UNDERSTANDING RECREATIONAL USE OF THE WESTERN NEWFOUNDLAND MODEL FOREST

HEATHER J. LUNDRIGAN

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UNDERSTANDING RECREATIONAL USE OF THE WESTERN NEWFOUNDLAND MODEL FOREST

by

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Abstract

The recreational participation, environmental attitudes, and knowledge, of Western Newfoundland Model Forest residents were examined through the use of a mail survey. Environmental attitudes were measured with the New Environmental Paradigm scale, as well as questions about environmental issues inside the model forest. Attitudes and knowledge were used to discriminate between consumptive recreationists, nonconsumptive recreationists, and nonparticipants. Results indicated that consumptive recreationists were more knowledgeable about the model forest than either nonconsumptive recreationists or nonparticipants. While it was anticipated that consumptive recreationists would have less environmentally positive attitudes than the other two groups, no substantial differences were found. This socioeconomic study was the first of its kind to be carried out in the Western Newfoundland Model Forest, and implications of the findings for forestry management are discussed.

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CHAPTER 1. INTRODUCTION

> "A major barrier to effective resource management is an incomplete understanding of the relationship between agency activities and public expectations and needs...The use of social science methodology helps to ensure that the information collected is current, valid, and relevant, and that the analysis is credible."
>
> (Wenner 1987)

1.1 Social Science in Natural Resource Management

Social science in natural resource management, or understanding the people component of the resource management equation, is integral to the successful implementation of an agency's management objectives and plans. In fact, most of the dimensions of resource management (Mitchell 1989) are human dimensions. While forest managers traditionally saw management based primarily on tree growth and timber harvesting (Farnham et al 1995), more recently managing for the human aspects of the forest (eg recreational values, aesthetic values) has become increasingly important (Kangas 1994).

In recent decades, resource managers have begun to realize the importance of, and to represent in their decision-making, the needs and wants of the publics they serve. In light of this development, social science research has become a key component of resource management (Decker et al 1987; Wenner 1987; Baerwald 1991; Barro and Manfredo 1996). If resource management is to be truly effective, information is necessary regarding such things as patterns of recreation (Applegate 1989; Enck 1993; Siemer et al 1994), knowledge (Spotts and Stynes 1985; Perdue 1987; Manfredo and Bright 1991; Reading et al 1994), attitudes (Leuschner et al 1989; Johnsen et al 1992; Christianson and Arcury 1992, Bengston and Fan 1999), and expenditures (Adamowicz 1986; Fesenmaier and Lieber 1987; Stoll et al 1988; Hvenegaard et al 1989; Donnelly et al 1990) of resource users.

Several trends have had an impact on resource management in the United States. Public interest in forests and value placed on commodities such as clean air and water, and unspoiled landscapes, are higher than ever before, and the public has acquired the legal right to be involved in the resource management decision-making process. This increased interest in public involvement has become a factor in resource management in Newfoundland as well. According to Hendee (1989), there is also an increased unwillingness to accept professional authority. Forest plans, policies, and actions are not readily accepted by the public, and their accuracy is often questioned.

While integrating social science in forestry resource management has a relatively long history in the United States, such research in Canada, and particularly

Newfoundland, remains in its infancy stage. Cramer et al (1993) claimed that United States Forest Service values are changing. A nationwide survey of USFS employees indicated that the values held by the employees were supportive of recreation, despite the fact that employees felt that the USFS as an agency placed more value on traditional uses such as logging. The authors suggested that pressure would be exerted on the agency to adjust to the values held by the younger, more widely educated employees. Farnham et al (1995) showed that the U.S. Forest Service had placed increased emphasis on "noncommodity programs" such as recreation in recent years. This conclusion was reached on the basis of funds spent on recreation and wildlife and fish habitat improvement, along with the number of new programs instituted in these areas and personnel assigned to these areas of interest.

With this change in values has come an increased acceptance of the role of social science in forestry and other types of resource management (Wenner 1987; Decker et al 1987). An incomplete understanding of the relationship between forestry projects and the expectations and needs of the public limits the effectiveness of management. Social science methods can be used to evaluate forestry projects, identifying potential areas of conflict and estimating the effects of the project on the public (Wenner 1987; Baerwald 1991). Scientific human dimensions research can help resource managers get and keep the public on side in forest management, while keeping the Forest Service on side as well.

Hendee (1989) points out the recent growth in appreciation of the forest as a source of nontimber values. Nontimber values, which are those values of the forest

resource, such as recreation, that are not traditionally bought and sold on the market, were often ignored by traditional forest management practices. Hendee (1989) goes on to suggest that "wood products are still the heart of forestry, and they make possible many of the practices that can enhance other values." As such, he suggests integrated resource management and public education are essential for effective forest resource management. The current study considers knowledge levels of Western Newfoundland Model Forest (WNMF) residents in light of the educational goals of the model forest.

1.2 Objectives

There is an increased desire on the part of managers to integrate social science into decision-making in the Western Newfoundland Model Forest. The overall goal of the current study is to work toward an understanding of WNMF residents' opinions and recreational behaviours. Three broad areas were explored. Information was gathered on attitudes toward the environment as well as toward specific issues surrounding the model forest. From a public involvement standpoint, it is important to have support for management practices. In addition, information was gathered on recreational participation and expenditure. Patterns of recreational participation can both affect and be affected by forestry management practices. It is essential that behaviour be monitored in order to increase the effectiveness of management. Knowledge about the model forest was also tested, in order to assess the effectiveness of educational efforts by the model forest.

These three broad areas translate into the following specific objectives:

1. To identify, document, and analyze model forest residents' environmental attitudes using the New Environmental Paradigm Scale (Dunlap and van Liere 1978). It is hypothesized that respondents will show positive environmental attitudes, similar to the pattern found in other Canadian provinces (Edgell and Nowell 1989).

2. To identify knowledge levels about the model forest held by model forest residents. Given that education is a high priority within the Western Newfoundland Model Forest, and that information sessions such as the Model Forest Bus Tour take place, it is anticipated that residents within the model forest have reasonably high knowledge of the purpose and uses of the model forest.

3. To identify, document, and analyze model forest residents' attitudes toward specific model forest issues. It is anticipated that attitudes will differ among consumptive recreationists, nonconsumptive recreationists, and nonparticipants.

4. To identify, document, and analyze recreational participation and expenditures by model forest residents. It is expected that consumptive activities will result in the highest participation rates and expenditures, consistent with previous studies at the provincial and national levels (Hill 1984; Filion 1993).

5. To evaluate the usefulness of environmental attitudes and attitudes toward recreation for predicting recreation participation. It is expected that these attitudes will be useful in discriminating between consumptive recreationists, nonconsumptive recreationists, and nonparticipants.

6. To determine whether knowledge of the Western Newfoundland Model Forest and attitudes toward model forest issues vary among different types of recreationists. It is hypothesized that nonconsumptive recreationists have more conservationist attitudes and are more knowledgeable about the model forest than consumptive recreationists or nonparticipants.

1.3 Relevance of Research

This research study contributes to a better understanding of the people component in forestry resource management, particularly within the Western

Newfoundland Model Forest, in three ways. It is the first socioeconomic research of its kind to be performed in the Western Newfoundland Model Forest and provides baseline information to aid in future management. The method by which this information was gathered, through a representative sample, illustrates the usefulness of survey research for resource management. In addition, this study provides a further test of the New Environmental Paradigm (NEP) Scale, through the use of principal components and discriminant function analysis. Table 1.1 summarizes the applied, methodological, and theoretical contributions of the study.

Table 1.1. Contribution to Knowledge

Type of Contribution	Concepts	Major questions
Applied	1. Public involvement 2. Baseline monitoring	1. Recreational participation 2. Environmental attitudes 3. Knowledge of WNMF
Methodological	1. Large scale survey of general public 2. Rigorous data checking 3. Discriminant analysis	1. Discriminant analysis to classify groups of recreationists
Theoretical	1. NEP 2. Attitudes as behaviour predictors	1. Model Forest residents environmental attitudes. 2. Nonconsumptive, consumptive, and nonparticipants have different environmental attitudes.

1.3.1 Applied

Traditionally, public involvement has consisted of techniques such as public meetings, which can suffer from bias. Public meetings often attract certain segments of society, leaving managers with an unrepresentative view of how the majority truly feels about an issue (Asher 1988; Mitchell 1989). A survey of the affected publics is a useful means to truly represent the entire constituency in the resource management decision-making process, allowing resource managers to better manage resources for the benefit of the entire public (Beatty 1991; Mitchell 1989).

Assessing and documenting current knowledge levels about the model forest will offer baseline data on the public's knowledge of the model forest. As further educational efforts are developed, the effectiveness of such programs could be measured by comparing results of future studies with the results provided in this study. A longitudinal study of attitudes and knowledge toward the model forest will help managers conduct attitudinal and knowledge monitoring, thus learning more about shifting public concerns and beliefs. In addition, to be successful in providing a variety of interpretive techniques it is essential to understand what knowledge doesn't exist. Interpretive and educational material can focus on the latter, thus becoming more effective.

1.3.2 Methodological

Methodologically, this study differs from the more traditional recreation resource management research. Rather than focussing on a particular user group such as skiers or big game hunters, a large scale survey of the general public (including recreation nonparticipants) was conducted. This approach should remove much of the bias associated with other types of studies by providing a representative sample of the general public in the model forest area.

In addition, data checking and analysis procedures performed in this study were particularly rigorous. The procedures outlined by Tabachnick and Fidell (1996) for all aspects of data preparation and checking were adhered to in order to ensure the reliability of results. It is essential that quantitative analysis of social science data be handled rigorously in order to ensure that results are credible and reliable. One of the barriers to the acceptance of social science in resource management lies in mistaken beliefs that "anyone can do survey research" (Decker et al. 1987). The methodology of data collection and analysis in this study is an example of a carefully executed social science in resource management study.

1.3.3 Theoretical

From a theoretical perspective, this study tests the New Environmental Paradigm (NEP) Scale (Dunlap and van Liere 1978) that was developed to measure environmental attitudes. In contrast to previous studies which considered just the 12 item NEP Scale (Albrecht et al. 1982; Edgell and Nowell 1989; Stern et al. 1995), in this study the NEP Scale was used in conjunction with scales measuring attitudes on importance of recreation and sociodemographic information to discriminate among different types of recreationists.

This use of the NEP Scale to predict recreation participation is a unique application and illustrates the connections between environmental attitudes and recreation behaviour. The majority of attitude-behaviour literature has focussed on using attitudes toward a behaviour for behaviour prediction (Ajzen and Fishbein 1980; Fishbein and Ajzen 1975). The usefulness of the NEP in discriminating among consumptive recreationists, nonconsumptive recreationists, and nonparticipants is discussed in Chapter 6.

