actions (General Public)

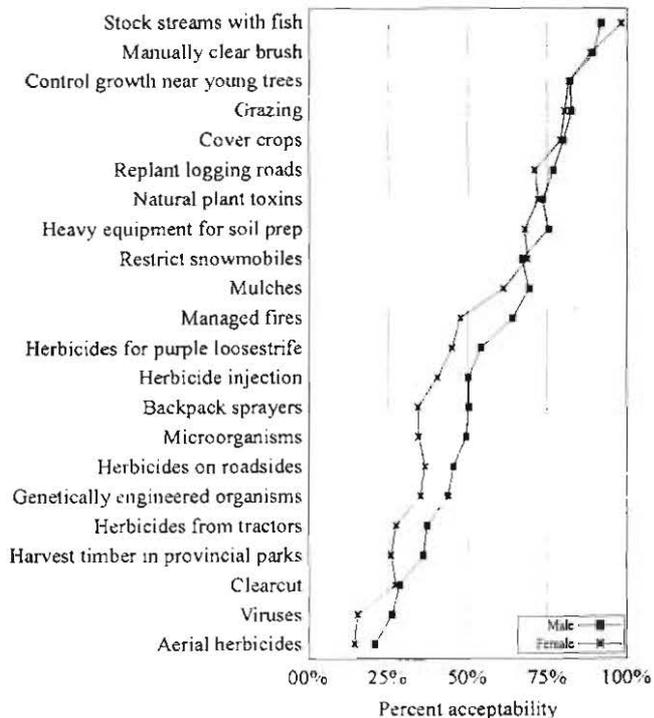


Figure 6.4. Acceptability of Forest-Management Actions by Gender (General Public)

ratings. The next two largest differences involved less support in timber communities for restricting the use of snowmobiles and replanting over logging roads. Here both practices had 9% less acceptability than was found in the general population. All other differences were 6% or less, with 15 of the items having less than a 4% difference.

*Professional samples.* Forest professionals, as expected, were generally much more accepting than the public of forest-management practices. All three groups of forest professionals gave higher acceptability ratings to 15 of the 22 practices than did the general public and timber communities. Of the seven practices seen as less acceptable, two (truck-applied herbicides on roadsides and genetically engineered organisms) were only seen as less acceptable by OMNR biologists and not by both groups of foresters. Only one practice, restricting snowmobiles, was seen as less acceptable by all forest professional groups (see Figure 6.7).

Not only did forest professionals find most forest-management practices acceptable, they frequently reported **much** more acceptability. This large difference in acceptability was most evident in practices that were least acceptable to the general public, such as the uses of herbicides, viruses and microorganisms to control vegetation, as well as the use of clearcutting for harvesting timber. Again, among the professional groups, biologists were typically the least likely to give high acceptability ratings to these forest practices.

For three practices, biologists differed from the two forester groups **and** the general public. For example, the general public gave an acceptability score of 41% to using trucks for applying herbicides along roads to control weeds. Only 22% of biologists found this practice to be acceptable (a 19% drop in support). Both industry and OMNR foresters found truck-applied herbicides to be more acceptable than did the general public. Acceptability scores ranged from 56% to 75%. Similar patterns occurred when respondents rated the use of genetically engineered organisms and the replanting of logging roads. Biologists were less accepting

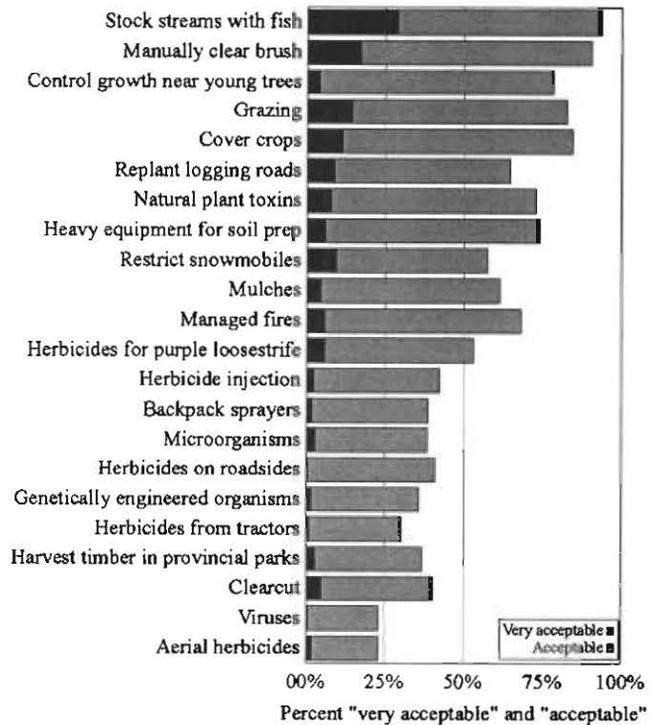


Figure 6.5. Acceptability of Forest-Management Actions (Timber-Dependent Communities)

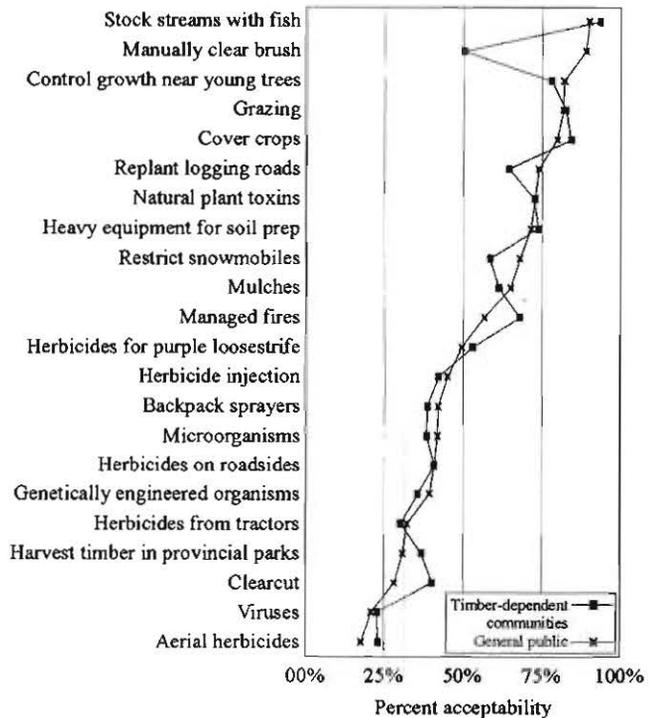


Figure 6.6. Acceptability of Forest-Management Actions: (General Public vs. Timber-Dependent Communities)

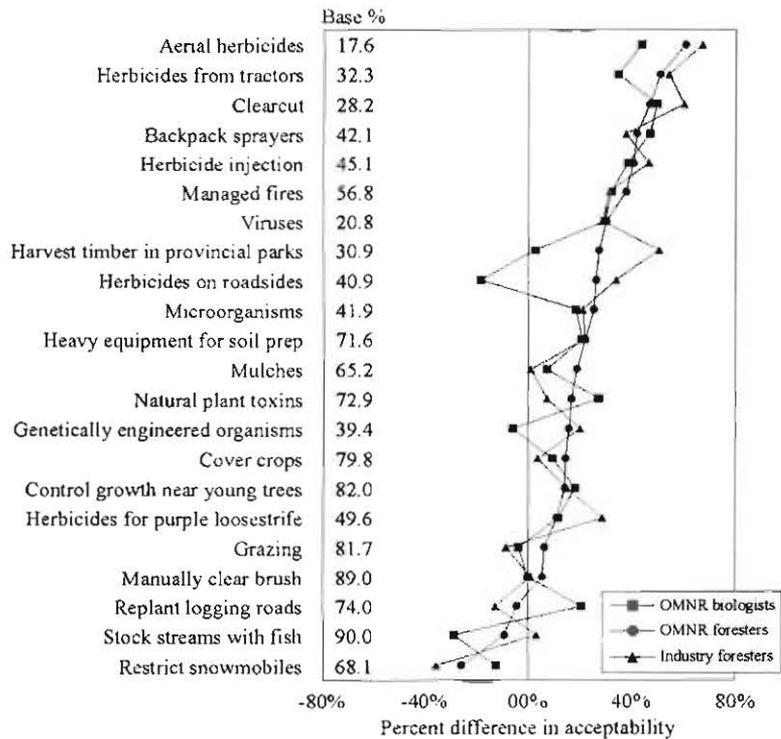
of engineered organisms than the general public, while foresters were more accepting than the general public. Conversely, biologists were more supportive of replanting logging roads than the general public while both forester groups were relatively less supportive of this practice.

Finally, grazing, stocking streams with fish, replanting logging roads, and restricting snowmobiles were all considered less acceptable by professional foresters (biologists aside) than was true among the respondents from the general public. Three of these four practices were still seen as acceptable by a majority of professional foresters but the ratings here were simply lower than those of the general public. The only exception was restricting snowmobiles, supported by 68% of the

general public, compared to less than half the forest professionals.

### 6.3. Conclusion

The people of Ontario were supportive of forest management, but under very specific conditions and terms. In general, practices perceived as environmentally sensitive and/or restorative forest-management practices were soundly endorsed. Significantly less support was offered to those forest interventions dependent on chemical or biological agents, except when considering the views of professional foresters (biologists aside). When we revisited the broadly defined management goals introduced in chapter 3 and correlated those goals with specific practices, attitudes, and risks, a clearer definition of each broad goal emerged.



**Note:** Base percentage equals general public acceptability response. Percent difference is percent of each professional group acceptability response minus the general public acceptability response.

**Figure 6.7.** Acceptability of Forest-Management Actions: Difference Between the General Public and Forest Professionals

## A Structural Model Analysis of Support for Herbicides in Vegetation Management

The purpose of this chapter is to describe and test a covariance structural model that used data from each of the primary subject areas as described in Chapters 2 through 6, above. These chapters describe the questions and responses for the following topics: Chapter 2, environmental values; Chapter 3, forest management goals and objectives; Chapter 4, perceptions of environmental risks; Chapter 5, trust in the governmental agencies responsible for vegetation management; and, Chapter 6, support for vegetation management strategies. These broad subject matters were examined in some detail by asking numerous questions, as indicated in the descriptive presentations for the earlier Chapters 2 through 6.

In this chapter, we report on the design and implementation of a structural model and examine how a set of constructs,<sup>1</sup> based upon a subset of variables from these earlier chapters, related to support (and opposition) to a specific vegetation management strategy. The strategy we chose to test was the use of herbicides as a vegetation management option. Herbicide use is often the preferred option for efficient and effective vegetation management but it provoked the most opposition and concern among the survey respondents. Our basic theoretical hypothesis is that each of the constructs described in the model shown in Figure 7.1, when examined as part of a structural model, will have a causal relationship with the level of support for the use of herbicides as a forest vegetation management option. The following section discusses the theoretical considerations, the specific de-

<sup>1</sup>A construct is a concept that can be defined in conceptual terms, but which cannot be measured directly or perfectly. Thus, it must be measured approximately by observed variables

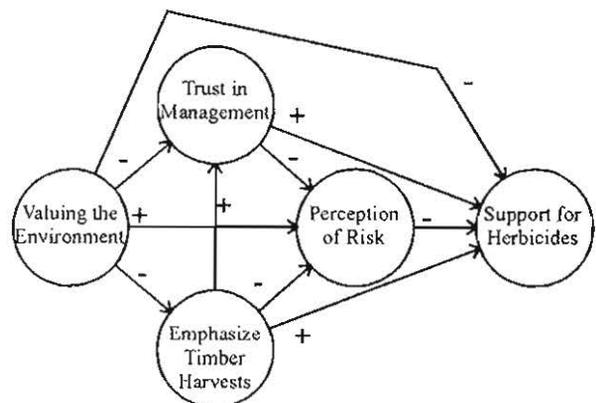


Figure 7.1. Theoretical covariance structural model of factors determining support for the application of herbicides in forest-vegetation management.

sign tested in this exercise, and the characteristics of applying a structural model approach.

### 7.1. Model Description

The modeling approach used in this chapter is called covariance structure modeling or structural equation modeling and has important advantages over more traditional multivariate methods, such as multiple regression or factor analysis. It allows the researcher to examine a series of cause-and-effect relationships simultaneously and is particularly useful when an effect is later seen as a cause in a subsequent relationship (Bentler, 1980; Fornell, 1982, 1987; Hair et al., 1992). Covariance structure modeling is primarily theory-driven and uses a data base to test hypotheses of inter-

est. Hypothesized relationships between constructs are evaluated statistically by noting the direction of the relationship and the strength of each effect. The direct and indirect effects or predictor variables are represented by a configuration of paths connecting model constructs. The use of multiple measures permits the reliability and validity of each construct to be determined. Finally this approach allows the analyst to incorporate latent or observed variables, place them as either a cause or an effect, and calculate their strength.