1.4 Thesis Outline

In the next chapter, a brief review will be conducted of the attitude-behaviour literature, as well as socio-economic recreation research, particularly on forest lands.

This second chapter will set the context for the current study, identifying any information gaps in the literature. This literature review is followed by the third chapter which outlines the study area, the Western Newfoundland Model Forest. Both biophysical and social characteristics of the study area are included. The methodology used in collecting and analyzing the data is discussed in Chapter 4. A detailed discussion of the data collection process is followed by an explanation of the statistical techniques used in the data analysis, including principal components analysis and discriminant function analysis. Results of descriptive statistics and more in-depth statistical analyses are the subjects of chapters 5 and 6, respectively. Chapter 5 gives percentage responses to the various items in the questionnaire, and offers an overall picture of the study results, while Chapter 6 presents the results of the principal components analysis, discriminant function analysis, and analysis of variance. A discussion of the results and conclusions appears in the final chapter. It presents highlights of the study, compares these results to other studies, and offers recommendations for further research in the Western Newfoundland Model Forest and in this area of social science in natural resource management.

CHAPTER 2. LITERATURE REVIEW

In this chapter, areas of attitude-behaviour research and social science in resource management are examined as they pertain to forest management. The NEP scale (Dunlap and Van Liere 1978) and its use in behaviour prediction is outlined after this initial overview. A roughly chronological examination of trends in social science in resource management research, and implications for the direction of the current study, concludes the chapter.

2.1 The Relationship Between Attitude and Behaviour

One of the objectives of this study is to examine model forest residents' attitudes toward the environment in general, and the model forest in particular, and the linkage between these attitudes and their recreational behaviour. Several authors have examined the attitude-behaviour relationship theoretically.

Fishbein and Ajzen (1975) define the word attitude as a "learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object." The attitude has played a central role in attempts to understand human thought and behaviour (Kraus 1995; Kim and Hunter 1993). Much of the research effort has been focussed on the attempt to predict overt behaviour based on measured attitudes. Three

basic positions on the attitude-behaviour relationship have been identified by Kim and Hunter (1993):

1. Since attitudes are cognitive events, they have no consequences for the way people act or the way they perform those acts. Therefore, attitudes cannot predict behaviour.

2. Attitudes are weakly and inconsistently related to behaviour. Instead, situational or individual factors are the crucial determinants of behaviour.

3. Construct-valid attitudes and corresponding behavioural tendencies are closely related to each other, whatever the causal direction might be. The most commonly chosen directional position has been that attitudes cause behaviours.

Early research into the attitude concept concluded that attitudes could be used to explain social behaviour (Ajzen and Fishbein 1980). Indeed, Ajzen and Fishbein asserted that the earliest use of the attitude concept to explain social behaviour occurred in 1918, when Thomas and Znaniecki explained attitudes as "individual mental processes that determine a person's actual and potential responses" (Ajzen and Fishbein 1980). The causal role played by attitudes in the determination of behaviour remained largely an unchallenged theory until the 1960s. One notable exception is a study by LaPierre (1933) of racial attitudes. He found that when hotel owners were questioned by mail about their policy for renting to Orientals, a large percentage stated that they would not rent to them. However, when a Chinese couple visited the same establishments a short time later, they

were refused at only one location (LaPierre 1933). Kraus (1995) states that in the first few decades of the 20th century many researchers simply assumed that attitudes would be closely related to overt behaviour, and saw no reason to demonstrate this claim. "There was at most the occasional caution that attitudes would not always be highly predictive of behaviour, but the frequency and implications of such occurrences were not seriously considered " (Kraus 1995).

The assumption that attitudes could be used to predict overt behaviour came under attack in the 1960s, and Kraus (1995) states that some researchers went so far as to conclude that attitude had become an obsolete concept. Wicker (1969) reviewed 46 studies in which subjects' verbal and overt responses to attitude objects were obtained. Measured attitudes were rarely found to account for more than 10 percent of the variance in overt behavioural measures. Tarter (1970) stated that "attitudes, as presently conceptualized, play no real role in behaviour." Other scientists suggested that the problem lay in measuring attitudes correctly as they relate to a specific behaviour.

Fishbein and Ajzen (1975) contributed greatly to the understanding of the relationship between attitudes and behaviour. Their theory of reasoned action suggests that behaviours are best predicted by intention to perform those behaviours. In turn, behavioural intentions are predicted by an individual's attitudes and the subjective norms surrounding the behaviour. The predictive ability of attitudes has also been improved through the consideration of attitude accessibility (Manfredo et al 1992; Barro et al 1996), personal importance of the attitude object (Bright and Manfredo 1995), attitude certainty,

attitude extremity, and attitude strength (Bright and Manfredo 1995), as well as attitudinal relevance (Kim and Hunter 1993). This current study will further contribute to the knowledge on attitude-behaviour relationships.

2.2 The New Environmental Paradigm Scale as a Measure of Environmental Attitudes

One area of attitudinal research that has received extensive treatment in the literature is people's changing attitudes toward the natural environment (Edgell and Nowell 1989). The traditional set of beliefs and values has been referred to as the "Dominant Social Paradigm," or DSP, in which humankind is viewed as being superior to the rest of nature. Supporters of this anthropocentric viewpoint believe that ecological problems are easily assuaged by science and technology (Geller and Lasley 1985).

During the last two to three decades, researchers have noted a shift in the dominant worldview toward more environmentally friendly beliefs and values (Henderson 1976; Dunlap and van Liere 1978). This worldview has been termed the "New Environmental Paradigm," or NEP (Dunlap and van Liere 1978). In an attempt to measure the strength of support for this worldview by the general public, Dunlap and van Liere (1978) developed the NEP Scale. The 12 item scale was designed to include items relevant to central aspects of the NEP such as limits to growth, balance of nature, and anthropocentrism (Dunlap and van Liere 1978). The 12 statements that make up the NEP Scale are listed in Table 2.1.

Table 2.1. New Environmental Paradigm Scale

Item	Statement*
1	We are approaching the limit to the number of people that the earth can support.
2	The balance of nature is delicate and easily upset.
3	Mankind was created to rule over the rest of nature.
4	When humans interfere with nature it often produces disastrous consequences.
5	To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.
6	Humans have the right to modify the natural environment to suit their needs.
7	Humans must live in harmony with nature in order to survive.
8	Plants and animals exist primarily to be used by humans.
9	The earth is like a spaceship with only limited room and resources.
10	There are limits to growth beyond which our industrialized society cannot expand.
11	Mankind is severely abusing the environment.
12	Humans need not adapt to the environment because they can remake it to suit their needs.

* Individuals responded to statements using a seven point Likert scale from strongly disagree (1) to strongly agree (7).

Source: Edgell and Nowell 1989.

Dunlap and van Liere (1978) tested their scale using a mail survey of the Washington State general public as well as the members of a statewide environmental organization. Results indicated that both the environmentalists and general public strongly supported the NEP. Dunlap and van Liere also tested the reliability and validity

of their scale. Factor analysis showed that all twelve items of the scale loaded heavily on one factor, indicating that the scale does indeed measure an underlying attitudinal dimension (Dunlap and van Liere 1978). The authors suggested that further research was necessary in other populations in order to validate their results, and indeed many researchers have since used the scale in an attempt to replicate and build upon their findings. Table 2.2 summarizes several studies that are representative of NEP studies.

Table 2.2. Representative examples of NEP research

Authors	Focus/Findings	Location and group studied
Dunlap and van Liere, 1978	Original NEP study. Showed strong support for the environment, and indicated that the NEP scale measured one underlying dimension.	Washington state - general public and a statewide environmental organization
Albrecht et al, 1982	Results supported the Dunlap and van Liere's findings for reliability and validity of the scale. However, indications were of three underlying dimensions, not just one.	Iowa - farm operators and the general public
Geller and Lasley, 1985	Tested the factorablilty of the NEP scale. Results supported Albrecht et al, suggesting a three factor model	Missouri farmers
Edgell and Nowell, 1989	In contrast to other groups, commercial fishers were found to respond in a unidimensional way to the NEP. It was hypothesized that this was due to close ties to resource exploitation	British Columbia - commercial fishers, environmentalists, and the general public
Stern et al, 1985	Used a revised NEP scale. Found that the NEP correlated highly with a measure of beliefs about the consequences of environmental problems	Virginia - general public

Most research seems to indicate that the NEP Scale is successful in expressing primitive beliefs, whether in one or several dimensions. Results of several studies (Dunlap and van Liere 1978; Albrecht et al 1982; Edgell and Nowell 1989) indicate strong support for this new worldview or environmental paradigm by the general public. While results are mixed about the scale's ability to predict behaviour, correlations have been found (Scott and Willis 1994, Stern et al 1995).

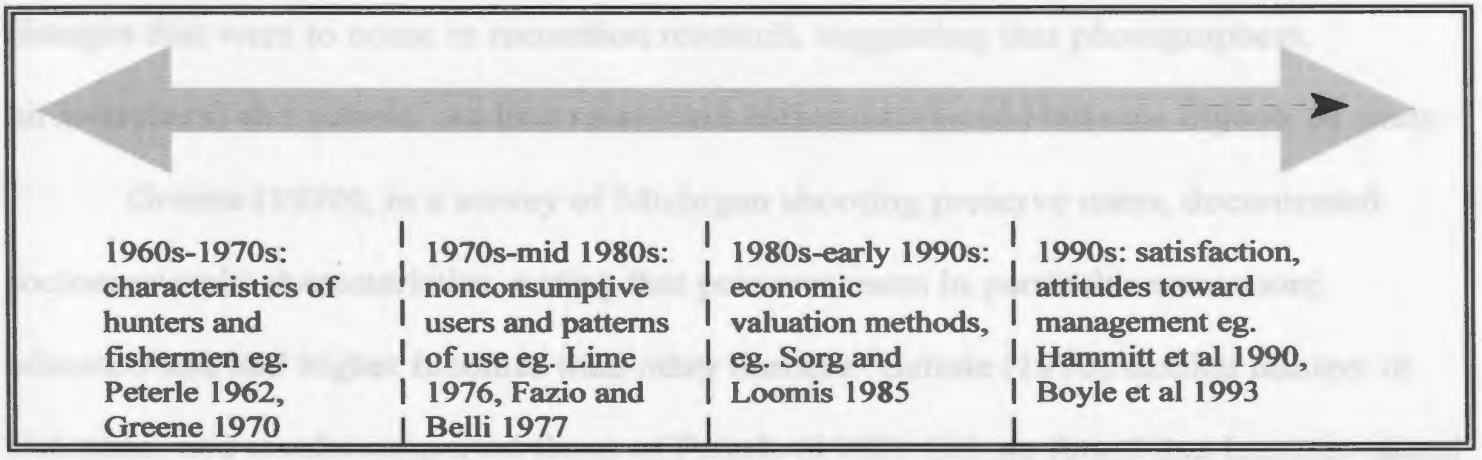
In this study, an attempt was made to divide the general public into three distinct groups based on recreation participation. Principal components analysis was performed using the NEP Scale, along with sociodemographics and attitudes toward the importance of recreational activities. The resulting components were used in an attempt to discriminate among the groups. This study is one of few to divide the general public in groups in this manner when using the NEP Scale to measure environmental attitudes.

2.3 Trends in Social Science Research

A major focus of social science in resource management research for the past three decades has been recreation research, probably because these groups are readily identifiable. Nonetheless, fairly distinct trends in research interests can be identified. The following discussion examines four broad trends in social science research. As Figure 2.1 indicates, these trends can be arranged in a roughly chronological fashion, although of course some overlaps will exist. The discussion of social science research which follows

will be organized in a similar "timeline" manner. The chapter concludes with a brief discussion of some ways in which the current study was influenced by this past research.

Figure 2.1 Trends in Social Science in Resource Management Research



2.3.1 Early Research : Consumptive Focus

Early research was quite consumption-oriented, with a myriad of articles on the characteristics of hunters and fishermen (Peterle 1962; Peterle 1967; Greene 1970; Eisele 1973; More 1973; Potter et al 1973; Schole et al 1973). T. J. Peterle was one of the foremost writers of this type of research (1962; 1967; 1977a; 1977b; Peterle and Scott 1975; Peterle and Scott 1977). Peterle's 1962 article is characteristic of social science writings of the time - he suggested that hunting was similar to other products, and in order to sell it effectively, it was necessary to know the consumer. Results of a mail survey in Ohio illustrated that hunters were younger, more educated, and had higher incomes and larger families than typical Ohio males (Peterle 1962, 1967). An effort was

also made to differentiate between types of hunters. The survey also indicated the more social aspects of hunting, such as the ability to spend time with family and friends, and gathered opinions on some hunting management issues. Peterle (1962) alluded to changes that were to come in recreation research, suggesting that photographers, birdwatchers, and general outdoor recreation enthusiasts would become objects of study.

Greene (1970), in a survey of Michigan shooting preserve users, documented socioeconomic characteristics, noting that preserve users in particular were more educated and had higher incomes than other hunters. Schole (1970) studied hunters in Colorado, and results supported those of Peterle (1962). Schole found that hunters valued the companionship of family and friends, and the outdoor experience, more than the thrill of the hunt or the meat that a kill provided. Schole (1973) suggested that these findings had important implications for management, in that hunting success need not be promoted as the sole benefit of hunting.

As stated by Peterle (1962), nonconsumptive recreation activities were becoming more important and being recognized by resource managers and social scientists. Hendee (1969) compared hunters to what he termed "appreciative" users of wildlife refuges, and found that these appreciative users were more educated than hunters. In contrast to hunting, which had always been male dominated, appreciative activities such as photography had many female participants. While Hendee (1969) conceded that some hunters did indeed participate in appreciative activities, he saw the two groups as clearly opposed, and correctly predicted that there would be competition for scarce resources

between the two. He urged that rigorous study of appreciative use be undertaken, particularly in an effort to grasp the intangible benefits of recreation. Appreciative, or "nonconsumptive" activities subsequently became a very important area of research, s outlined below.

2.3.2 The Nonconsumptive Focus

The period from the late 1970s to the mid 1980s was highlighted by a flood of nonconsumptive research, documenting patterns of uses (Lime 1976; Fazio and Belli 1977; Peterle and Scott 1977; Langenau 1979; Lyons 1982). As participation in nonconsumptive recreation increased, research was performed on conflicts between users (Knopp and Tyger 1973; Bart et al 1979; Jackson and Wong 1982), crowding (West 1982; Cullen 1985; Westover and Collins 1987), and ecological damage (Wilkes 1977; Cole 1981; Shelby et al 1988).

Lime (1976) studied nonconsumptive wildlife recreation in Superior National Forest and the Boundary Waters Canoe area in the United States. The decline in the popularity of hunting was noted and several possible explanations of the phenomenon were offered: the shrinking land base available for hunting, increased urbanization, decline in the quality of the hunting experience due to crowding, and pressure from increasing anti-hunting sentiment. Lime (1976) noted that incidental encounters with wildlife during other activities was an important nonconsumptive activity, and also took

such activities as hearing wildlife, reading about wildlife, and watching TV programs about wildlife into consideration. Active management for nonconsumptive users was encouraged, through the manipulation of habitat to increase encounters with wildlife, using techniques such as managed openings and prescribed fires. Brush (1976) also proposed this active management, managing open spaces within forests to increase the visual enjoyment of users.

Langenau (1979) divided nonconsumptive uses of the Michigan deer herd into four categories: nonconsumptive experiences while hunting, active pursuit with intent to observe wildlife, incidental observation, and conceptual activities related to wildlife (TV, reading, etc). Results of a mail survey showed that 41 percent of respondents were involved in searching for deer solely to observe or photograph them. Nearly 90 percent thought that seeing deer would increase their enjoyment of other forms of recreation, and 78 percent participated in conceptual activities relating to deer. Only one-third of respondents had not been involved in any deer-related activities in the previous year. Noting that for every person who hunted deer, three people drove or hiked to search for deer or attempted to photograph deer, Langenau (1979) urged management of the Michigan deer herd for nonconsumptive uses.

As participation in nonconsumptive activities, and recognition of these users by managers, increased, conflicts between competing users and uses were intensively studied. Forested lands, traditionally used for timber and hunting, were in demand for nonconsumptive uses. Methods of multiple use forestry were studied and implemented

(Ffolliott and Thorud 1977; Brown and Carden 1977; Calish, Fight and Teegarden 1978; Kincaid 1985; Johnson and Letson 1988). Conflicts between competing recreational uses were also studied; an area of conflict that received considerable attention was that between snowmobilers and skiers (Knopp and Tyger 1973; Jackson and Wong 1982). Zoning of areas for snowmobiles and separate areas for skiers resulted in minimizing what was a serious conflict between those users.

Increased participation in nonconsumptive activities caused ecological damage over and above that already attributed to consumptive uses (Wilkes 1977; Wall and Wright 1977; Cole 1981). Wilkes (1977) rejected the concept of nonconsumptive use, stating that these uses are consumptive along spatial, temporal, and physical dimensions. He used Ivy Green Park in British Columbia to illustrate his argument. While the park was dedicated to the preservation of the natural environment, facilities such as campsites that had been installed for nonconsumptive users meant only a quarter of the park was unimpaired (Wilkes 1977). Citing further damage such as littering and wildlife disturbance due to nonconsumptive activities, Wilkes urged changes in management such as user restrictions and nonuse planning.

Crowding of recreation areas has been extensively studied (Graefe, Vaske, and Kuss 1984; Manning 1985; Shelby and Heberlein 1986; Kuss, Graefe, and Vaske 1989); Shelby et al (1988) proposed that it was one of the most frequently studied aspects of outdoor recreation. West (1982), along with Westover and Collins (1987), noted that behaviour of users, as well as actual numbers of users, influenced perceptions of

crowding. Crowding in Sylvania Recreation Area of the Ottawa National Forest in Michigan was studied by West in 1982. Results indicated that objectionable behaviour by other users, particularly noise-related behaviour, increased the perception of crowdedness. West (1982) suggested zoning for different types of behaviour and silvicultural management strategies as ways to decrease the perception of crowding.

Cullen (1985) discussed the congestion problem on public lands in New Zealand. Six rationing devices to attempt to alleviate the problem through controlling and allocating uses of public land were discussed: prices, effort requirement, lotteries, queues, permits, and zones. Price was suggested as the best rationing device in most cases. Other techniques were found useful in some instances; for example, permits were said to be useful when safety of recreationists was an issue (Cullen 1985).

2.3.3 Economic Valuation Methods

As competition for scarce resources increased, whether for recreational activities, agriculture, logging, or mining, it became popular to measure the relative values of the competing uses (O'Leary and Weeks 1979; Sorg and Loomis 1985; Bishop et al 1987; Keith and Lyon 1985; Sorg et al 1985; Canham 1986; Fesenmaier and Leiber 1987). Several economic valuation techniques have been developed that can be used for recreation resource evaluation.

The simplest of the economic valuation methods, the gross expenditures method, has been used for the valuation of recreational activities such as hunting, and involves totalling the money spent by all participants for such things as transportation, food, and equipment (Sorg and Loomis 1985). Dardis et al (1981) examined recreation expenditure data gathered in the 1972-1973 Bureau of Labor Statistics Consumer Expenditure Survey. Results indicated that recreation expenditures were positively related to income and education. Birdwatching at Point Pelee National Park has also been valued using the gross expenditures method (Hvenegaard et al 1989). Average expenditures by birdwatchers totalled $224 per birdwatching trip, and the activity made a significant contribution to the economy of the surrounding area. Canham (1986) claimed that the expenditures method was the best to use when valuing forest recreation in order to create a meaningful comparison with timber values. On a national level, the Survey on the Importance of Wildlife to Canadians has been carried out in 1981, 1987, and 1991 (Filion et al 1996, DuWors et al 1999) and has collected information on Canadians ' recreation patterns and expenditures. Average yearly expenditure per participant for primary nonconsumptive trips or outings was $490 per participant, while for hunting the average was $919 (Filion et al 1993).

As not all outdoor recreation requires expenditures in order to participate, the value of an activity can be underestimated by the expenditures method. Consumer surplus refers to the benefits that are received from a resource or activity, over and above actual expenditure. Two economic valuation methods based on this concept are the travel cost

method and the contingent valuation method (Sorg and Loomis 1985). The travel cost method (TCM) is based on the idea that travel costs can be used instead of price when estimating the demand curve for activities such as hunting at a particular site (Sorg and Loomis 1985; Leuschner et al 1987; Loomis 1987; Caulkins et al 1986; Farber 1988). Distance from the recreation site is divided into zones based on travel time. This travel time is then used to calculate travel costs for each zone. The contingent valuation method (CVM) is based on hypothetical situations, in which recreationists are asked how much they would be willing to pay to participate in an activity (Cocheba and Langford 1981; Sorg and Loomis 1985; Desvouges et al 1987; Bowker and Stoll 1988; Lee and Chun 1999).