The structural model shown in Figure 7.1 conceptualizes the relationships among the theoretical constructs. Four components were hypothesized to influence the level of support for use of herbicides in forest management. The purpose of this model is to examine the ability of these four constructs to explain the fifth, *Support for Herbicides*. The general-public<sup>2</sup> sample data was used to test the model.

Three items were used to measure the *Support for Herbicides* construct. Respondents were asked to what extent they believed various forest management actions were either very unacceptable, unacceptable, acceptable, or very acceptable. The three items selected for modeling purposes were: spraying herbicides from helicopters or airplanes to control unwanted forest vegetation; using trucks to apply herbicides to roadsides to control weed growth, and spraying herbicides from tractors to control unwanted vegetation in forests. These three practices represented the most liberal use of herbicides in forest management. They were also the practices that received the least public support. Only 17.6% of the public sample indicated that aerial spraying was acceptable or very acceptable (see Figure 6.3). Spraying herbicides from tractors or trucks was more acceptable with 32.3% and 40.9%, respectively, recording acceptable or very acceptable responses.

The *Perception of Risk* construct measured public concerns about environmental health risks facing the Ontario public as a whole. It was measured by two items. The first is a composite index created by calculating the mean score of 11 environmental risks (e.g., manufacture of chemicals, using herbicides in forests, bacteria in food, nuclear power plants, etc.). Individual risk items were scored from 1 meaning almost no health risk to 4 meaning high health risk. The other item

was a question asking the respondent to evaluate how important the problem of damage to the forest environment was to society. Responses were coded: 1 for not important, 2 for slightly important, 3 for moderately important, and 4 for very important. *Perception of Risk* was hypothesized to have a negative influence on *Support for Herbicides*; people with higher risk perceptions were believed to show less support for using herbicides in forest management.

The *Trust in Management* construct pertains to the public's confidence in federal and provincial government agencies to regulate the use of herbicides. A single indicator was used to measure this construct. Other items in the survey that were hypothesized to represent this construct were inadequate and did not make an additional contribution for the construct. *Trust in Management* was hypothesized to have a positive affect upon *Support for Herbicides* and a negative influence on *Perception of Risk*.

The construct, *Emphasize Timber Harvests* measured the respondent's preferred objectives for forest management. While there are different possible goals forest management could have, for modeling purposes we chose the goal of maintaining timber harvest levels. Two questions were used to measure this construct. The first asked respondents whether sustainable forestry in Ontario would require a major reduction in timber harvest levels. The second item asked whether timber harvests in Ontario forests should be reduced in light of global pressures on environmental resources. The responses to these items were coded so higher scores would reflect a position of maintaining timber harvest levels. *Emphasize Timber Harvests* was hypothesized to have a positive affect on *Support for Herbicides* and *Trust in Management*, and to have a negative influence on *Perception of Risk*. In other words, those who support maintaining timber harvest levels would have lower risk perceptions, higher levels of trust in management, and show greater support for use of herbicides in forest management.

Finally, the *Valuing the Environment* construct measured attitudes toward nature and other species. Two items were used to measure this construct. The first asked whether respondents would be willing to sacrifice much of their current standard of living in order

<sup>2</sup>"General public" refers to the entire Ontario public. See the Appendix for a description of sampling.

to help insure that nature is not harmed. The second variable asked whether all species, including humans, have an equal right to co-exist on the planet. Responses were coded so a high score represented a pro-environmental attitude. *Valuing the Environment* was hypothesized to have a positive influence on *Perception of Risk* and a negative affect on *Trust in Management*, *Emphasize Timber Harvests*, and *Support for Herbicides*. In other words, the model suggested that people holding pro-environmental values and attitudes would have higher risk perceptions, less trust in management, less support for forest management goals that attempt to maintain timber harvest levels, and would be less supportive of herbicide use in forest management.

As illustrated in Figure 7.1, all four constructs were predicted to directly influence *Support for Herbicides*. In addition, *Valuing the Environment* and *Emphasize Timber Harvests* were expected to indirectly influence *Support for Herbicides* through *Perception of Risk* and *Trust in Management*. *Trust in Management* also was hypothesized to indirectly influence *Support for Herbicides* through *Perception of Risk*.

## 7.2. Results

Data were analyzed using the SAS System's CALIS procedure (SAS, 1995). The model tested was a covariance structure model with multiple indicators for all latent constructs except *Trust in Management*, which used a single variable. For this indicator, the variable loading value was fixed at .75 to indicate approximately 40% measurement error and provide reasonable path estimates between constructs for measurement error (see review of structural model literature by Burns, 1994). Correlations and standard deviations for the study's 10 manifest variables are presented in Table 7.1.

Covariance structure modeling typically requires a complete set of responses for each respondent. Missing data can either be reconstructed (e.g., by substituting mean values for missing data) or the database can be limited to only those respondents who have complete data for each variable in the model. In the 1994

Ontario public sample database, there were 1278 respondents with complete data on all items used. Because this was more than adequate for the purpose of this analysis, we used only respondents with complete data.

All measurement and path coefficients have been standardized to ease interpretation and are shown in Figure 7.2.<sup>3</sup> Measurement coefficients range from .48 to .78 and are all significant ( $p < .001$ ). Only two measurement coefficients are below .60. Cronbach coefficient alphas were also computed to measure the reliability of each construct. Two constructs had coefficient alphas below .60 but above .50: *Valuing the Environment* and *Emphasize Timber Harvests*. While these are lower than would be desirable, it was felt that they were acceptable for this area of research.

The first test of the model indicated that three paths were not significant at the .05 level: the direct effect of *Valuing the Environment* on *Support for Herbicides*; the indirect path from *Emphasize Timber Harvests* to *Trust in Management*; and the direct path from *Emphasize Timber Harvests* to *Support for Herbicides*.

A statistical test (i.e., the Wald test; see Bentler, 1989) suggested that it was possible to remove two paths without a significant decrease in the model's fit to the data: the path from *Valuing the Environment* to *Support for Herbicides* and the path from *Emphasize Timber Harvests* to *Trust in Management*. Therefore, a revised model was tested without these two paths. Goodness of fit indices changed only slightly with these modifications. However, the coefficient for the direct path from *Emphasize Timber Harvests* to *Support for Herbicides* became statistically significant ( $p < .05$ ) even though it was modest (.12). Other path coefficients remained essentially the same (although somewhat stronger) with the exception of the link between *Valuing the Environment* and *Trust in Management*, which appeared much stronger in the revised model. The path coefficient went from  $-.21$  to  $-.30$  in the revised model.

Goodness of fit indices for the revised model appear on Figure 7.2, and indicate a good fit for the model to

<sup>3</sup>The measurement coefficient can be interpreted as the correlation of the variable with the underlying construct. The path coefficient is similar to a regression coefficient. A coefficient of .40 on path A to B means that a one standard deviation change in A will produce a .40 standard deviation change in B.

	Std. Dev	Q15	Q19	Q58	Q54R	Q70R	Env. Risk	Q2	Q118	Q120	Q130
Q15. I would be willing to sacrifice much of my current standard of living in order to help insure that nature is not harmed	0.70	1.00									
Q19. All species, including humans, have an equal right to co-exist on the planet	0.70	0.33	1.00								
Q.58. Federal and provincial government agencies do a good job in regulating the use of herbicides and insecticides	0.68	-0.15	-0.09	1.00							
Q54R. Sustainable forestry in Ontario will require a major reduction in timber harvest levels.*	0.63	-0.24	-0.16	0.12	1.00						
Q70R. Timber harvests in Ontario forests should be reduced in light of global pressures on environmental resources*	0.66	-0.29	-0.20	0.11	0.40	1.00					
Environmental Risk Index	0.56	0.36	0.25	-0.23	-0.26	-0.27	1.00				
Q2. Damage to forest environment	0.73	0.30	0.23	-0.09	-0.26	-0.22	0.46	1.00			
Q118. Spraying herbicides from helicopters or airplanes to control unwanted forest vegetation	0.68	-0.12	-0.11	0.25	0.12	0.14	-0.22	-0.10	1.00		
Q120. Using trucks to apply herbicides to roadsides to control weed growth	0.66	-0.16	-0.10	0.29	0.10	0.12	-0.22	-0.10	0.41	1.00	
Q130. Spraying herbicides from tractors to control unwanted vegetation in forests	0.66	-0.15	-0.11	0.28	0.17	0.15	-0.25	-0.13	0.47	0.49	1.00

\*Coding scored so high score = no reduction necessary.

Note: Correlation measures the strength and direction of the relationship between two variables: the coefficients range between -1.00 and +1.00. All correlations in this table are significant at  $p < .001$ .

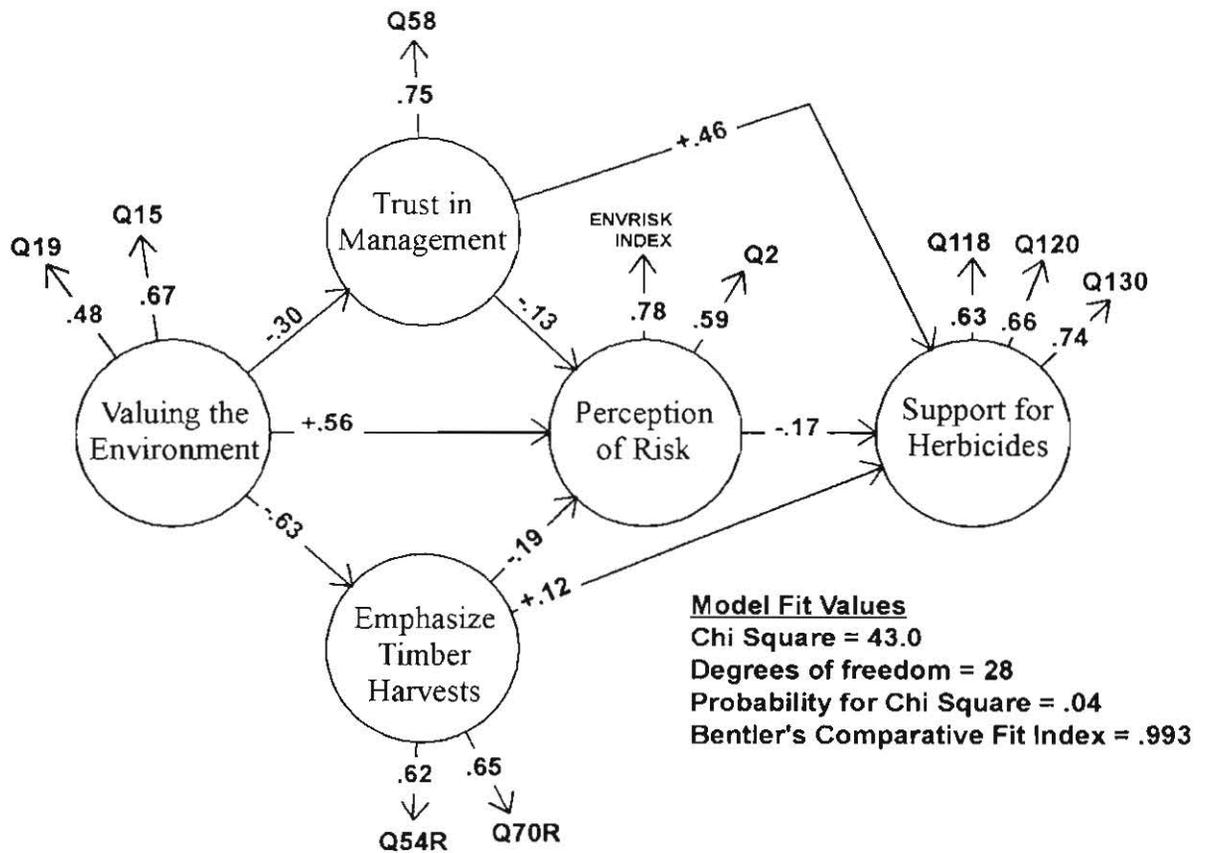
**Table 7.1.** Intercorrelations of Ten Manifest Variables

the data. Bentler's Comparative Fit Index (CFI) and the Bentler-Bonett Non-normed Fit Index (NNFI) are both well above .9, which is considered the minimum acceptable level. The CFI for our model was .99, suggesting the model performed very well in explaining the sample covariances.