Both economic valuation methods were used in a study by Farber (1988). Farber (1988) identified an information gap with respect to the value of coastal wetlands for recreation, as most wetland research had focussed on commercial harvests. Farber attempted a valuation of a major wetlands area in Louisiana, using both contingent valuation and travel cost methods. The sampling method for the survey consisted of placing self-addressed, stamped questionnaires on the windshields of all vehicles parked at 27 boat launch facilities in the wetlands. Contingent valuation and travel cost resulted in similar values, the average of which ranged from $36 to $111 per acre, or from $23.6 to $72.7 million annually (Farber 1988).

Leuschner et al (1987) considered socioeconomic characteristics, attitudes, and TCM data in their study of user fees for backcountry areas. Although TCM indicated that

user fees would reduce use to some extent, the authors considered modest fees appropriate, as they would lead to a significant increase in revenue. Johansson et al (1988) used CVM in an attempt to determine the optimal stock of moose in the county of Vasterbotten, Sweden. The decrease in consumer surplus of hunters if moose stock was decreased was compared to benefits to forest owners through the reduction of damage to trees, as well as decreased frequency of moose-related car accidents. While no definitive stock size was offered, the procedure had promising implications for resource management decision making.

2.3.4 Motivations, Satisfaction, and Attitudes Toward Management

Over the last decade, attention has shifted toward improving the quality of available recreation experiences, rather than actually increasing the number of facilities (Graefe and Fedler 1986; Hammitt et al 1990; Boyle et al 1993). This management focus has resulted in many articles being published concerning motivations behind recreation and satisfaction with the recreation experience. Much of this research has considered traditional hunting and fishing activities (Graefe and Fedler 1986; Hultsman et al 1989; Rollins and Romano 1989; Hammitt et al 1990; Hazel et al 1990; Vaske et al 1990; Boyle et al 1993, Floyd and Gramann 1997). Recent research has examined the effect of demographic characteristics such as race and gender on motivations behind recreational fishing (Toth and Brown 1997).

Nonconsumptive activities such as birdwatching (Applegate and Clark 1987; McFarlane 1994), camping (Connelly 1987), and boating (Robertson and Regula 1994) have also been studied. As nonconsumptive recreation has increased, so has research on what these users desire from their recreation experience. Forest-related recreation has been studied extensively, particularly with regard to visual preferences of these forest users (Hollenhurst 1993; Hammitt et al 1994; Schroeder and Orland 1994).

It has long been recognized that hunting is motivated by more than the desire to hunt and kill an animal; companionship and love of nature are important to the hunting experience as well (Schole et al 1973). Vaske et al (1986) used multiple regression analysis to evaluate the individual and combined effects of three basic dimensions (wildlife, human interaction, and nature/sport) on overall waterfowl hunting satisfaction. Results indicated that nature/sport items such as being outdoors explained more of the variation in satisfaction than either the wildlife or human interaction variables. Interestingly, hunting success was not found to be significantly correlated with satisfaction (Vaske et al 1986). Hammitt et al (1990) showed that satisfaction with deer hunting was related to several factors such as the quality of the hunt, the behaviour of other hunters, and just being outdoors.

Hunter satisfaction with management techniques has become an area of interest in recent years (Hultsman et al 1989; Rollins and Romano 1989; Boyle et al 1993, Diefenbach et al 1997, Olsen and Afton 1999). Rollins and Romano (1989) endeavoured to determine how satisfied hunters were with the selective harvest system for moose in

Ontario that had been introduced in 1983. Results indicated that while support for the system increased between 1985 and 1988, some hunters, particularly those that were older or more experienced than average, were not satisfied. Boyle et al (1993) questioned whether moose hunters in Maine preferred the hunt to occur in late September, mid-October, or early December. Results indicated that most hunters preferred a mid-October hunt, which had been the timing of the actual hunt. Interestingly, management scheduled the hunt for early October in the year following the final survey.

Connelly (1987) used a mail survey to determine factors critical to camper satisfaction in Adirondack Park, New York. Three factors: solitude/rejuvenation, nature, and facility characteristics were identified as critical for a satisfying camping experience, with solitude/rejuvenation being the most important of the three. Applegate and Clark (1987) studied satisfaction levels of birdwatchers in Forsythe National Wildlife refuge in New Jersey. Reported satisfaction levels were similar to other nonconsumptive recreation activities and considerably higher than consumptive activities such as hunting or fishing.

Robertson and Regula (1994) studied recreational displacement and overall satisfaction of boaters in Iowa. The artificial lake under consideration was experiencing problems with excessive sedimentation. Results indicated that boaters who were less satisfied with their last recreation experience at the lake reduced or discontinued their use of the lake. By using a mail survey questionnaire rather than an on-site survey, Robertson and Regula (1994) overcame traditional difficulties with measuring recreational

displacement and satisfaction. An on-site survey would overlook dissatisfied users who had been displaced due to the problems with excessive sedimentation.

Individuals' knowledge of recreational facilities and activities has been examined using surveys and has been shown to affect participation rates. The current study considers knowledge levels of model forest residents in light of the educational objectives of the model forest, and compares level of knowledge among recreation participants and nonparticipants. Perdue (1987) used a mail survey of recreational boaters in southeast Texas to examine the effect of awareness of a lake on site choice. Awareness of recreational boating opportunities was shown to be a negative function of distance and a positive function of lake attractiveness. Perdue (1987) stressed the importance of information as a management tool. In a Canadian context, McFarlane and Boxall (1998) studied site choice of wilderness users in Nopoming Provincial park in Manitoba. An association was found between past experience and site choice, with experienced users choosing more difficult, less managed routes. Spotts and Stynes (1985) used a personal interview survey of Lansing, Michigan residents to measure their familiarity with local parks. Of the 19 parks included in the study, residents were aware of an average of 11. People also seemed to think they were much more familiar with the Lansing park system than they actually were. More recently, Manfredo and Bright (1991) assessed the effects of information packages on recreation behaviour. They concluded that information could indeed be used to change beliefs and behaviour. Marynowski and Jacobson (1999) found that a targeted ecosystem education program at Eglin Air Force Base in northwest Florida

was effective in increasing knowledge, with mass media being most effective in shifting attitudes.

Reading et al (1994) studied the attitudes and knowledge of people living in the Greater Yellowstone Ecosystem. The GYE, which represents one of the largest intact ecosystems in the United States, is managed by more than 25 political and administrative agencies. Results indicated that respondents did not feel very knowledgeable about the GYE. Despite living inside the GYE, 47 percent of respondents said that they knew "very much" to "a moderate amount" about it, 31.5 percent stated that they knew only "a little" and the remaining 21 percent said they knew "not much" or "hardly anything at all" (Reading et al 1994). Knowledge was also lacking about ecological issues surrounding the plants and animals in the GYE. Results indicated that males and those with higher incomes and education levels had greater knowledge about the GYE. Reading et al (1994) suggested that their findings should be considered by managers when developing policies for the Greater Yellowstone Ecosystem.

Economic valuation of recreation benefits has remained important, particularly for forest-related recreation such as hiking (Englin 1990) and camping (Daniel et al 1989; Richards et al 1990; Christensen et al 1993). A relatively new form of outdoor recreation, mountain biking, has also been studied. Fix and Loomis (1997) used the travel cost method to estimate the economic value of mountain biking trails in Moab, Utah. Individual per-trip values were estimated at $197 to $205.

Willis and Garrod (1999) studied the recreational value of increased river flow to anglers and other recreationists in Britain. They determined that in five of seven rivers studied, recreational benefits exceeded the costs of increasing river flow. Economics of forest characteristics such as aesthetics have been extensively studied as well (Richards et al 1990; Walsh et al 1990; Englin and Mendelsohn 1991; Hanley and Ruffell 1993). Van Kooten (1995) suggested that constantly updated estimates of annual nonmarket values of forests could be used as an economic indicator of forest sustainability, to be compared against the sustainable rent from logging operations.

Daniel et al (1989) used photos to determine campers' judgements of scenic beauty and willingness to pay to camp at 35 forest sites in four national forests in Arizona. A near perfect linear relationship was found between the scenic beauty and willingness to pay judgements. Factors affecting willingness to pay and perception of beauty in ponderosa pine forests were found to include large trees, lush low ground cover, openness in the stand, and a lack of downed wood. Englin (1990) examined the effect of backcountry hiking on the optimal rotation periods of several species of trees. Results suggested that the recreational component of the social value of stands of large trees was great. It was suggested that the most economically beneficial use for stands on popular trails was recreational.

In contrast, Hanley and Ruffell (1993) found that forest characteristics were not particularly useful for explaining the variation in consumers' surplus across different forest types. Their first experiment involved showing forest visitors pairs of photographs,

each pair depicting two forests which differed significantly with respect to one characteristic. The visitors were asked which they preferred and how much they were willing to pay to visit the preferred forest.

In the second experiment, visitors were asked to bid to preserve the option to visit the forest in which they were interviewed. The bids were related to forest characteristics, socioeconomic characteristics of visitors, and purpose of visit. The paired photograph experiment showed that people were willing to pay to visit forests exhibiting characteristics such as height diversity. The bid-curve analysis, however, showed weak relationships between many characteristics and option price. Hanley and Ruffell (1993) suggested that the majority of visitors to public forests in Britain were not particularly concerned about the physical characteristics of the forests.

The economic value of wildlife, for both consumptive (Adamowicz 1991; Luzar et al 1992) and nonconsumptive (Schafer et al 1993; Clayton and Mendelsohn 1993; Benson 1993) activities, has recently been studied. Benson (1993) considered an innovative valuation technique for forest-based recreation activities. Not an economic valuation method per se, it involved the use of imaginary "tokens" which visitors used to illustrate the relative values of such things as wildlife, landscape, and visitor centers. Fourteen districts in Great Britain were surveyed in 1987 and 1988. Results indicated that in most districts wildlife was valued more highly than landscape, access, special recreation, or visitor centers. The pattern was true for both residents and tourists, indicating the high value of the wildlife resource for all visitors.

Clayton and Mendelsohn (1993) designed a study to measure the value of watchable wildlife at McNeil River, a game sanctuary in Alaska in which unique opportunities exist to watch grizzly bears. The goal of the study was to extend the wildlife valuation literature to include nonconsumptive activities through the use of a concrete example. Willingness to pay averaged between $228 and $277 per person to visit McNeil River, and the authors concluded that watchable wildlife could be used to raise revenue and provide support for conservation.