*Trust in Management* was found to have a moderately high (.46) direct positive influence on *Support for Herbicides*. The coefficient linking *Perception of Risk* directly to *Support for Herbicides* was modest, but statistically significant indicating that higher risk perceptions tend to lower level of support for herbicide use. *Trust in Management* was also found to influence *Support for Herbicides* indirectly through *Perception*

*of Risk*. The coefficient was low (-.13) but statistically significant ( $p < .01$ ). The low coefficient for this path is surprising given findings from other research, which has found strong links between risk perception and trust (Bella, Mosher, & Calvo, 1988a, 1988b; Dantico, Mushkatel, Pijawka, & Ibitayo, 1991; Flynn, Burns, Mertz, & Slovic, 1992; Kemp, 1990; Rayner & Cantor, 1987; Slovic, Flynn, & Layman, 1991; Slovic, Layman, & Flynn, 1991).

*Valuing the Environment* had an indirect affect on *Support for Herbicides* through *Perception of Risk*, *Trust in Management*, and *Emphasize Timber Harvests*. The coefficients linking environmental values with forest management goals emphasizing timber harvests and



**Notes:** This model is the revised model, which drops two paths shown in Figure 7.1., because they were nonsignificant. The indicator variables names (e.g., Q19) represent the question number from the survey. The full text of the questions can be found in Table 7.1. The coefficients on the arrows going from the latent construct to the indicator variables are the standardized measurement coefficients and can be interpreted as the correlation between the variable and the underlying construct.

**Figure 7.2.** Covariance structural model to examine factors determining support for the application of herbicides in forest-vegetation management: results with general public data.

risk perception were particularly strong,  $-.63$  and  $.56$  respectively. Pro-environmental attitudes were also found to be associated with lower trust levels ( $-.30$ ).

The results indicated that *Emphasize Timber Harvests* had a positive direct influence on *Support for Herbicides* (coefficient of  $.12$ ,  $p < .05$ ) and a positive indirect affect through *Perception of Risk* with statistically significant coefficients of  $-.19$  and  $-.17$ , respectively ( $p < .05$ ).

Table 7.2 summarizes the total effects of each construct on *Support for Herbicides*.<sup>4</sup> In summary, trust in those who manage decisions about and application of forest herbicides seemed to have the strongest influence on the level of support for herbicide use, followed by one's environmental values. Risk perceptions and forest management goals had a small but significant influences on level of support. These factors explain approximately 35% of the variance in the *Support for Herbicides* construct.

<sup>4</sup>Total effect is calculated by summing the products of the coefficients for each path.

Construct	Total effect on support for herbicides
Perception of risk	-0.17
Trust in management	0.48
Emphasize timber harvests	0.15
Valuing the environment	-0.34

Table 7.2. Total Effects on *Support for Herbicides*.

Environmental values seemed to have the strongest influence on risk perceptions. The goals of forest management (to emphasize timber harvests) and trust in the managers had a significant, but smaller influence on risk perceptions. Approximately 55% of the variance of risk perception was explained by these factors.

Trust in management may be the least understood construct in the model. Environmental values had a moderate influence on trust, but only 9% of the variance of trust was explained by the values construct.

Environmental values had a very strong negative affect on *Emphasize Timber Harvests* with a path coefficient of  $-.63$ . Thirty-nine percent of the variance of the goals construct was explained by *Valuing the Environment*.

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## A Decision-Pathways Experiment

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Surveys have unique attributes for gathering information on public opinions that cannot be matched by any other method. Most importantly, they can be used to quickly gather information about a large population on a wide variety of topics. As long as scientific (and statistical) criteria are met, the results of surveys can be generalized and can therefore provide insights into the opinions, beliefs, and behaviors of the larger public.

However, surveys have been criticized for being too abstract and for failing to provide accurate indications of behavior under context-specific conditions. This is because the questions asked of people in surveys reflect their opinions, rather than actual decisions such as those made in the marketplace. The concern is that when faced with a problem in all its real-world complexity, people may take actions that cannot be predicted by their expressed opinions because other factors may come into play. For example, people may express support for ideas or activities that are mutually exclusive when faced in a practical, trade-off situation. How is the survey analyst to interpret opinions that support both of two opposing sides of a decision that must be made?

In an attempt to address this important issue, the 1994 Ontario vegetation-management survey included an experimental set of questions on vegetation-management practices, nature, and environmental risks, costs and benefits that encouraged participants to face some of the complexities and tradeoffs inherent in real-world decisions. These questions followed a decision-path-

way approach, which was designed to simulate real-world judgments. After reading a short introductory scenario, respondents were asked an opening question about whether they supported the use of vegetation-management techniques in an area slated for replanting. Based on their answers, respondents were then asked a sequence of questions that followed one of many possible pathways, each presenting sets of choices and decisions specific to a different way of thinking about forest vegetation-management techniques.

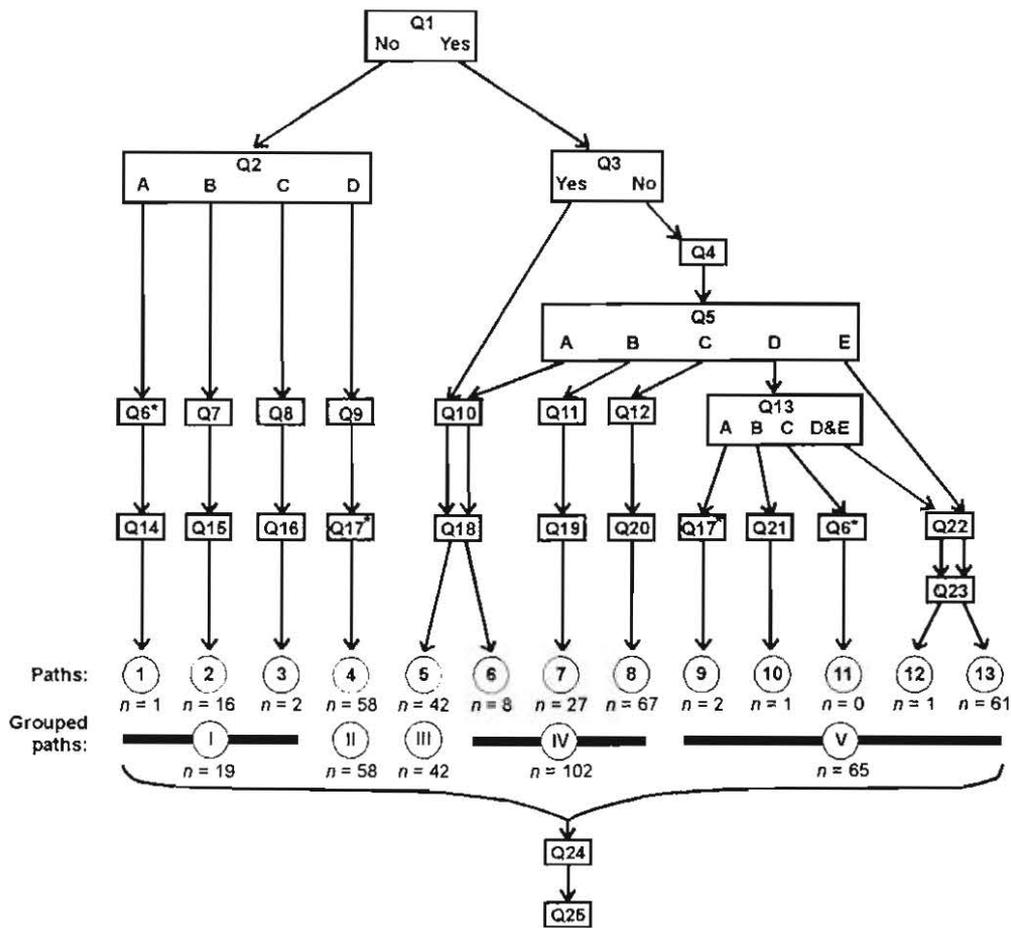
### 8.1. Design

The decision-pathway questions were administered to 303 people chosen at random from the larger, general public<sup>1</sup> sample, 208 people chosen at random from the timber-community sample, all participating forest professionals ( $n = 204$ ), and the outdoor interest group respondents ( $n = 14$ ). In each case, the structured questions were asked after all other information relating to vegetation-management options, economic/environmental tradeoffs, and risk perceptions had been obtained, so as not to influence these earlier results.

Attachment A at the end of this chapter provides a copy of the decision-pathway survey questions. The survey contained 25 questions with 13 discrete pathways that completed a route from the first question to the last. These pathways presented respondents with 6 to 9 of the 25 questions included in the overall design. As each question was answered, the respondent was routed to a linked follow-up question until the final outcome evalu-

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<sup>1</sup>“General public” refers to the entire Ontario public. See the Appendix for a description of sampling.



\*Questions 6 and 17 are each asked twice, on two different paths.

Figure 8.1. Decision Pathways Map

ation was made. The opening question had two possible answers and the intermediate questions had from one to five possible answers. The ability to link the answers and subsequent questions in an efficient and seamless manner depended upon the use of a computer-assisted telephone interview (CATI) system. All questions provided closed-ended answers from which the respondents made a choice.

The questions presented to participants in the decision-pathways survey were developed on the basis of discussions held earlier in focus groups. The goal of these focus-group sessions was to gain sufficient understanding of the thoughts and reasoning processes of individuals to then create a comprehensive set of pathways.

Participants would choose one of the pathways, and only one, as a constructed representation of their point of view. By asking a sequence of between six and nine linked questions, each representing a unique pathway, our hope was to investigate the source of respondents' support for, or opposition to, various possible forest vegetation-management options. Figure 8.1 shows a schemata or map of the question numbers and pathways. The text of the questions is shown in Attachment A.

The decision-pathway section of the survey opened with a brief description of a forested area about to be harvested for timber. Question #1, posed to all respondents, asked whether participants supported the idea of

controlling for unwanted vegetation after replanting. Respondents who rejected, outright, the idea of managing for unwanted plants were then asked a more detailed question to explain their reasoning. The answer given to this question (#2) determined how they would continue through the succeeding portions of the pathway. Four possible reasons were presented for rejecting vegetation management, each of which initiated a distinct pathway.<sup>2</sup>

*Path 1.* #2 A: forest managers don't know enough

*Path 2.* #2 B: the respondent doesn't know enough to choose

*Path 3.* #2 C: the respondent doesn't trust forest managers

*Path 4.* #2 D: nature is complex and should be left alone.

Respondents who accepted the idea of vegetation management were asked Question #3. After hearing that forest managers recommended the use of aerially sprayed herbicides, respondents were asked whether they agreed or disagreed (with this recommendation). Respondents who agreed moved on to a decision pathway that was different from those who disagreed.

*Path 5.* #3 Yes: supporters of aerial herbicides.

Respondents who disagreed with the use of aerial herbicides in this situation were presented with a scenario concerning the invasive weed, purple loosestrife. They were told about the weed's "potential to overrun and destroy native plants growing in some of the lower elevation areas of the forests." They were then asked about their willingness to use herbicides (or not) via five possible questions/options. Four of these options created unique pathways:

*Path 6.* #5 A: for the invasive weed, okay to use aerial herbicides

*Path 7.* #5 B: okay to use herbicides from tractors

*Path 8.* #5 C: okay to apply herbicides from backpacks

*Path 13.* #5 E: okay to use a non-herbicide option.

The fifth possible response to question #5, response D—"Even in this case, do not use herbicides"—led respondents to a new question (#13) which gave rise to

one of four more pathways. These new pathways attempted to probe the reasoning of respondents who persistently resisted the use of aerial herbicides.

*Path 9.* #13 A: nature is complex

*Path 10.* #13 B: herbicides are too risky

*Path 11.* #13 C: forest managers don't know enough

*Path 12.* #13 D,E: there are better alternatives, herbicides are not effective.

These questions routed respondents to 1 of 13 potential pathways. Thereafter, respondents were asked two further questions designed to elicit more in-depth information about why they chose their particular decision path and what they thought its potential strengths and/or weaknesses might be. These questions varied with the nature and intent of each pathway.