Attitudes toward the recreation experience itself, as well as toward wildlife, nature, and the environment have also been extensively studied. Several scales have been developed to measure people's attitudes, including the New Environmental Paradigm Scale (Dunlap and van Liere 1978) which measures environmental attitudes, and the Wildlife Attitudes and Values Scale (Purdy and Decker 1989) which measures attitudes toward wildlife. A Wildlife Acceptance Capacity (WAC) scale has also been developed to offer managers information on how many animals are too many to the public (Decker and Purdy 1988).

Attitudes toward animals in general (Kellert 1976; 1977a; 1977b; 1979; 1980; Peyton and Langenau 1985; Purdy and Decker 1989), and toward specific species (Bath and Buchanan 1989; Bath 1994; Stevens et al 1994) have been examined by many researchers. Kellert (1980) is perhaps best known in the field of attitudes toward animals. His research has identified nine dimensions in public attitudes toward animals: naturalistic, ecologistic, humanistic, moralistic, scientistic, utilitarian, dominionistic,

negativistic, and aesthetic. Peyton and Langenau (1985) used these attitudinal dimensions in their comparison of Bureau of Land Management biologists and the general public. Results indicated that the attitudes of the two groups were quite different, for example the biologists exhibited ecologistic, scientistic, and dominionistic attitudes which were stronger and more variable than those of the general public. Peyton and Langenau (1985) suggested that the differences in attitudes between the groups would have important implications for management.

Attitudinal research on specific wildlife species often centers on predatory species such as wolves (Bath and Buchanan 1989) and bears (Decker and Purdy 1988; Bath 1994). Attitudes toward medium-sized predators such as foxes have also been studied (Messmer et al 1999). An area of this research that has important implications for management is attitudes toward protection and reintroduction of species. Bath and Buchanan (1989) studied attitudes toward wolf restoration in Yellowstone National Park. Results indicated that most of the Wyoming general public held a positive attitude toward wolves and supported restoration. These attitudes were found to be affected by distance from the restoration area; residents in counties surrounding the park had more negative attitudes.

In a study of public attitudes toward coyotes in New England (Stevens et al 1994), opinions were more divided. Only 5 percent of survey respondents felt that coyotes should be eliminated, but when asked if coyotes should be completely protected, 39 percent agreed and 40 percent disagreed. In addition, 19 percent of respondents were

willing to pay an average of $4.20 per year for coyote control, while 23 percent were willing to pay about the same amount for coyote protection (Stevens et al 1994).

Public attitudes toward environmental management programs have also been studied (Manning et al 1999, Messmer et al 1999). Kurzejeski et al (1992) examined the wildlife conservation attitudes and land use intentions of Conservation Reserve Program participants in Missouri. Land enrolled in this program is kept idle, relatively free of haying and grazing. The primary reason is to prevent soil erosion, but there is potential to provide habitat for a variety of wildlife species (Kurzejeski et al 1992). Results indicated that wildlife and provision of wildlife habitat influenced decisions to enroll in the program and choice of conservation practices. Johnsen et al (1992) studied public perceptions and attitudes toward the Green Bay Remedial Action Plan in Michigan. Respondents to a survey were poorly informed about the RAP, but supported its goals of improving water quality problems. Results indicated differences in attitudes between recreational users and nonusers (Johnson et al 1992). Loker et al (1999) studied suburban residents' acceptance of wildlife damage management in New York. Acceptance of invasive and lethal interventions was found to be related to concerns about nuisance and economic damage issues.

Comparison of attitudes toward the environment and resource issues, by gender (Kellert and Berry 1987; Mohai 1992, Ozanne et al 1999), occupation (Peyton and Langenau 1985), group membership (Bath and Buchanan 1989; Vining 1992), land ownership (Bourke and Luloff 1994), and region (Christianson and Arcury 1992; Gooch

1995) has also been undertaken. Identifying differences or similarities in attitudes between what appear to be disparate groups can aid in management (Peyton and Langenau 1985).

Mohai (1992) used a national survey in the United States to examine gender differences in environmental concern and activism. Results indicated that while women expressed greater concern than men for the environment, rates of environmental activism for women were substantially lower than for men (Mohai 1992). Bourke and Luloff (1994) examined differences in attitudes toward the management of nonindustrial private forest (NIPF) land between the landowners and the general public. While previous studies assumed the groups differed, with landowners having more utilitarian values, Bourke and Luloff's (1994) study did not support these findings. Results indicated that sociodemographic characteristics, use of the forest, and ownership status had little influence on attitudes toward management (Bourke and Luloff 1994).

Gooch (1995) compared environmental beliefs and attitudes in Estonia, Latvia, and Sweden using interviews and a mail survey. Four scales were used in the study: (1) the New Environmental Paradigm (NEP) Scale, (2) a scale to measure support for science and technology, (3) a scale to measure postmaterial values, and (4) a scale to measure concern for local environmental problems. Expected correlations between the scales were only partially met, if at all. In addition, regional variations were apparent for certain NEP items, concern with local problems, and extent of postmaterialism (Gooch 1995). It

was suggested that these findings might be important for the implementation of environmental policy, particularly at a global scale.

Christianson and Arcury (1992) examined differences in attitudes toward the environment and environmental policy in the Kentucky River Drainage Basin, where problems exist in securing adequate water supplies. Differences were expected in environmental attitudes between residents of the eastern Appalachian region and the central Bluegrass region of the Basin, but this hypothesis was not supported. The authors suggested policy makers go beyond stereotypes and assess the knowledge and opinions of the public when developing environmental policy (Christianson and Arcury 1992). The current study addresses the stereotype issue by comparing attitudes and knowledge levels among different groups of recreationists to see if traditional assumptions about consumptive versus nonconsumptive recreationists are upheld.

2.4 Implications for the Current Study

The preceding review of the literature was undertaken to provide an understanding of important areas of inquiry in the field of social science in resource management research, and to give some direction for the current study. Trends in social science research were shown to move from the early consumptive focus provided by a proliferation of hunting-related studies, through the development of an interest in

nonconsumptive recreation and economic valuation, to the current interest in satisfaction and attitudinal research.

As a result of this review, some gaps in the literature can be identified. Many of the examples given were conducted in the United States or Europe; few Canadian studies were found. Studies of this nature in a model forest environment are relatively new. Popular target groups were also identified - hunters, skiers, and so on. Few researchers concentrated their efforts on the general public, particularly with attention to nonparticipants. The current study meets a need for a Canadian study of attitudes and recreational behaviour of the general public.

The survey instrument was designed after an examination of previous studies. The NEP scale was chosen as a measure of environmental attitudes, after a review of several scales available (Dunlap and van Liere 1978, Purdy and Decker 1989). Recreational activities considered in the study were chosen after a review of the more popular activities covered in the literature.

Various methods of data collection were used in the studies reviewed, including personal interviews, mail surveys, and intercept surveys. A mail survey was chosen for the current study after a comparison of data needs with previous research (Robertson and Regula 1994). Knowledge and attitude scores could have been biased toward the higher end of the scale had an onsite survey or personal interview format been used, as respondents might have been influenced by the presence of the interviewer. In addition, due to the gaps in the literature as previously identified, it was considered important to

document the opinions and attitudes of the general public, including nonparticipants, rather than limiting the study to the traditional user group that would be contacted through on-site methods.

This study will provide information on recreational activities and expenditures in the Western Newfoundland Model Forest, along with documenting environmental attitudes and knowledge levels of model forest residents. The study also provides a test of the NEP Scale for use in recreation behaviour classification. Its focus on the general public and its Canadian context provide additional contributions to knowledge. The following chapter gives an overview of the study area, the Western Newfoundland Model Forest.

CHAPTER 3. STUDY AREA

This chapter describes the model forest program as a whole, as well as at the local scale. Canada's model forest network and the rationale behind its development are discussed first, along with the more recent international model forest program. The Western Newfoundland Model Forest then becomes the focus of discussion.

3.1 Canada's Model Forest Network

The network of model forests began as part of the $100 million *Partners in Sustainable Development of Forests* program, a component of Canada's Green Plan. A competitive selection process was used to ensure maximum innovation and public participation in the creation of the Model Forest sites. A National Advisory Committee of experts, supported by a Technical Review Subcommittee, examined 50 proposals submitted from across Canada and made recommendations for selection. The ten original successful sites were announced in June 1992 (Forestry Canada, 1992). The ten sites chosen represented eight of Canada's ten provinces (Newfoundland, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia) and covered the five major forest eco-regions: the boreal forest, the Acadian forest, the Great Lakes-St. Lawrence forest, the interior forests of British Columbia, and the coastal temperate rainforest (Forestry Canada, 1992) Figure 3.1 illustrates the distribution of model forests

throughout the Canadian network at the time this research was carried out. Since that time there have been some changes in the model forest system structure. There are now eleven model forests: the Western Newfoundland, Fundy (together with the Nova Forest Alliance in central Nova Scotia), Bas St. Laurent, Waswanipi Cree, Eastern Ontario, Lake Abitibi, Manitoba, Prince Albert, Foothill, McGregor, and Longbeach Model Forests.

The forests chosen also illustrated a wide variety of cultural and ecological values, such as wildlife, biodiversity, watersheds, recreation and fisheries, as well as the traditional economic value of wood supply. The program, which was for an initial five-year period (1992-1997), required the signing of funding agreements followed by annual reviews and approval of work plans for each of the Model Forests. Based on the success of the program, the program was continued for another five years, 1997-2002. The objectives of the model forest network are:

- to accelerate the implementation of sustainable development in the practice of forestry, in particular the concept of integrated resource management
- to develop and apply new and innovative concepts and techniques in the management of forests
- to test and demonstrate the best sustainable forestry practices available.

(Forestry Canada, 1992).