Finally, all respondents were asked two closing questions. The first question (#24) gave each respondent a chance to reconsider his or her initial choice (to support or reject vegetation management). The second question (#25) asked their reaction if their preferred position on vegetation management was not adopted. Of the 303 general-public respondents who began the decision-pathway questions, 17 did not complete this section, for a final sample of 286.

Though 13 possible decision pathways were available to respondents, some paths attracted many respondents while others attracted only a few participants or none at all. Some pathways presented strikingly different decision options; other pathways were very similar in terms of the ideas or opinions they represented. Consequently, the similar paths and the low-respondent paths were combined (where appropriate) to produce five distinct, representative pathways (see Figure 8.1). This integration across pathways was expected: in light of the experimental nature of this portion of the survey, we wanted to provide respondents with as much freedom of expression and thought as possible. Thus, it was important to offer respondents a broad range of options and to give them an opportunity to make their pathway selections from the available range of reasonable possibilities.

<sup>2</sup>Textual descriptions of the following pathways are abbreviated for descriptive purposes. The complete text of the questions and answers is shown in Appendix A3.

## 8.2. Results

Two of the five representative pathways, summarized below, account for those respondents who initially opposed vegetation-management initiatives.

Oppose management (#1 No)

1. #2 A,B,C: Lack of knowledge or trust in oneself or in management
2. #2 D: Nature is too complex for people to manage.

The three other pathways cover those initially supportive of management initiatives:

Support management (#1 Yes)

3. #3 Yes: Support management recommendations for aerial herbicides
4. #5 A,B,C: Support herbicide use after hearing the weed-threat scenario
5. #5 D,E: Oppose herbicide use after hearing the weed-threat scenario.

Each of these five paths describes a unique view about forest vegetation-management options. The following description of the five decision paths uses data from the Ontario general-public decision pathways sample ( $N = 286$ ).

*Path 1 ("Distrust forest management").*  $n = 19$  (6.3% of general-public sample, 24.1% of those who opposed management). These respondents were cautious about forest management because they lacked faith in their own level of knowledge and in the knowledge of forest managers. Some respondents also distrusted forest managers. This group wanted to know more about how decisions were made and were concerned about the impact of forest-management decisions on forest ecology and on the health of community residents and forest workers. They did not view economic concerns as important.

*Path 2 ("Nature is too complex").*  $n = 58$  (19.1% of general-public decision pathways sample; 73.4% of those who opposed management). This group saw nature as complex and believed that forest managers lacked adequate knowledge. These respondents prioritized forest health and dismissed economic concerns as irrelevant. The group favors a "hands-off" policy: let nature take care of itself. These respondents see the forest as too complex to manage and believe in nature's

intrinsic wisdom or ability to manage itself. They would like to see the forest returned to wilderness.

*Path 3 ("Support aerial spraying").*  $n = 42$  (13.9% of the general-public decision pathways sample; 19.7% of those who supported vegetation management). This group, almost 20% of those who believed in the necessity of vegetation management, was willing to support aerial spraying. They did not need encouragement in the form of a threatening killer-weed scenario. This group explained their support of aerial herbicides in terms of speed, effectiveness, and minimal human intrusion into the forest. Economic costs were not a concern.

*Path 4 ("Ground-applied herbicides only").*  $n = 102$  (33.9% of general-public decision pathways sample, and 47.9% of those who agreed to management). This group supported the need for vegetation management, but all initially vetoed aerial spraying of herbicides. However, when faced with the threat of the invasive-weed scenario, these respondents changed their position and moved to support some use of herbicides. However, most of these respondents ( $n = 94$ , or 92%) only supported herbicide use when applied by backpack sprayers or with tractors. Eighty-two percent (82%) of respondents explained their support of non-aerial herbicides in terms of the specificity and care offered by these ground applications. Although these respondents supported herbicides, 77% thought there could be a problem with herbicide applications. Damage to wildlife, human health, and forest ecology were the primary concerns.

*Path 5 ("Use alternatives only").*  $n = 65$  (21.5% of general-public decision pathways sample, and 30.5% of those who supported vegetation management generally) All members of this group supported vegetation management, but when faced with the killer-weed scenario they resisted all herbicide options. Four of the 65 rejected herbicides outright. The other 61 (93.8%) believed there were better alternatives to herbicides. Their preferred management options are listed here in "rank" order: cover crops (31.1%), grazing animals (26.2%), natural plant toxins (18%), manual cutting (16%), mulching (6.6%), and managed fire (4.9%). When asked why more people didn't support their "alternative" options, the primary reasons given by these 61 respondents were: incorrect information about the economics of alternatives and incorrect information about the effects of alternatives on human health. Un-

like other participants in the structured and general survey, effects of herbicides on the forest environment were ranked last by these respondents.

### 8.3. Sample Group Comparisons

The paths selected by representatives from the general public, timber-dependent communities, and professional foresters are summarized in Figure 8.2.

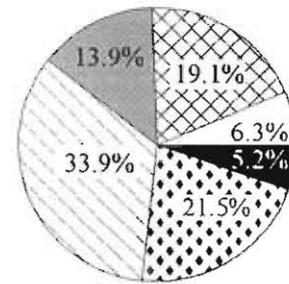
The general-public respondents and the timber-dependent community respondents generated similar responses to the decision-pathways questions. Seventy percent of the general public supported the idea of management for replanted areas, whereas 26% did not. In timber communities, 69% of respondents supported vegetation-management options whereas 30% opposed them. For the general public, 20% of those supporting management also supported aerial spraying of herbicides. Another 48% approved of herbicide use once faced with the threatening-weed scenario. Similarly, in the timber-community sample, 18% of management supporters initially approved aerial herbicides. Fifty-three percent approved the application of herbicides after being presented with the threatening-weed scenario.

Those in the general public who did not support management of replanted areas were most likely to believe that nature is too complex and should be left to manage itself. Seventy-three percent of those opposing management took this view. In the timber-community sample, these proportions were even higher: 76% of those opposing management believed that nature is too complex and should be left to manage itself.

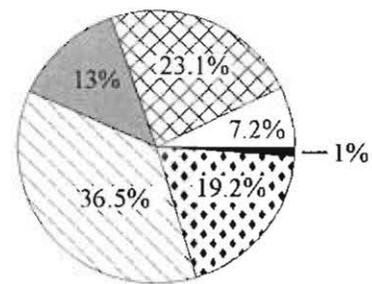
Forest professionals, on the other hand, responded quite differently from the general-public and timber-community samples. In general, forest professionals were much more supportive of vegetation management in replanted areas. Ninety percent of the members of two forest professional groups (OMNR and industry foresters) supported the idea of management. Only 7 out of 183 (4%) of these forest professionals opposed management in replanted areas. Again, OMNR biologists represented a unique position among forest professionals: only 72% of biologists supported forest management, a response similar to that of the general public.

On the question of herbicide use, support for aerial spraying (before the weed-threat scenario) ran from a low of 44% for

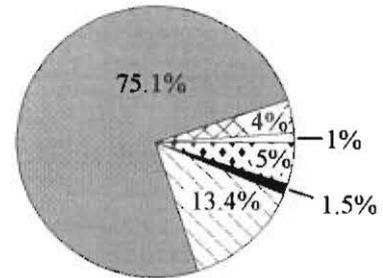
**General Public**



**Timber-Dependent Communities**



**Forest Professionals**



- Path 1. Distrust forest management
- Path 2. Nature is too complex
- Path 3. Support aerial spraying
- Path 4. Ground-applied herbicides only
- Path 5. Use alternatives only
- Don't know/no answer, incomplete

Figure 8.2. Pathway Choices

biologists to a high of 87% for industry foresters. Here, even the biologists were twice as likely as the general public or residents of timber communities to support the use of aerial herbicides. When the threat scenario was offered, the support for herbicides jumped to almost 100%. In this case, only 3 of 204 (2%) forest professionals continued to oppose the use of herbicides when faced with the outbreak of an invasive weed.

Of the 10 forest professionals who initially resisted any forest management, eight explained their position in terms of the complexity of nature. These responses were similar to those of the general public and timber-community residents.

#### 8.4. Demographics and Decision Making

The Ontario general-public survey responses to the first question in the pathway (#1) and the pathway chosen thereafter were unaffected by most demographic variables. Age, income, community size, and political orientation all failed to predict the subjects' chosen pathway. However, education and gender correlate with the pathways chosen by respondents. Subjects with postgraduate degrees were a unique group. Those respondents with advanced degrees were between 9% and 15% less likely to agree on the general need for forest management (63%); nearly half (47%) of those who did agree to forest management rejected the use of herbicides despite exposure to the "threat" scenario. Overall, subjects with postgraduate degrees were twice as likely to resist herbicide use compared to those subjects with undergraduate degrees. All of the postgraduate subjects who resisted management at the top of the pathway did so because they believed that: "nature is too complex to manage." As a group, those with postgraduate educations were the strongest opponents of herbicides, the most supportive of ideas defined as deeply ecological.

The subset of the Ontario general-population sample that answered the decision pathway questions were composed of an equivalent number of men and women (141 women and 145 men). Men and women were equally likely to respond "yes" or "no" to the initial question (#1) regarding support for forest management after replanting: 75% of men and 73% of women supported vegetation management after replanting.

Men's and women's responses differed after being presented with herbicide options. When first asked about

herbicides (prior to any mention of weed threats), less than one-third (12) of the 42 pro-herbicide respondents were women. When the remaining respondents were offered herbicides as an option for dealing with the threat of an invasive weed, almost as many women as men accepted the option; 49 women and 53 men supported some (e.g., ground or aerial) herbicide use at this juncture. (The sample pool at this point had more women than men in it, 92 vs. 76, because so many men had previously opted for aerial herbicide use.) In the end, the number of women supporting herbicide use, with or without the weed-threat scenario, was 61. The number of men supporting herbicide use under these same conditions was 83. In other words, 55% of men supported herbicide use as opposed to 40% of women. Under the conditions of threat, 65 people (22%) still refused to support herbicide use; these resisters were twice as likely to be women (43 women vs. 22 men).

#### 8.5. Considering Environmental Values in Light of Decision-Pathway Responses

*Pathways as predictors.* The paths chosen by respondents to the structured question included a set of environmental decisions representative of a diverse set of environmental values. In particular, Path 2 reflected a view of nature as finite, limited, and at risk if controlled or exploited by humans. We have referred to these views as "deeply" ecological in chapter 1, a label borrowed from A. Naess (1991); Cotgrove (1982) has used the term *catastrophist* for a similar set of views. Path 3 appears to represent an opposite position, a view some theorists have labeled "cornucopian," reflecting a concept of nature as abundant, thus inexhaustible (Cotgrove, 1982; Thompson, Ellis, & Wildavsky, 1990).

Using the Ontario general-population survey we constructed two environmental indices, deep ecology and environmental activism, to measure the strength of environmental beliefs and the commitment to environmental actions. The deep-ecology index used four questions about a respondent's environmental beliefs. The questions included: concern with the speed of environmental change; support for the equal existence of **all** species; attraction to a spiritual quality in nature; and a willingness to sacrifice **much** of one's standard of living for the protection of nature. The environmental-activism index used four different questions about pro-environmental behavior. The questions included:

membership in environmental organizations; voting for candidates on the basis of their environmental positions; regular reading of an environmental magazine; and the donation of money to environmental causes. Interestingly, subjects who chose Path 2 had significantly higher scores on both indices, but they were not the subjects with the highest scores. The highest scores on both indices were recorded by subjects who chose Path 5, the path that included support for management, yet resistance to any form of herbicide use. So it seems the initial question (#1) did not necessarily separate people who hold strong environmental views from those who do not. Part of the explanation for this probably lies in the way question #1 is framed. Cutting or harvesting the forest is assumed; subjects are only asked about their support for management of the forest given such logging. Many environmentalists (as defined by our indices) appeared willing to support management of an environment that had already been disturbed; strong environmental views emerged, instead, in the form of resistance to herbicide use. Consistently, subjects who chose Path 3, the path taken by respondents supportive of aerial herbicides, had the lowest average score on both the deep ecology index and the environmental activism index.