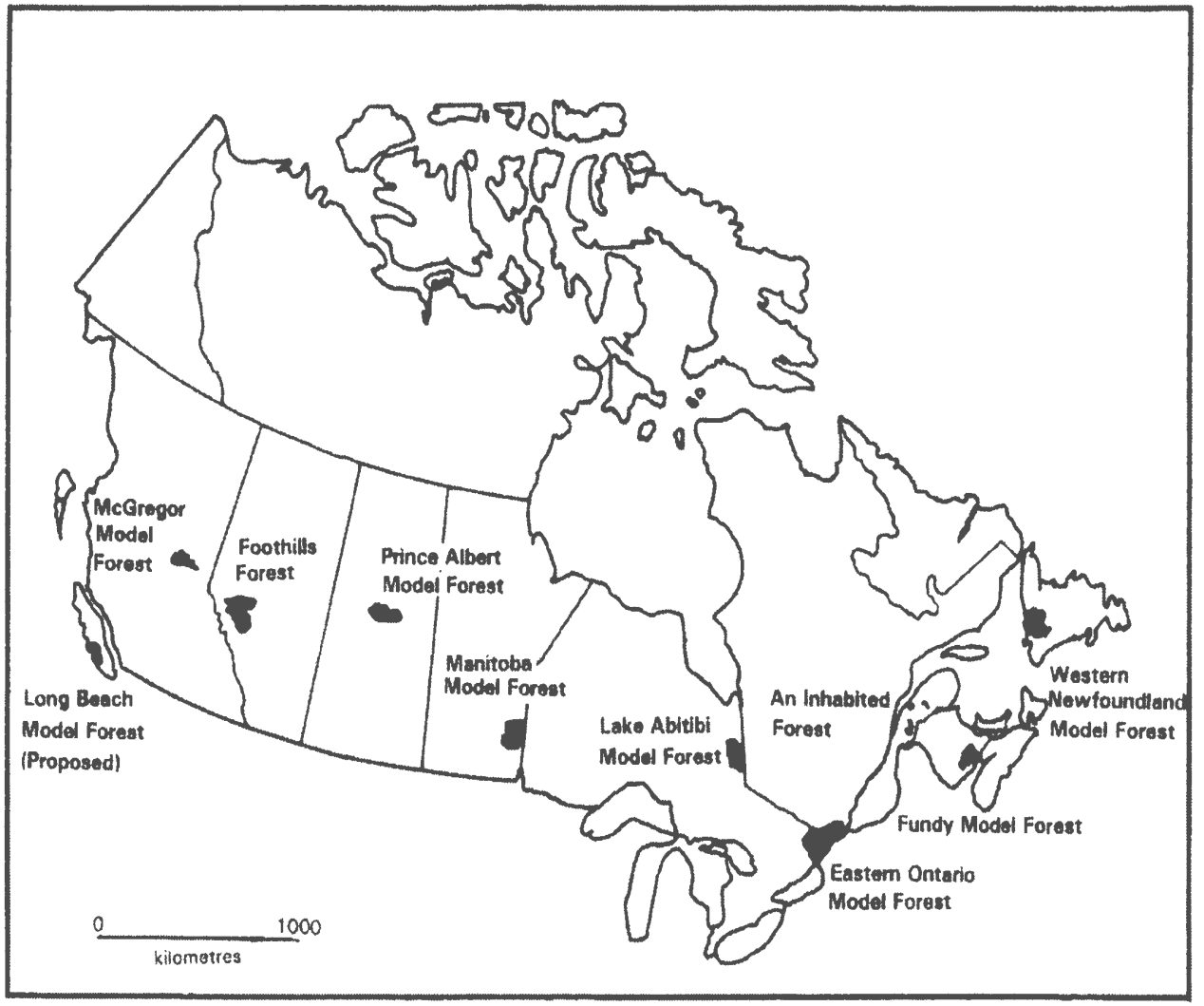


Figure 3.1: Model Forest Network of Canada

Map after Brand, D. G. and A. J. Dunlop. 1994. The model forest program: Information technology to support sustainable development of forests. Decision Support Strategies in Canada's Model Forests. Eighth annual Symposium on Geographic Information Systems (GIS 94); February 21-24; Vancouver, B.C.;pp. 5-16.

Each model forest operates independently, but a strength of the model forest program is that as each site develops its own approach to achieving sustainable development, it does so within a network of other model forests where both positive and negative experiences in research and management techniques can be shared (Natural Resources Canada 1994). Research activities vary between the model forests, but some general areas of research interest include:

- forest ecology and wildlife habitat
- environmentally sensitive silviculture and harvesting techniques
- the development of ways to forecast the future state of the forest under different management programs
- creating state of the art databases using Geographic Information Systems and remote sensing data gathered through satellites
- gathering information on local communities and their needs, and
- compiling statistics on nontimber values related to culture, aesthetics, and recreation.

This study addresses issues of local communities and their needs in addition to nontimber values.

3.2 The International Model Forests Program

Interest in the model forest concept has grown internationally as a way for countries to work toward a common definition of sustainable forest management that takes into account the different political, economic, social and cultural values of individual nations. Canada has provided financial support for the development of model

forests in other countries. To date, sites have been established in Mexico (Calakmul, Chihuahua, and Mariposa Monarca Model Forests) and in Russia (Gassinski Model Forest) (Natural Resources Canada 1994). The United States has designated three model forests: Cispus in Washington State, Hayfork in California, and Applegate in Oregon. Countries in the process of developing model forests include Argentina, Malaysia, China, Japan, and Vietnam. Several other countries have expressed interest in joining the program, including Australia, Ecuador, Indonesia, The Southern African Development Community, and the United Kingdom. The hope is that over time other countries will join the program, expanding the network around the globe.

The general objectives of the international model forest program are:

- to foster international cooperation and exchange of ideas relating to the working concept of sustainable forest management
- to support international cooperation in critical aspects of forest science and social science that underlie the search for new models of forest management; and
- to support ongoing international discussion on the criteria and principles of sustainable development.

(Supply and Services Canada 1993).

3.3 The Western Newfoundland Model Forest

An understanding of the physical and human characteristics of the Western Newfoundland Model Forest, the study area, will provide a more complete understanding and better interpretation of this research and its results.

In 1996, the partners in the Western Newfoundland Model Forest included:

- Corner Brook Pulp and Paper Ltd.
- The Newfoundland Forest Service
- The Wildlife Division, Department of Tourism and Culture
- The City of Corner Brook
- The Forest Committee of the Humber Environment Action Group
- Abitibi-Price Inc., Grand Falls Division
- The Centre for Forestry and Environmental Studies, of Westviking College

Since that time, the management partnership has changed and expanded. In total, 17 groups are now involved in managing the WNMF:

- The Center for Forest and Environmental Studies
- Abitibi - Consolidated
- City of Corner Brook
- Sir Wilfred Grenfell College
- Newfoundland Forest Service
- Newfoundland and Labrador Wildlife Division
- Corner Brook Pulp and Paper
- Canadian Forest Service
- Humber Naturalist Society
- Humber Economic Development Board
- Communicators Energy and Papermakers Union 60N
- School District #3
- Humber Arm Atlantic Coastal Action Program
- Gros Morne National Park
- Department of Fisheries and Oceans
- Newfoundland and Labrador Trappers Association
- Canadian Institute of Forestry/Registered Professional Foresters Association

The management of the Western Newfoundland Model Forest is based on five strategic goals:

- to develop an integrated resource management planning process for Newfoundland
- to integrate wildlife and timber management objectives
- to integrate water quality and timber management objectives
- to instill within the public greater awareness of forest resource management
- to operate the model forest as a working forest.

3.4 Physical Characteristics

At the time this research was carried out, the Western Newfoundland Model Forest (Figure 3.2) was bounded on the north by Gros Morne National Park, the east by the Buchans Plateau and Lloyd's River, the south by the Burgeo highway, and the west by the Gulf of St. Lawrence. The model forest was 707 060 hectares in size. Of this 707 060 hectares, 50 percent is productive forest land, 20 percent is softwood scrub, 17 percent is rock or soil barrens and bog. The remainder is water, residential, rights of way, or cleared land (Western Newfoundland Model Forest proposal, n.d.) Since that time, Gros Morne National Park has become part of the model forest, increasing its total size to 923,000 hectares. The inclusion of Gros Morne is a reflection of the increased emphasis the park has placed on considering the whole ecosystem.

3.4.1 Climate and Vegetation

Opportunities for and participation in recreational activities can be strongly influenced by the climate and vegetation of a region. Large differences in altitude (from sea level to a high of 815 metres at Lewis Hills) cause major variations in duration of vegetative season and temperature within the region (Damman 1983). Climate data for the region appears in Table 3.1. This data was recorded at stations in Corner Brook, Deer Lake, and Buchans. While the latter is not actually inside the model forest, Buchans is

Table 3.1. Climate Data for Western Newfoundland Model Forest

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	Corner Brook 1933-1990											
Daily Mean Temperature	-5.4	-6.8	-2.8	2.6	7.5	12.9	17.4	16.8	12.4	7.2	2.8	-2.5
Rainfall (mm)	28.0	17.1	27.5	39.5	58.6	83.5	82.7	97.4	95.5	109.0	86.0	46.0
Snowfall (cm)	111.6	74.9	55.0	23.6	5.3	0.2	0.0	0.0	0.0	6.4	40.4	97.0
Days with Measurable Precipitation	23	17	15	14	14	14	13	15	15	19	19	23
	Deer Lake 1965-1990											
Daily Mean Temperature	-8.4	-9.1	-4.9	1.3	6.8	12.1	16.4	15.5	10.7	5.3	0.8	-5.1
Rainfall (mm)	17.2	12.6	23.5	33.9	61.8	81.4	81.1	100.6	91.5	96.1	64.7	32.4
Snowfall (cm)	99.5	68.8	54.5	28.9	7.3	0.2	0.0	0.0	0.0	8.6	41.5	84.5
Days with Measurable Precipitation	22	17	15	14	14	14	13	15	15	19	19	23
	Buchans 1965-1990											
Daily Mean Temperature	-8.1	-8.6	-4.8	0.5	6.5	12.1	16.2	15.5	10.8	5.3	0.2	-5.2
Rainfall (mm)	31.3	24.3	37.8	48.4	64.5	89.5	88.1	111.2	88.9	103.8	90.2	48.0
Snowfall (cm)	71.3	54.4	46.2	23.4	6.8	0.6	0.0	0.0	0.3	5.5	27.3	65.0
Days with Measurable Precipitation	14	11	11	12	12	12	12	13	14	14	14	14

Source: Environment Canada (Atmospheric Environment Service): "Canadian Climate Normals, 1961-90 " Downsview, Ont