Paths 3 and 5 are unique in that they clearly express management applications suggested by the ideas embedded in the Ontario general-population survey. As discussed in chapter 4, material on risk perceptions examined the fact that many people see technologies, practices, natural hazards, environmental hazards, and certain forest-management practices as involving considerable risk. This aggregate response varied significantly when respondents from paths three and five were examined. Path 3 respondents perceived less than average risk in all 22 potential hazards; Path 5 respondents saw more risk than the average rating for all 22 hazards. Path 3 respondents not only see less risk, they frequently see much less risk, with moderate or high health risk 16.9% lower than the Ontario general-population sample average. This pattern of "reduced" perception of risk is stronger still with regard to some forest-management practices. For example, 72.5% of the Ontario general-population sample viewed herbicides as moderately or highly risky, but for Path 3 respondents the perception of risk was 43.2%, a reduction of 29.3%. Similar differences existed between Path 3 respondents and the general sample when comparing risk ratings for the agricultural use of herbicides, geneti-

cally engineered bacteria, loss of forest environment, and dioxin from pulp mills.

Path 5 respondents saw more risk, but do not differ as dramatically from other respondents; an average percentage of Path 5 respondents see moderate or high health risk at a rate that is 8.3% higher. This "higher rate" finding is true across most hazards, including most forest-management practices. However, in the case of herbicide use in the forest, Path 5 respondents expressed an exceptionally high rating—87%, as opposed to a 72.5% rating by the other decision-path respondents. This Path 5 risk rating (87%) differed dramatically from the 43.2% rating given by Path 3 respondents. In the case of herbicide use in the forest, there was a difference of slightly more than two-to-one in the percentage of those who saw high risk. The gap in perception of risk between these two pathway groups demonstrated the strong relationship between risk attitudes and the support, or not, of specific forest-management practices.

Other pathways were not generally predictive of responses in the main survey. Path 2 respondents, who opposed management in question #1 because of the belief that nature is complex, expressed environmental attitudes comparable to respondents from Path 5, but the similarity disappeared when nonenvironmental issues (e.g., health risk questions) were examined.

## 8.6. The Decision-Pathway Experience and Final Choices on Vegetation Management

The pathway questions presented respondents with the types of interrelated issues that need to be faced in the course of reaching real-world decisions about forest-management options. The respondents who chose herbicides under any of the conditions offered were given a set of questions addressing potential problems inherent in herbicide use. These "potential problem" questions drew attention to herbicide risks, albeit in a reasonable manner, to address concerns that might not have come to mind when herbicide choices were first offered. The act of introducing reasonable potential risks, even if they are not quantified or well described, has been shown to increase people's perceptions of risk (Gregory & Lichtenstein, 1994): Even a "hint of risk" may prove quite powerful in changing people's opinions about the value of herbicide use. Consequently, we analyzed people at the end of the decision-pathway process.

As anticipated, overall support for using herbicides drops after exposure to questions about why herbicides were selected and what the potential risks from herbicides might be. Of the 213 people who supported vegetation management after the first (#1) pathway question, 144 (68%) chose one of three forms of herbicide use before or after exposure to the invasive-weed scenario. At the end of the pathway, 96 of these people still supported herbicide use but 48 (one-third) changed their positions and no longer supported the use of herbicides. Most of the people who had moved away from herbicides still supported vegetation control (38 of the 48), but 8 of the initial herbicide supporters had moved to a “hands-off-the-forest” position.

The final 144 herbicide supporters were made up of two groups: 42 people who supported herbicide use **before** receiving information about a killer-weed threat, and 102 people who supported herbicide use only **after** the invasive-weed threat. The group of 42 had all answered yes to an initial question about the use of aerial herbicides. Yet, at the end of the pathway questions, after being asked about potential risks from herbicides, only 12 (or 29%) were still supportive of aerial herbicide use. Fourteen people decided, instead, to support ground-based applications of herbicides. These 26 people made up 62% of the original 42. One-third of the original 42 herbicide supporters moved completely away from herbicide use when exposed to a “hint of risk.” Only 29% of this group consistently endorsed the aerial application of herbicides.

Among the 102 people who selected herbicides as the preferred method for dealing with a potential infestation of weeds, 70 (69%) maintained their support after questioning about its potential risks. Thirty-two people, or 31%, no longer supported any method of herbicide use and six (6%) supported leaving nature completely alone.

The design of the decision pathways did not allow herbicide risk, or the forest-threat scenario questions, to be asked of the 79 respondents who rejected forest vegetation-management practices at the outset (#1). Instead, these people were questioned about why they opposed vegetation management and about their beliefs concerning nature and forest management. Their additional responses included belief in beneficial results of forest management without any mention of the potential risks of herbicide use. But herbicides were included as part of their end-of-pathway response options. Of the 79

respondents in this anti-management group, 34 (43%) continued to agree that nature should be left alone. However, 29 (37%) people supported management of vegetation without herbicides. Fifteen (19%) supported the use of herbicides, despite their initial opposition to vegetation-management techniques. Availability of options appeared to lead some respondents toward a shift in opinion. The questioning these people went through mentioned several benefits of forest management, including its effects on jobs and the economy as well as the idea that forests could be managed to improve forest health. Thirty-two of the 58 people (55%) in Path 2 supported the idea of management for forest health.

## 8.7. Conclusion

We began this chapter by presenting an alternative, experimental survey technique, which we term the decision-pathway approach. By simulating decision processes more typical of real life judgments, respondents make a series of choices and decisions that explain their positions in greater detail and the survey information available to policy makers is enriched.

The pathway findings suggest that when faced with the possibility of risk, threat of infestation, or information about the diverse benefits of forest management, respondents’ initial opinions can change. Despite pervasive support for environmental values (see chapter 2), a large percentage of the public is willing to support diverse forest vegetation-management options. This is especially true when alternatives to aerial herbicides are provided. Those who do not endorse intervention via forest management generally explain their resistance in terms of nature’s complexity and ability to manage itself.

People perceive an innate complexity and wisdom in natural systems and, in many cases, feel that these qualities are lacking in forest-management practices. Yet after alternative management practices are introduced, some of these respondents reverse their positions and indicate a new support for management practices. Even biologists, who strongly endorse environmental protection (see chapter 2), are willing to support management initiatives (including the use of herbicides) in the face of an infestation of noxious vegetation.

Overall, these results emphasize that opinions are complex phenomena, subject to change when challenged

by new information or by the diverse consequences of actual behavior. Decision-pathway analyses offer some hope for understanding the dynamic nature of these opinions without having to wait until a real-life management or forest-policy conflict arises. By that time, unfortunately, it may be too late to communicate effectively with the concerned parties. In this sense, decision-pathway surveys offer a promising new tool for forest managers to learn about, and work with, their human constituents.

# Attachment A

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## Decision-Pathway Survey Questions

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The paths selected by representatives from the general sample, timber-dependent communities, and professional foresters are summarized in Figure 8.1.

This final series of questions asks you to think again about the decisions faced in management of Ontario's forests. Often forest management decisions are linked: first one thing needs to be decided, then something else, and then something else again. So we will be asking you to think like a forest manager and make several decisions, one after the other.

Here is the context. The provincial government oversees the management of a large tract of land in northern Ontario. Most of the trees on the property are mature spruce and pine, between 60' and 80' tall. Birds and wildlife are common and there are several small lakes. Although no one lives on the property, nearby areas are occasionally used by campers during the summertime and by snowmobilers and cross-country skiers in winter.

The land has never been cut but has been managed for timber production since the 1930s. It is scheduled to be harvested for the first time later this year and, after the merchantable timber has been removed, the area will be replanted with a mixture of fir and spruce.

**Q1.** *The first decision is a common one for foresters in Ontario: should managers try to control weeds and other vegetation that might compete with the trees that have been replanted?*

Yes, managers should control unwanted vegetation?

No, managers should not control unwanted vegetation

**Q2.** *We'd like to know more about why you are opposed to controlling unwanted forest vegetation. Which of the following four reasons is the most important in explaining your opposition to vegetation management?*

A. Ontario's forest managers don't know enough to distinguish good from bad plants

B. I don't know enough about forest management to make an informed choice

C. I don't trust the recommendations of Ontario's forest managers

D. Nature is complex and should be left to manage itself.

**Q3.** *Many different techniques are available for controlling unwanted forest vegetation. In this case, the recommendation is to control unwanted vegetation by aerial spraying of herbicides, using airplanes or helicopters. Do you agree?*

Yes, I agree

No, I do not agree

**Q4.** *Which one of the following reasons best describes your response?*

Herbicides sprayed from airplanes can drift off-target and affect other areas

Better vegetation management techniques are available

Spraying herbicides from airplanes is opposed by many Ontario residents

Scientists don't know enough about the long-term effects of aerial herbicides

Aerial spraying of herbicides is too expensive

**Q5.** *In one section of the forest there has been an outbreak of an invasive weed, accidentally brought into Ontario from Europe in the early 1900s. This weed has the potential to overrun and destroy native plants growing in some of the lower elevation areas of the forests. Suppose that the use of herbicides is the only sure way to stop the spread of this weed. Under these conditions, which one of the following options would you support?*

- A. Use aerial herbicides but apply as little as possible
- B. Use herbicides but spray from tractors rather than airplanes
- C. Use herbicides but have workers apply them using backpack spray equipment
- D. Even in this case, don't use herbicides
- E. Don't use herbicides because there are better alternatives

**Q6.** *Other people in Ontario also feel that forest managers just don't know enough to make these very complex decisions. Which one of the following answers best describes the basis for your concern?*

Forest managers are not sufficiently trained

The science is complex and we don't yet know very much about how forests work over time

Forest managers often argue; if they knew what they were doing, then everyone would pretty much agree

Forest managers generally take a short-run view of things and it's the long-run that matters here

**Q7.** *It's true that forest vegetation management can pose complicated problems. Which one of the following kinds of information about forest management alternatives would be most helpful to you?*

Information about effects on forest ecology

Information about effects on the health of forest workers and community residents

Information about effects on the provincial economy

Information about how forest management decisions are made in Ontario

**Q8.** *It's not clear what should be done to improve the public's trust in forest managers. In order to improve the public's trust, which one of the following actions would you recommend be tried first?*

Forest managers should give the public more complete information about their management practices

Forest managers in Ontario should stop listening so much to industry

Forest managers in Ontario should stop listening so much to environmentalists

A provincial commission should review Ontario's forest vegetation management practices

**Q9.** *Other people in Ontario also feel like you do—that nature is complex and should be left to manage itself. Which one of the following reasons do you think gives the best description of why you feel this way?*

Nature's wisdom is greater than human's wisdom

Managed forests should be left alone so they can return to wilderness

Forest management is too expensive, given the current state of the economy

Nature is too complex for humans to manage forests effectively

**Q10.** *Which one of the following reasons is most important to your support for aerial spraying of herbicides?*

It quickly covers a large area of the forest

It is inexpensive compared to alternative methods

It reduces the amount of human activity in the forest

It is the only effective way to get rid of some types of unwanted forest vegetation.

**Q11.** *You selected the use of tractors instead of airplanes. Please tell us which one of the following three reasons why is the most important from your point of view?*

It's easier with tractors to be very specific about where the herbicide is applied

Tractors are safer than airplanes for forest workers

Spraying herbicides from tractors is cheaper

**Q12.** *You would like to see backpack sprayers used in this case instead of airplanes. Please tell us which one of the following reasons why is the most important from your point of view?*

Backpack sprayers can be more careful about where the herbicide is applied

Backpack sprayers are safer for forest workers and equipment operators

Backpack spraying is cheaper

**Q13.** *Which one of the following five explanations best describes your opposition in this case to the use of herbicides?*

A. Nature is complex and should be left to manage itself

B. The risks of herbicides are too great

C. Managers don't know enough to distinguish good from bad plants

D. I think there are better vegetation management alternatives

E. I don't believe that herbicides will prove to be effective

**Q14.** *You have expressed a lack of confidence in the ability of Ontario's foresters to make sound vegetation management decisions. How do you feel, in general, about the role of scientists in managing complex environmental issues? Would you say:*

You don't trust any scientific experts

Experts such as scientists know a lot but they are often self-serving in their decisions

Experts should not have such a big role in making environmental decisions—this is the job of the community,

the public and our elected officials

The real experts on forest issues are loggers and forest community residents

**Q15.** *You have said that you don't know enough about forest management to make an informed choice among options. Which one of the options listed here do you think is the best all-around source for this information?*

The provincial government through the Ministry of Natural Resources

One of the environmental groups such as the Sierra Club

The federal government through Forestry Canada

I don't think that any experts have the wisdom to help because all experts are biased in their opinions

**Q16.** *You have expressed a lack of trust in Ontario's forest managers. Which one of the following sentences best describes how you feel, in general, about the role of scientists in managing complex environmental issues?*

I really don't trust any scientific experts

Experts such as scientists know a lot but they are often self-serving in their decisions

Experts should not have such a big role in making environmental decisions—this is the job of the community, the public, and our elected officials

The real experts on forest issues are loggers and forest community residents

**Q17.** *Many people in Ontario would argue that nature, and forests in particular, produce valuable raw materials and that forest managers need to make tradeoffs, balancing the needs of nature against the needs of people for jobs and forest products. Which one of the following statements best describes how you feel about this point of view, in light of your earlier statement that nature is complex and should be left to manage itself?*

Economic tradeoffs must be faced—jobs and forest products are also important concerns

Economic success is not important—if people can't work in the forests, then they will just do something else

In the long run, a more natural forest will bring in even more money to Ontario

Forest managers should be responsible for the ecological health of the forest, not the financial health of the forest industry

**Q18.** *Do you believe that any problems also could be associated with the aerial spraying of forest herbicides? Which one of the following statements best describes your opinion?*

In most cases there won't be any problems at all

The most serious problem is drifting of the herbicides outside the target area to the forest ecosystem

The most serious problem is unintended adverse effects on wildlife

The most serious problem is possible long-term contamination of the groundwater

The most serious problem is possible adverse impacts on human health

**Q19.** *Do you believe that any problems also could be associated with the use of tractors to spray forest herbicides? Which one of the following statements best describes your opinion?*

In most cases there won't be any problems at all

Operation of tractors in the forest could damage vegetation and the soil

The most serious problem is unintended adverse effects on wildlife

The most serious problem is possible long-term contamination of the groundwater

The most serious problem is possible adverse impacts on workers or visitors to the forest

**Q20.** *Do you believe that any problems also could be associated with the use of backpack*

*sprayers to control unwanted vegetation growth? Which one of the following statements best describes your opinion?*

In most cases there won't be any problems at all

The most serious problem is unintended damage to workers' health

The most serious problem is possible long-term contamination in the groundwater

The most serious problem is possible adverse health impacts for visitors to the forest

**Q21.** *Other people in Ontario also feel that the risks of herbicides are too great. Which one of the following reasons provides the best description of why you feel this way?*

The human health risks to the public are too great

The human health risks to forest workers are too great

The risks to the forest ecosystems are too great

The risks to wildlife in the forest are too great

The risks to ground water supplies are too great

**Q22.** *Other people in Ontario also feel that there might be better vegetation management options than herbicides. Which of the following alternatives to you prefer (ACCEPT MORE THAN ONE CHOICE) to control unwanted forest vegetation? (FIRST CHOICE = 1, SECOND CHOICE = 2, ETC.)*

Use grazing animals, such as cattle or sheep

Use natural toxins or microorganisms

Manually cut unwanted vegetation, with axes and chainsaws

Use a cover crop, such as grasses

Use prescribed and managed fires

Use mulches such as plastic or paper

**Q23.** *You have just told us that your first preference as a vegetation management option is \_\_\_\_\_ (INSERT 1ST CHOICE FROM Q22). Which one of the following*

*reasons do you think is the major obstacle to more widespread acceptance of this option by the Ontario public?*

Incorrect information about its effects on human health

Incorrect information about its effect on forest ecosystem

Incorrect information about its economic costs and impacts on jobs

Incorrect information about how frequently it is used elsewhere

**Q24.** *Thank you for your answers. Now let's come back to the original question. Foresters could either do nothing to control unwanted vegetation or, if something is done, they could choose from a variety of different vegetation management techniques. Which one of the following four types of actions do you feel would be most appropriate?*

Don't do anything to control forest vegetation; just let nature alone

Control unwanted forest vegetation, but don't use any herbicides

Use herbicides when necessary, but only if applied from tractors or by forest workers using backpack sprayers

Use aerial spraying of herbicides because it's the cheapest form of control

**Q25.** *Suppose that you live in or frequently visit an area of Ontario where a decision has been made to undertake a vegetation management program that you disagree with. Which one of the following options best describes your most likely reaction?*

I'd ignore it; there are lots of more important things for me to worry about

I'd be somewhat upset and might talk about it with others in my neighborhood

I would be quite upset and try to change the policy by calling a reporter from the local newspaper

I would be very upset and try to change the policy by calling the Minister or someone else high up in the government

I would be extremely upset and would work with a lawyer to challenge the decision in the courts

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# Appendix

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## **Ontario Forests Attitude and Perception Survey**

### Data Collection Technical Report

## Introduction

Goldfarb Consultants was contracted by the Ontario Ministry of Natural Resources and the Agricultural Research Institute of Ontario to carry out all sampling, data collection and data processing requirements as outlined by Decision Research and the Ministry of Natural Resources for the Ontario Forests Attitude And Perception Survey.

Five separate publics were surveyed in this study:

1. The General Public (ie. A Province-Wide Random Sample Of Ontario Adults)
2. Natural Resource Managers (ie. Government & Industry Foresters, Fish & Wildlife Managers)
3. Residents Of Timber Communities/Mill Towns
4. Outdoor Interest Group Members
5. Aboriginal Peoples (in-person interviews)

This report summarizes the methodologies and procedures used in fulfilling this assignment.

## Methodology

### 1. Questionnaire Design, Pre-Testing and Finalization

The same questionnaire, with some minor variations (principally in the screening and demographic sections), was administered to all five publics surveyed (The General Public, Natural Resource Managers, Residents of Timber Communities, Outdoor Interest Group Members, Aboriginal Peoples).

The draft questionnaire was pre-tested with 25 properly screened, qualifying respondents. In the pre-test the flow and timing of the questionnaire and the comprehension, verbiage and terminologies of the questions being asked were examined. Some minor adjustments were then made to the questionnaire based on the insights gleaned from the pretesting.

A copy of the questionnaire used is included at the end of this Appendix.

Because of the length of the interview, the questions in Forms A to I and Form X (decision pathways) of the questionnaire were asked only of a sub-sample of respondents in the province wide General Public survey and the Residents of Timber Communities survey. A

random rotation sequence was used to ensure that a minimum sub-sample of 133 survey respondents in the province wide General Public survey answered each form (A to I) and 300 answered Form X. A random rotation sequence was also used to ensure that a minimum sub-sample of 66 survey respondents in the Residents of Timber Communities survey answered each form (A to I) and 200 answered Form X. Natural Resource Managers answered Form X ( $n = 204$ ) but were not asked for responses to Forms A to I.

Because of the length of the interview, forms A to I and Form X were not asked of Outdoor Interest Group Members and Aboriginal Peoples.

### 2. Interviewing Dates

Interviewing was conducted in stages. The periods during which the interviewing was conducted for each of the publics surveyed was as follows:

- The General Public — September/early October, 1994
- Natural Resource Managers — October, 1994
- Residents Of Timber Communities/Mill Towns — October/early November, 1994
- Outdoor Interest Group Members — October/November, 1994
- Aboriginal Peoples (in-person interviews) — October, 1994

### 3. Interviewing Technique

All telephone interviewing was conducted utilizing Goldfarb Consultants' central location computer assisted telephone interviewing (CATI) system. The CATI process enables the questionnaire to be put completely on computer such that interviewers enter the responses from the respondent directly onto a computer screen. The computer automatically shows the correct sequence of questions to be asked, and controls for skip patterns and random rotation of questions to eliminate first exposure bias. CATI not only provides enhanced quality control of central location interviewing, it also offers the advantage of being able to provide virtually instant data tabulation and output of results as soon as interviewing is complete. This state-of-the-art system reduces error, reduces cost, and reduces overall interviewing and data preparation time, while enhancing quality.

CATI systems allow for the development of much more complex surveys that are responsive to the attitudes and perceptions of survey respondents, and permit the pattern of survey questioning to be directed by the specific concerns or choice preferences that respondents express. In this survey design Form X (decision pathways) takes advantage of the CATI capability to dynamically configure the paths of survey questioning. These paths link the initial responses to a number of topic areas and choice or trade-off preferences.

#### 4. Sample Design

The total number of completed interviews for the five publics surveyed in this study and the associated statistical reliability of random samples of this size is as shown in the table below.

#### 5. Sampling Procedures and Computer Weighting Techniques

##### *The General Public Survey*

Goldfarb Consultants utilized the sampling expertise of Sampling, Modelling & Research Technologies Inc. (SM Research Technologies) in drawing the sample for the General Public survey. SM Research Technologies is a company that specializes in survey sampling.

A total of 1,500 random telephone interviews were completed with Ontario residents 18 years of age or over. Males and females were proportionately repre-

sented in the sample. Respondents were selected through a multi-stage, proportional, equi-probability selection plan using seeded random generation of numbers for dialing.

The frame for the survey was the Statistics Canada Census of Households in Ontario. For each enumeration area in the frame a telephone number was selected. For each telephone number, called a seed number, a list of fifty (50) contiguous phone numbers was computed. This list then formed the telephone frame for the survey. This frame is proportionate to the household population in the province.

The frame was stratified by Community Size, CMA/CA, CSD, Tracts and EA. This stratification ensured proportionate representation of all areas in the province in the survey. The sampling unit was households with telephones at the primary stage. An individual, randomly selected within each household was the final stage of sampling.

The Next Birthday Method was used to determine which member of the household, 18 years of age and over, to interview. This is a simple, non-intrusive method of randomly selecting and qualifying household members for an interview. Having selected a member of the household, the interviewer attempted to complete an interview with only that individual. No substitution within the household was allowed. Only one interview was conducted within each selected household. Up to five callbacks were conducted before any substitutions were allowed.

Sample Group	Sample Size	Statistical Reliability
General Public	1,500	+/-2.6%
Natural Resource Managers	204	+/-7.1%
Residents of Timber Communities	801	+/-3.5%
Aboriginal Peoples	30	*
Outdoor Interest Group Members	14	*

\* Since this sample was *not* a random probability sample, statistical error range estimates are not presented. Results are presented as directional and experimental only.

Disproportionate, regional quota sampling techniques were used to ensure that a large enough sample of respondents were drawn from each region of the province to facilitate breaking out and analyzing respondents' attitudes and opinions on a region-by-region basis in a statistically reliable

Region	Sample Size	Statistical Reliability
SW Ontario	200	±7.1%
Hamilton/Niagara	200	±7.1%
Metro Toronto	400	±5.0%
Central Ontario	200	±7.1%
Eastern Ontario	200	±7.1%
NE Ontario	150	±8.2%
NW Ontario	150	±8.2%
<b>Total</b>	<b>1,500</b>	<b>±2.6%</b>

manner. The regional breakdown of the sample and the statistical reliability associated with random samples of the sample sizes obtained for each region (at the 95% confidence level) is as follows:

The definition of the Central Ontario region as used in this study excludes the Metro Toronto and Hamilton/Niagara Regions. The Hamilton/Niagara region includes the regional municipalities of: Hamilton-Wentworth, Niagara, and Haldimand-Norfolk. Computer weighting techniques were used, as necessary, to weight each region of the province back to its proper proportion so that the total sample achieved is properly representative of the province as a whole. Computer weighting techniques were also used, as necessary, to weight the sample to the 1991 Census counts by age and sex.

### *Timber Communities Survey*

In the Timber Community Survey random telephone interviews were conducted with 801 Ontario residents living in Ontario communities meeting the definition of a timber community or mill town. All respondents were 18 years of age or over. Males and females were proportionately represented in the sample.

The geographical location of potential timber communities was defined as those in northern Ontario, excepting the Ottawa metropolitan area. This definition excludes southern Ontario including the Toronto and the Hamilton-Niagara

metropolitan areas. Information on northern Ontario communities was obtained from records of Census Canada for the 1991 Census of Population and the 1993 Standard Industrial Classification (SIC) Manual for Canadian businesses. These data bases provided information on total population for 374 communities, ranging in size from less than 50 to more than 100,000. Employment information from the 1991 Census listed total labour, logging, and manufacturing. The information from the 1993 SIC Manual for Canadian businesses listed total businesses, number of manufacturing firms, agricultural, and forestry businesses.