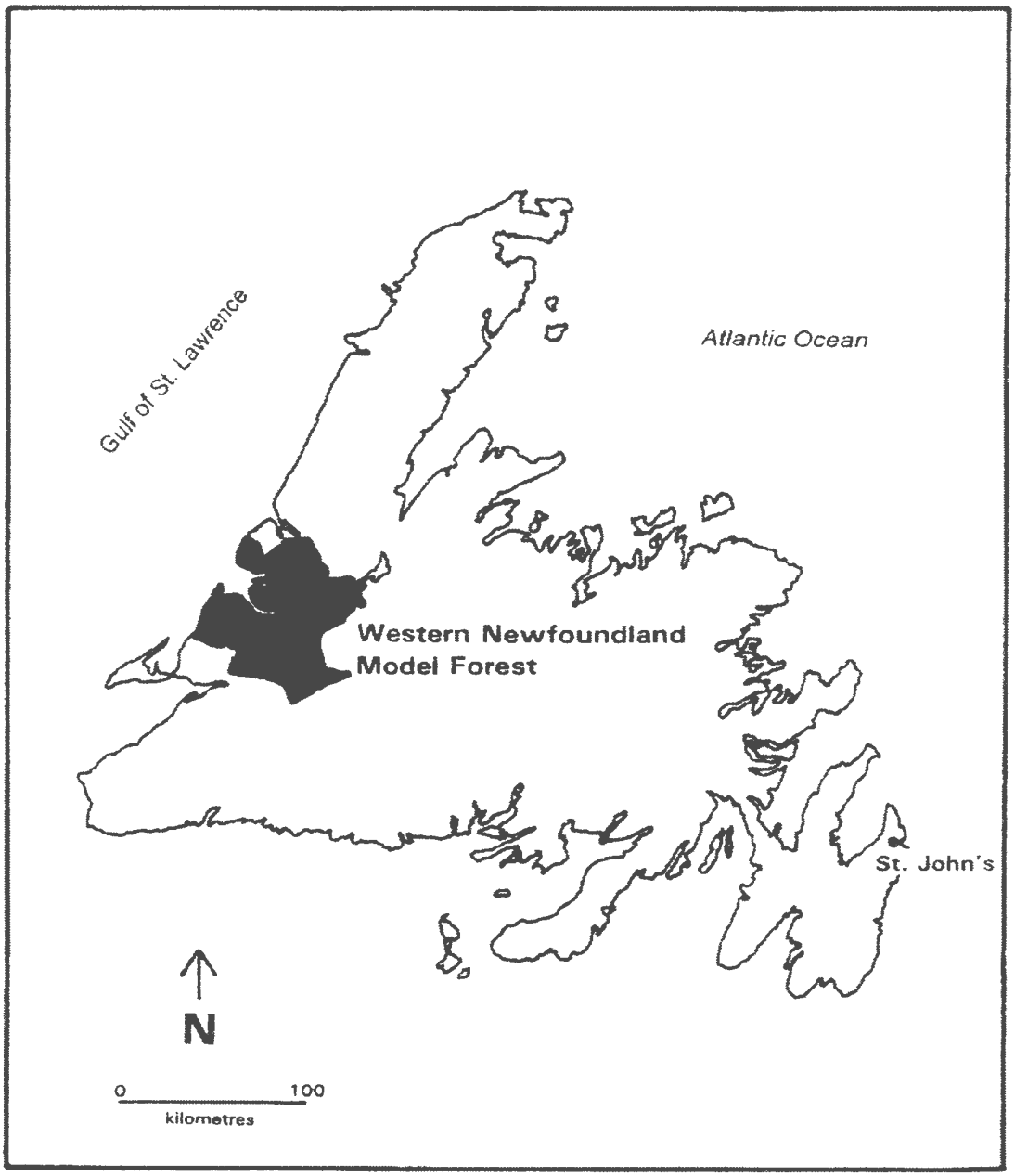


Figure 3.2 Location of Western Newfoundland Model Forest in Newfoundland

nonetheless quite representative of interior upland sections of eastern parts of the model forest (C. E. Banfield, pers. comm.). The Long Range Mountains protect the model forest area from the cold northeasterly winds in spring and early summer. As a result, it

has a distinctly longer frost free season than Central Newfoundland (Damman 1983). Such characteristics provide numerous opportunities for outdoor activities such as hiking, camping, and wildlife viewing. The ecoregion has a wide variety of forest types and ecosystems, ranging from young regeneration to old growth timber, bogs, fens, barrens, coastal heathlands, and riparian areas. The variations in the area, particularly between the Serpentine Range and Corner Brook subregions, is described clearly in Damman (1983, p. 172): "The topography [of the Serpentine Range subregion] is mountainous with elevations rising steeply from sea level to over 800 metres. The serpentine areas do not support a forest even at sea level...The vegetation is very sparse with rocks and soil exposed on most of the surface, except in a few extensive fen areas on the plateau." In contrast, the Corner Brook subregion is described as "a heavily forested area with a rugged topography; slates and limestones underlie most of the area. The soils are generally nutrient-rich and productive" (Damman 1983, p. 172). Balsam fir (*Abies balsamea*) is predominant, with Black spruce (*Picea mariana*) and Yellow birch (*Betula lutea*) also found. The soil of the Western Newfoundland Ecoregion tends to be more fertile than in other parts of the island (WNMF proposal, n.d.).

A wide variety of wildlife species can be found inside the model forest. Several caribou (*Rangifer tarandus*) herds, the Buchans, Blow-Me-Down, and Gregory Plateau herds, are found there (Table 3.2), as well as unknown numbers of caribou in the Little GrandLake/Marten Pond area. Moose (*Alces alces*) are also quite numerous in the model forest. Introduced on the island in 1878 and 1904, moose are important as a source of

food, and also for recreational hunting and viewing, to island residents. Estimates of moose numbers in the model forest could be as high as 18,000(Table 3.3.).

Other species of mammals found inside the model forest are: black bear (*Ursus americanus*), snowshoe hare (*Lepus americanus*), Arctic hare *(Lepus arcticus)*, Newfoundland pine marten *(Martes americana atrata,* red squirrel (*Tamiasciurus hudsonicus*), Eastern Chipmunk (*Tamias striatus*), deer mice (*Peromyscus maniculatus*), meadow voles (*Microtus pennsylvanicus*), masked shrews (*Sorex cicreus*), coyote (*Canis latrans*) red fox (*Vulpes vulpes*), lynx (*Felix lynx*), otter (*Lutra canadensis*), mink (*Mustela vison*), short-tailed weasel (*Mustela erminea*), beaver (*Castor canadensis*), and muskrat (*Ondatra zibethias*).

Table 3.2. Caribou Management Areas and Resident Population Estimates

Management Area	Caribou Herd	Census	Present Estimate
62	Buchans	1995*	5300
75	Blow-Me-Down	1985*	100
-	Gregory Plateau	1987*	360

* Most recent data available at this time.

Source: Christine Doucet, Department of Forest Resources and Agrifoods, pers. comm.

Table 3.3. Moose Management Units and Population Estimates

MMU	Last Survey Estimate	1998 Harvest Estimates	Approximate Percent of Population
5	3500 (1993)	730	20.9
6	4700 (1994)	710	15.1
7	2500 (1994)	440	17.6
8	4000 (1987)	580	14.5
11	2200 (1998)	530	24.1
12	1300 (1996)	170	13.1

Source: Christine Doucet, Department of Forest Resources and Agrifoods, pers. comm.

Numerous avian species occur inside the model forest. Some of the raptors found inside the model forest include: merlin (*Falco columbarius*), sharp-shinned hawk (*Accipiter striatus*), goshawk (*Accipiter gentilis*), rough-legged hawk (*Buteo lagopus*), boreal owl (*Aegolius funereas*), great horned owl (*Bubo virginianus*), northern hawk owl (*Surnia ulula*), osprey (*Pandion haliaelus*) and bald eagle (*Haliaeetus leucocephalus*). Other birds found there include golden eye duck (*Bucephala clangula*) and red crossbill (*Loxia curvirostra*).

3.4.2 Newfoundland Pine Marten

Newfoundland pine marten are a unique subspecies. Island isolation has resulted in a Newfoundland race not found anywhere else in the world (O'Driscoll 1991). The

Newfoundland pine marten has been listed as an endangered species at the national level by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (WNMF proposal, n.d.). In the early 1980's it was estimated by the Provincial Wildlife Division that there were between 630 and 875 marten in Newfoundland. Recent data indicate that there are now less than 500 marten on the island (O'Driscoll 1991). The only remnant population of the Newfoundland pine marten is concentrated in the Grand Lake-Little Grand Lake area of western Newfoundland. As the pine marten population continued to decline, concern over its fate increased and the Pine Marten Study Area was created in 1973 (WNMF proposal, n.d.). As Figure 3.3 illustrates, this study area closely overlaps part of the model forest. This designation has important ramifications for trapping activities in the area. Work is underway with local communities to determine the mportance of snaring of rabbits for food and recreation. Through public involvement, it is hoped that support can be gained for alternative trapping methods which are less harmful to pine marten than traditional snares. Trapping and snaring are prohibited inside the Pine Marten Study Area, to protect the marten from accidental capture.