An index was created to account for logging employment and forestry manufacturing. Logging employment was divided by total employment from the 1991 Census of Population to produce a logging employment index score. The number of forestry businesses was divided by the total number of businesses from the 1993 SIC Manual to produce a forestry business index score. These two index scores were added together. The formula can be shown as:

$$\text{(LABOUR FORCE LOGGING/TOTAL LABOUR FORCE)} + \text{(FORESTRY MANUFACTURING/TOTAL MANUFACTURING)} = \text{TIMBER DEPENDENT INDEX SCORE}$$

Using a cutoff of .05 on the Timber Dependent Index Score provided 133 communities from an original list of 374. The highest rating was Gull River 55 with a Timber Dependent Index Score of .6667. The 133 communities selected as having a reasonable dependence upon timber resources either through logging employment or forestry business locations were then divided into three categories: The 32 communities with index scores between .2 and .6667 were designated as high dependent timber communities; the 47 communities with scores between .1 and .199 were designated as medium dependent timber communities; and the 54 communities with scores of .05 to .099 were designated as low dependent timber communities. A stratified sample of these communities was then drawn.

Using the Timber Community Index, the sample was stratified into three tiers as, as shown in the table on the following page.

In each Tier, the sample was drawn to be proportionate by population, except for Tier 1. Tier 1 sample was further stratified as follows:

Tiers	Actual Sample	Percentage of Population	Ideal Sample
1. Low dependence (Index .05 to 0.99; Rank 80 – 133)	301	61%	489
2. Medium dependence (Index .1 to .199; Rank 33 – 79)	250	31%	248
3. High dependence (Index .2+; Rank 1 – 32)	250	8%	64
<b>Total</b>	<b>801</b>	<b>100%</b>	<b>801</b>

- Thunder Bay N = 100
- All other (proportionate by pop) N = 200

Computer weighting was used to bring the Tier 1 sample and the total sample for all 3 Tiers into proper proportion by population in the computer tabulation.

Respondents in each Tier were selected through a multi-stage, proportional, equi-probability selection plan using SM Technology's data base of telephone listings for each timber community. This provided a sample proportionate to community size and population within the province.

The frame was stratified by Community Size, CMA/CA, CSD, Tracts and EA. This stratification ensured proper proportionate representation of all timber communities in the province in the survey. The sampling unit was households with listed telephones at the primary stage. An individual, randomly selected within each household is the final stage of sampling.

#### *Natural Resource Manager Survey*

The Natural Resource Manager Survey involved conducting telephone interviews with 204 government and industry foresters and fish and wildlife managers. The sample for the Natural Resource Manager Survey was drawn from lists supplied by the Ministry of Natural Resources. This involved a census sampling of all the prospective respondents listed.

#### *Survey of Outdoor Interest Group Members*

The survey of Members/Representatives Of Outdoor-Interest Groups involved conducting telephone inter-

views with an experimental, convenience sample of members of different environmental or outdoor-interest groups listed in the province. A total of 14 of these interviews were completed. Lists of various environmental or outdoor-interest groups in the province and the cooperation of these groups was sought in developing the sampling frame for this survey. Survey participants were selected at random from the lists obtained, but since this sample was not a true random probability sample, statistical error range may exceed normally expected limits. Results are intended to be experimental and directional only.

#### *Aboriginal Peoples Survey*

A separate experimental convenience sample of 30 Aboriginal Peoples was included in this study. This involved personal interviewing, since this is the only reliable way to draw a sample of Aboriginal People. The interviews were conducted on three separate reserves in Northern Ontario in forested/timber community areas:

- Serpent River First Nation
- Wikwemikong First Nation
- West Bay First Nation

Ten people were interviewed from each community. Survey participants were selected at random. Support from the leadership (Chief and Council) was obtained for this survey. In two communities, a designated contact person facilitated the survey by suggesting names of possible interviewees and providing an introduction to many of those surveyed. Unfacilitated contacts were

also generally willing to participate. The following sampling guidelines were followed for the Aboriginal interviews for each community:

- approximately half male and half female
- approximately half with community leaders and/or those with special knowledge of/involvement with resource or forestry issues
- approximately half with general population sample i.e., not community leaders

Since this sample is not a true random probability sample, statistical error range may exceed normally

expected limits. Results are intended to be used as experimental and directional only.

## 6. Response Rates

The table which follows details the response rate for each of the publics surveyed before any substitutions were made.

To attain maximum control of non-response, up to five callbacks were made in an effort to complete an interview with a selected individual, before any substitutions were made. Callbacks were scheduled for different intervals and different days of the week.

Province-Wide General Public Survey	Total*	Percentage of	
		Total	Eligible Contacts
Total Numbers Called	7337	100%	
Non-Contacts	5181	71%	
Not in service	3677	50%	
Business number	1050	14%	
No answer/recording/fax	454	6%	
Ineligible Contacts	655	9%	
Language problem	571	8%	
Selected respondent not available	11	1%	
Sensitive occupation	72	1%	
Callback incomplete	1	–	
Eligible Contacts	1501	21%	100.0%
Household refusal	516	7%	34.0%
Respondent refusal	78	1%	5.0%
Discontinued mid-interview	1	–	0.5%
Completion	906	12%	60.0%

\*Total initial sample before substitution.

Timber Community Survey	Total*	Percentage of Total	Percentage of Eligible Contacts
Total Numbers Called	1618	100%	
Non-Contacts	695	43.0%	
Not in service	599	37.0%	
Business number	61	4.0%	
No answer/recording/fax	35	2.0%	
Ineligible Contacts	123	8.0%	
Language problem	115	7.0%	
Sensitive occupation	8	1.0%	
Eligible Contacts	800	49.0%	100%
Household refusal	288	18.0%	36%
Respondent refusal	56	4.0%	7%
Discontinued mid-interview	13	0.8%	2%
Completion	443	27.0%	55%

\*Total initial sample before substitution.

Resource Managers Survey	Total*	Percentage of Total	Percentage of Eligible Contacts
Total Numbers Called	308	100%	
Non-Contacts	38	12.0%	
Not in service	13	4.0%	
Business number	—	—	
No answer/recording/fax	25	8.0%	
Ineligible Contacts	17	6.0%	
Language problem	—	—	
Selected respondent not available	15	5.0%	
Sensitive occupation	—	—	
Callback incomplete	2	0.6%	
Eligible Contacts	253	82.0%	100%
Respondent refusal	45	15.0%	18%
Discontinued mid-interview	4	1.0%	2%
Completion	204	66.0%	80%

\*Based on a census of managers rather than a sample.

### **Survey Instrument**

Note: Form X (decision pathways) is presented as an attachment to Chapter 8 of the report, pages 57 – 61, above.



FINAL VERSION

PROJECT #947003

GOLDFARB CONSULTANTS

DATE: \_\_\_\_\_

TIME: \_\_\_\_\_

Good morning/afternoon/evening, my name is \_\_\_\_\_ of Goldfarb Consultants, a national opinion research company. We are currently conducting a survey about different aspects of Life in Ontario today and would appreciate hearing your opinions. The survey deals with a number of issues including economic issues, health and environmental issues. Do you have some time to work through this questionnaire with me. Thank you.

SCREENER

1. Do you or does anyone in your household work for . . .

	<u>Yes</u>	<u>No</u>
a newspaper/magazine	<input type="checkbox"/>	<input type="checkbox"/>
a radio/television station	<input type="checkbox"/>	<input type="checkbox"/>
a market/opinion research firm	<input type="checkbox"/>	<input type="checkbox"/>

**IF "YES" TO ANY OF THE ABOVE — TERMINATE**

2. In this household I need to interview the person in the household who is eighteen years of age or over and whose birthday falls next. Is that you?

Yes       **CONTINUE INTERVIEW**

No       **ASK TO SPEAK TO THAT PERSON. IF THAT PERSON IS NOT AVAILABLE, ARRANGE FOR A CONVENIENT TIME TO CALL BACK. RE-INTRODUCE YOURSELF AND RE-READ INTRODUCTION TO SURVEY.**

CALL BACK SCHEDULED FOR:

DATE: \_\_\_\_\_

TIME: \_\_\_\_\_

When asked to think broadly about the kind of problems facing society today, some people mention the following concerns. For each one, please tell us how important a problem you think it is for Ontario.

(ROTATE Q. 1 – 10)	Not important	Slightly important	Moderately important	Very important
1. Absence of strong political leadership	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Damage to forest environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Unemployment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Risks associated with technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Loss of animal and plant species	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Crime and violence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Overpopulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Illegal drugs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Decline in water quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please tell us whether you strongly disagree, disagree, agree, or strongly agree with each of the following statements of opinion.

(ROTATE Q. 11– 24)

11. I think environmental problems are extremely important.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

12. I trust our government to make the proper decisions about the management of environmental risks.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

13. It bothers me that the world's natural environment is changing so quickly.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

14. Current scientific information should decide the outcome of environmental disputes.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

15. I would be willing to sacrifice much of my current standard of living in order to help insure that nature is not harmed.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

16. I am attracted to the spiritual qualities inherent in the natural world.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

17. The use of herbicides prevents the forest from generating its own solution to unwanted vegetation.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

18. Natural resource industries (e.g., mining, wood products, oil, etc.) are the basis of a strong economy.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

19. All species, including humans, have an **equal** right to co-exist on the planet.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

20. Economic growth is necessary to improve our quality of life.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

21. When the health risk is very small, it is okay for society to impose that risk on individuals without their consent.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

22. Technological development is destroying nature.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

23. Economic growth will lead to serious losses of natural resources.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

24. When I see or hear a story about an environmental issue, I pay particular attention to that story.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

Please tell us your opinion of the human health risks of each of the following items for the Ontario public as a whole. For each item, please tell us whether you think there is almost no health risk, slight health risk, moderate health risk, or high health risk for the Ontario public as a whole.

**DO NOT READ**

(ROTATE Q. 25 – 46)	Almost no health risk	Slight health risk	Moderate health risk	High health risk	Don't know	No opinion
25. Radon in the home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Medical x-rays	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Manufacture of chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Using herbicides in forests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Cigarette smoking	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Bacteria in food	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Nuclear power plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Use of genetically engineered bacteria in agriculture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Motor vehicle accidents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Depletion of the ozone layer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35. Agricultural uses of herbicides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Climate change (global warming/ greenhouse effect)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37. Food irradiation (to preserve food)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38. Suntanning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. Ground water contamination from landfills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Storms and floods	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Loss of forest environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Food additives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. Dioxin from pulp and paper mills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Water quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Exposure to asbestos in buildings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Blood transfusions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please tell us whether you strongly disagree, disagree, agree, or strongly agree with each of the following statements of opinion.

(ROTATE Q. 47 – 72)

47. People in Ontario are becoming too concerned about small health risks.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

48. The primary goal of forest management in Ontario should be to produce wood products.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

49. Environmental health risk decisions should be made by scientific experts.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

50. Herbicides pose a greater risk to the natural environment than they do to individual human health.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

51. Environmental groups interfere with government efforts to solve environmental problems.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

52. If a person is exposed once to a chemical that can cause cancer, that person will probably get cancer some day.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

53. I believe that a risk-free environment is an attainable goal in Ontario.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

54. Sustainable forestry in Ontario will require a major reduction in timber harvest levels.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

55. Forests grow back better after harvesting if new trees are replanted rather than relying on natural regeneration.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

56. Differences of opinion about the risks of chemicals should be settled by scientific data and analysis.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

57. Pesticides are needed for forest management.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

58. Federal and provincial government agencies do a good job in regulating the use of herbicides and insecticides.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

59. The most important objective of forest management should be to protect the environment.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

60. There are serious environmental problems where I live.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

61. Some plants in the forests are harmful and should be controlled.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

62. I feel that I have very little control over risks to my health.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

63. The first priority for forest managers should be to provide local communities with jobs in the wood products industry.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

64. If a scientific study produces evidence that a chemical causes cancer in animals, we can be reasonably sure that the chemical will cause cancer in humans.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

65. Pesticides are needed in agriculture.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

66. The forest industry will protect the environment only if it is required to by the government.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

67. Scientists are able to make accurate estimates of the risks from herbicides.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

68. Natural chemicals are not as harmful as synthetic chemicals.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

69. We should be prepared to accept some risks to our health in order to strengthen the economy.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

70. Timber harvests in Ontario forests should be reduced in light of global pressures on environmental resources.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

71. I try hard to avoid contact with chemicals and chemical products in my daily life.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

72. Forests should be managed primarily as places for human recreation, such as hiking, canoeing, camping, or fishing.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

People obtain their information on environmental issues and risks from a number of sources. Below is a short list of possible sources for environmental information. Please tell us for each one whether you get almost no information, a little information, a fair amount of information, or a lot of information from that source about environmental issues and risks?

(ROTATE Q. 73 –84)	Almost no information	A little information	A fair amount of information	A lot of information
73. TV, radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
74. Newspapers and magazines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
75. Private industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76. Municipal/local government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
77. Ontario elected officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
78. Ontario Ministry of Natural Resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
79. Environment Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
80. Agriculture Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
81. Environmental groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
82. Forestry Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
83. University scientists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
84. Friends and relatives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* If respondent seeks clarification – explain this is a department of the federal government.

In considering this same list again, please tell us how much confidence you have in each one as an information source about environmental issues. Would you say you have almost no confidence, a little confidence, a fair amount of confidence, or a lot of confidence in each of the following as an information source about environmental issues?

(ROTATE Q. 85 – 96)	Almost no confidence	A little confidence	A fair amount of confidence	A lot of confidence
85. TV, radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
86. Newspapers and magazines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
87. Private industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
88. Municipal/local government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
89. Ontario elected officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
90. Ontario Ministry of Natural Resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
91. Environment Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
92. Agriculture Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
93. Environmental groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
94. Forestry Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
95. University scientists	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
96. Friends and relatives	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Another aspect of environmental policy is the degree to which people and organizations are responsible for protecting the forest environment in Ontario. For each of the following, please tell us if you think they have very little responsibility, some responsibility, moderate responsibility, or major responsibility for protecting the forest environment.

(ROTATE Q. 97 – 104)	Very little responsibility	Some responsibility	Moderate responsibility	Major responsibility	Don't know	No opinion
97. Local governments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
98. Individual citizens	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
99. Ontario elected officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
100. Ontario Ministry of Natural Resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
101. Environment Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
102. Environmental groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
103. Forestry Canada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
104. Private industry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**DO NOT  
READ**





[FORM A ONLY]

The following six questions ask about the possible health and environmental risks of **herbicides applied from helicopters or airplanes** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 –140)

135. Scientists understand the risks of herbicides applied from helicopters or airplanes.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of herbicides applied from helicopters or airplanes.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using herbicides applied from helicopters or airplanes, even if the herbicides are carefully applied.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of herbicides applied from helicopters or airplanes are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of herbicides applied from helicopters or airplanes are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of herbicides applied from helicopters or airplanes.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM B ONLY]

The next six questions ask about the possible health and environmental risks of **using cover crops such as grasses or clover** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 -140)

135. Scientists understand the risks of using cover crops such as grasses or clover as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of using cover crops such as grasses or clover as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using cover crops such as grasses or clover as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of using cover crops such as grasses or clover as a vegetation-management tool are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of using cover crops such as grasses or clover as a vegetation-management tool are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of using cover crops such as grasses or clover as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM C ONLY]

The following six questions ask about the possible health and environmental risks of **ground-applied herbicides** (e.g., from tractors or workers using backpack equipment) as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 – 140)

135. Scientists understand the risks of ground-applied herbicides.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of ground-applied herbicides.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using ground-applied herbicides, even if the herbicides are carefully applied.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of ground-applied herbicides are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of ground-applied herbicides are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of ground-applied herbicides.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM D ONLY]

The next six questions ask about the possible health and environmental risks of **prescribed and managed fires** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 - 140)

135. Scientists understand the risks of prescribed and managed fires.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of prescribed and managed fires.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of prescribed and managed fires.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of prescribed and managed fires are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of prescribed and managed fires are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of prescribed and managed fires.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM E ONLY]

The following six questions ask about the possible health and environmental risks of using **grazing animals such as sheep or cattle** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 – 140)

135. Scientists understand the risks of using grazing animals such as sheep and cattle as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of using grazing animals such as sheep and cattle as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using grazing animals such as sheep or cattle.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of using grazing animals such as sheep and cattle as a vegetation-management tool are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of using grazing animals such as sheep and cattle as a vegetation-management tool are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of using grazing animals such as sheep and cattle as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM F ONLY]

The next six questions ask about the possible health and environmental risks of using **manual cutting (e.g., with chain saws)** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 - 140)

135. Scientists understand the risks of using manual cutting as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of using manual cutting as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using manual cutting as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of using manual cutting as a vegetation-management tool are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of using manual cutting as a vegetation-management tool are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of using manual cutting as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM G ONLY]

The following six questions ask about the possible health and environmental risks of **biological agents, such as natural toxins or microorganisms** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 - 140)

135. Scientists understand the risks of biological agents.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of biological agents.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using biological agents.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of biological agents are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of biological agents are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of biological agents.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM H ONLY]

The next six questions ask about the possible health and environmental risks of using **mulches such as plastic or paper** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 – 140)

135. Scientists understand the risks of using mulches such as plastic or paper as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of using mulches such as plastic or paper as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using mulches such as plastic or paper as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of using mulches such as plastic or paper as a vegetation-management tool are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of using mulches such as plastic or paper as a vegetation-management tool are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of using mulches such as plastic or paper as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

[FORM I ONLY]

The next six questions ask about the possible health and environmental risks of using **bulldozers and other heavy equipment** as a vegetation-management tool in Ontario's forests. Please tell me whether you strongly disagree, disagree, agree, or strongly agree with it.

(ROTATE Q. 135 – 140)

135. Scientists understand the risks of using bulldozers and other heavy equipment as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

136. The public understands the risks of using bulldozers and other heavy equipment as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

137. It is difficult to control the risks of using bulldozers and other heavy equipment as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

138. The risks of using bulldozers and other heavy equipment as a vegetation-management tool are potentially catastrophic.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

139. The risks of using bulldozers and other heavy equipment as a vegetation-management tool are not a problem for future generations.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

140. I do not worry about the risks of using bulldozers and other heavy equipment as a vegetation-management tool.

Strongly disagree	Disagree	Agree	Strongly agree
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

RESPONDENTS ANSWERING FORMS A TO I ALSO ANSWER Q. 1021

1021 Suppose that you live in or frequently visit an area of Ontario where a decision has been made to undertake a vegetation management program that you disagree with. Which one of the following options best describes your most likely reaction?

I'd ignore it; there are lots of more important things for me to worry about

I'd be somewhat upset and might talk about it with others in my neighborhood

I would be quite upset and try to change the policy by calling a reporter from the local newspaper

I would be very upset and try to change the policy by calling the Minister or someone else high up in the government

I would be extremely upset and would work with a lawyer to challenge the decision in the courts

## BASIC DATA

Now, in order to classify our data, we need some basic information about you. We will treat all the following information as confidential.

141. What is your age?

- |          |                          |           |                          |
|----------|--------------------------|-----------|--------------------------|
| 18 to 24 | <input type="checkbox"/> | 45 - 54   | <input type="checkbox"/> |
| 25 to 29 | <input type="checkbox"/> | 55 - 64   | <input type="checkbox"/> |
| 30 to 34 | <input type="checkbox"/> | 65 % over | <input type="checkbox"/> |
| 35 to 44 | <input type="checkbox"/> |           |                          |

142. Including yourself, how many people live in your household? \_\_\_\_\_

143. How many children under the age of 18 live in your household? \_\_\_\_\_

144. Do you own or regularly use a camp or cottage in Ontario?

- |     |                          |
|-----|--------------------------|
| Yes | <input type="checkbox"/> |
| No  | <input type="checkbox"/> |

145. What is the highest level of school you have attended or completed?

- |   |                          |
|---|--------------------------|
| Less than high school                       | <input type="checkbox"/> |
| High school graduate                        | <input type="checkbox"/> |
| At least 2 full years of college/university | <input type="checkbox"/> |
| College\university degree                   | <input type="checkbox"/> |
| Post graduate degree                        | <input type="checkbox"/> |

146. In addition to Canadian, to what ethnic or cultural group do you most identify?  
(DO NOT READ LIST. PROVIDE EXAMPLES, IF NECESSARY)

- |                           |                          |                         |                          |
|---------------------------|--------------------------|-------------------------|--------------------------|
| American                  | <input type="checkbox"/> | Indian (East)           | <input type="checkbox"/> |
| African (Afro American)   | <input type="checkbox"/> | Indian (West) Caribbean | <input type="checkbox"/> |
| Austrian                  | <input type="checkbox"/> | Indian (North American) | <input type="checkbox"/> |
| Canadian and nothing else | <input type="checkbox"/> | Italian                 | <input type="checkbox"/> |
| Chinese                   | <input type="checkbox"/> | Japanese                | <input type="checkbox"/> |
| Czech                     | <input type="checkbox"/> | Jewish                  | <input type="checkbox"/> |
| Dutch                     | <input type="checkbox"/> | Mexican                 | <input type="checkbox"/> |
| English/British           | <input type="checkbox"/> | Pakistani               | <input type="checkbox"/> |
| French                    | <input type="checkbox"/> | Polish                  | <input type="checkbox"/> |
| French Canadian           | <input type="checkbox"/> | Scandinavian            | <input type="checkbox"/> |
| German                    | <input type="checkbox"/> | Scottish                | <input type="checkbox"/> |
| Greek                     | <input type="checkbox"/> | Spanish                 | <input type="checkbox"/> |
| Hungarian                 | <input type="checkbox"/> | Ukrainian               | <input type="checkbox"/> |
| Irish                     | <input type="checkbox"/> | Yugoslavian             | <input type="checkbox"/> |
|                           |                          | Other _____             | <input type="checkbox"/> |

(specify)

Have you done any of the following things in the past year?

- | (ROTATE Q. 147 – 155)  | Have<br>done             | Have not<br>done         |
|--|--------------------------|--------------------------|
| 147. Spent time hunting or fishing in Ontario  | <input type="checkbox"/> | <input type="checkbox"/> |
| 148. Spent other recreational time in Ontario<br>(e.g., bird watching, camping, canoeing,<br>or hiking)        | <input type="checkbox"/> | <input type="checkbox"/> |
| 149. Avoided using consumer products that<br>harm the environment  | <input type="checkbox"/> | <input type="checkbox"/> |
| 150. Been a member in a group or organization<br>that works to protect the environment                         | <input type="checkbox"/> | <input type="checkbox"/> |
| 151. Been active in a group or organization that<br>works to promote jobs in your community                    | <input type="checkbox"/> | <input type="checkbox"/> |
| 152. Voted for candidates because of their<br>positions on environmental issues                                | <input type="checkbox"/> | <input type="checkbox"/> |
| 153. Purchased a higher priced product because<br>it was better for your health or<br>environmentally friendly | <input type="checkbox"/> | <input type="checkbox"/> |
| 154. Regularly read or subscribe to an<br>environmental magazine   | <input type="checkbox"/> | <input type="checkbox"/> |
| 155. Donated money to any environmental<br>organization or cause   | <input type="checkbox"/> | <input type="checkbox"/> |

156. In a dispute between an industry group and an environmental interest group, would you generally support the industry or the environmental group?

- | Industry                 | Environmental<br>group   | Neither                  |
|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 1                        | 2                        | 3                        |

157. Where would you place yourself on the following political scale?

- |                          |                          |
|--------------------------|--------------------------|
| Far left                 | <input type="checkbox"/> |
| Left                     | <input type="checkbox"/> |
| Centralist               | <input type="checkbox"/> |
| Right                    | <input type="checkbox"/> |
| Far right                | <input type="checkbox"/> |
| Other                    | <input type="checkbox"/> |
| (DO NOT READ) Don't know | <input type="checkbox"/> |

158. Is your total family income before taxes less than \$45,000 or more than \$45,000? *If below \$45,000:* Would that be less than \$15,000, between \$15,000 and \$29,999, or between \$30,000 and \$44,999?

Less than \$15,000	\$15,000- \$29,999	\$30,000- \$44,999
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3

*If above \$45,000:* would that be between \$45,000 and \$59,999, between \$60,000 and \$74,999, between \$75,000 and \$89,999, or over \$90,000?

\$45,000- \$59,999	\$60,000- \$74,999	\$75,000- \$89,999	\$90,000- and above
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1	2	3	4

159. Home postal code \_\_\_\_\_

160. Sex:

Male	<input type="checkbox"/>
Female	<input type="checkbox"/>

161. City/Town: \_\_\_\_\_

162. Region

S.W.	<input type="checkbox"/>
Hamilton/Niagara	<input type="checkbox"/>
Metro Toronto	<input type="checkbox"/>
Central	<input type="checkbox"/>
East	<input type="checkbox"/>
N.E.	<input type="checkbox"/>
N.W.	<input type="checkbox"/>

Respondent's Name:

\_\_\_\_\_

Respondent's Address:

\_\_\_\_\_

Respondents Telephone Number:

\_\_\_\_\_

*Thank you for your participation in this survey*

End Time: \_\_\_\_\_