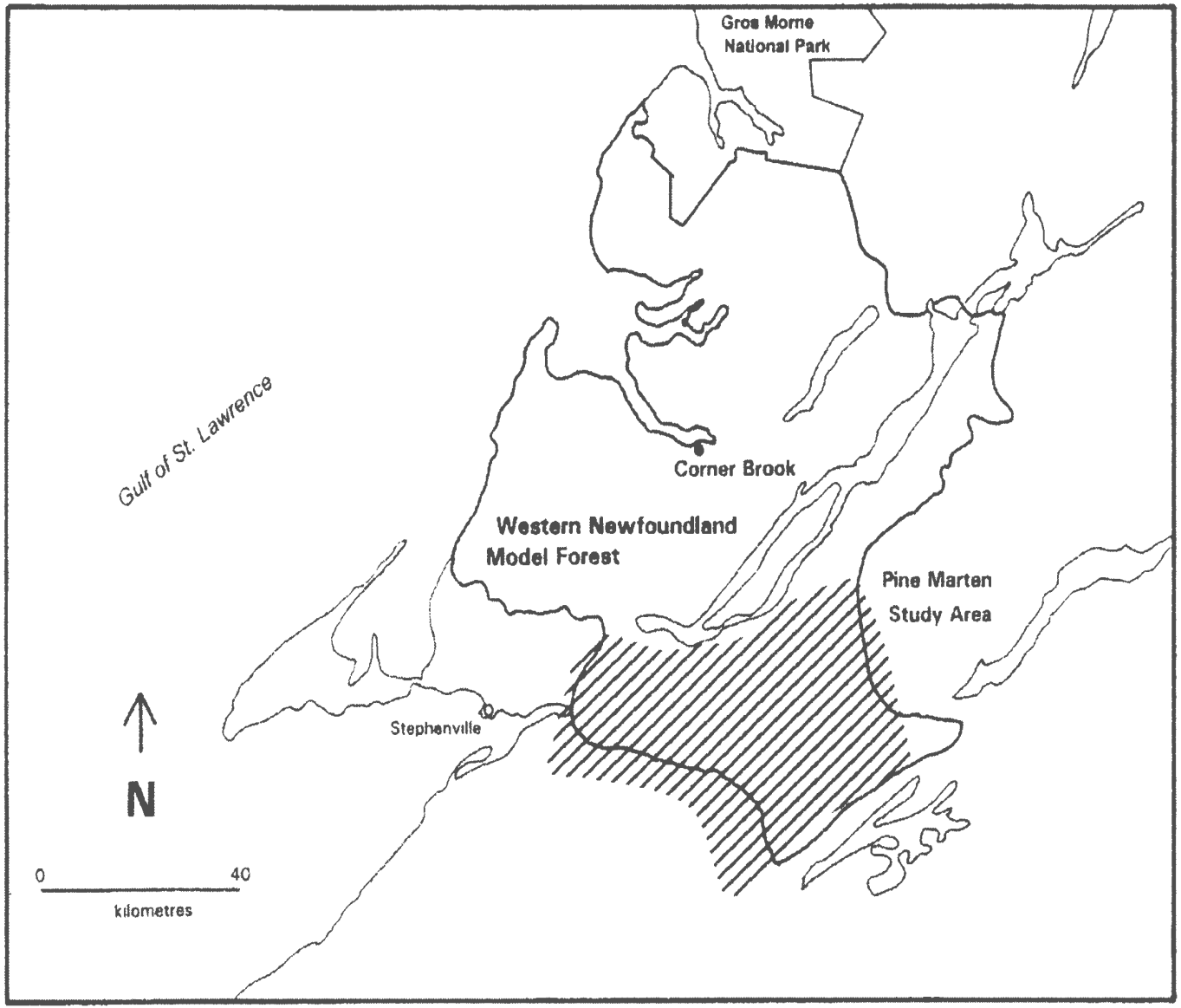


Figure 3.3 Pine Marten Study Area of the Model Forest

3.5 Human and Economic Characteristics

At the time of data collection in 1995, the Western Newfoundland Model Forest was home to nearly 43 000 residents who lived in 26 cities, towns and communities within its boundaries (Figure 3.4). The population of each of these places is shown in Table 3.4. The largest community within the model forest is the City of Corner Brook, which had a population of 22 410 in 1991. The second largest community in the model forest is Deer Lake, which in 1991 had a population of 4327 (Table 3.4). Median community size is 619 residents. Since the inclusion of Gros Morne National Park and its enclaves inside the model forest boundaries, the population of the WNMF may have slightly increased.

Table 3.4. **Population of Communities Within the Western Newfoundland Model Forest, 1991**

Community	Population
Corner Brook	22410
Cox's Cove	941
Deer Lake	4327
Nicholsville	583
Spillway	224
Gallants	73
Glenburnie, Shoal Brook, and Birchy Head	365
Hughes Brook	166
Halfway Point, Benoit's Cove, and John's Beach	2104
Humber Village	99
Irishtown, Summerside	1560
Lark Harbour	755
Little Rapids	220
Massey Drive	619
McIvers	725
Meadows	719
Mt. Moriah	726
Pasadena	3428
Pynn's Brook	91
St. Jude's	236
Steady Brook	421
Trout River	763
Wiltondale	35
Woody Point	648
York Harbour	415
Total	42653

Source: 1991 Census

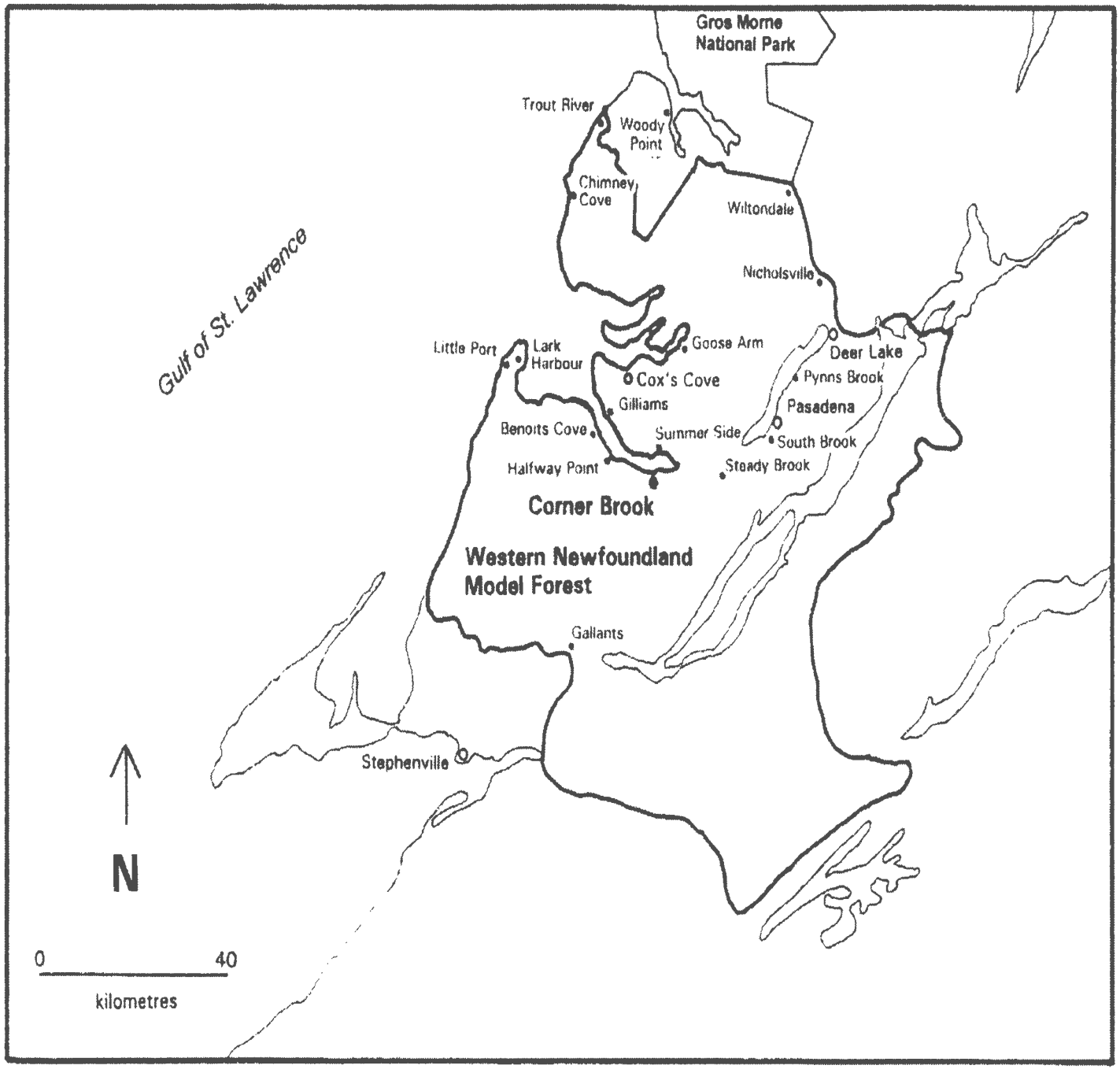


Figure 3.4 Communities within the Western Newfoundland Model Forest

3.5.1 Timber Related Industries

Timber management activities and wood-using industries are an important source of employment and income on the west coast of the island. The City of Corner Brook originated as a direct result of the early forest industry on the west coast. A saw mill was established there in 1864, and the pulp and paper mill was built in 1925. The mill, built by a British firm called Armstrong-Whitworth, changed ownership several times between 1925 and 1938 when it was taken over by Bowater Pulp and Paper Mills Ltd. Bowater's owned the mill from 1938 until 1984 when it was purchased by Kruger Inc. of Montreal, the present owners (City of Corner Brook, n.d.). This long history of traditional, consumptive forest uses may be expected to result in utilitarian attitudes by residents of the region, a prediction that will be explored in this study.

Corner Brook Pulp and Paper Ltd. employs approximately 600 people in its mill operation and 1100 forest workers in its woodlands operation. While most of the mill workers live in or near Corner Brook itself, the forest workers may live in communities some distance from Corner Brook, such as Gallants. The estimated timber volume of the model forest is 31.96 million cubic metres, of which 27.99 million cubic metres is softwood. Mean annual increment is estimated at 1.8 cubic metres per hectare. Annual allowable cut is estimated at 296 000 cubic metres, of which 240 000 cubic metres comes from Corner Brook Pulp and Paper Ltd. land (WNMF proposal, n.d.).

3.5.2 Other Related Employment

When the WNMF joined the model forest system, sawmilling and sawlogging operations employed approximately 50 people in the area, while 14 people were employed in the provincial parks inside the forest. The Newfoundland Forest Service directly employed 90 full time employees, and the Wildlife Division employed 12 people. More than 150 people were seasonally employed in the wilderness outfitting business in the area. (WNMF proposal, n.d.).

Marble Mountain, the largest single recreational development in the area, employed approximately 86 people during its winter operation and 25 year round. An additional 40 people were employed in directly related spin-off businesses in the Corner Brook area (WNMF proposal, n.d.). In 1963 the Corner Brook Ski Club relocated from the Massey Drive area to Marble Mountain. By 1971 the lower 100 metres of the mountain side was developed, and the private club obtained provincial government funding to expand Marble Mountain into a major ski resort. By the early 1980s challenging ski slopes had been constructed to a vertical rise of 1700 feet and skiers were coming from all over eastern North America. Marble Mountain has since been developed as a four season resort.

3.5.3 Land and Timber Ownership

The significance of forestry to the local economy is illustrated by the patterns of land and timber ownership in the area when this study was conducted. Corner Brook Pulp and Paper Ltd. held a lease from the Crown on 65.5% of the landbase in the WNMF. Crown land amounted to 20 percent of the land, 2 percent of which was under the jurisdiction of the City of Corner Brook. Abitibi-Price Inc. owned, or has a license on, 12.3 percent of the land base (Figure 3.5).

There were 265 535 hectares within the model forest with some form of protected status (Table 3.5). Five small provincial parks had a total of 1661 hectares, Marble Mountain (a Development Control Area) was 3585 hectares in size, and there was a Crown Land Reserve, Serpentine Lake/Blow-Me-Down Mountains, that was 47 062 hectares. There were also 13 protected water supplies that take up 12 157 hectares. In addition, the previously mentioned Pine Marten Study Area covered 203 000 hectares of the model forest.

Table 3.5. Protected Areas Within the Western Newfoundland Model Forest

Protected Area	Size (Hectares)
Pine Marten Study Area	203 000
Crown Land Reserve	47 062
Protected Water Supply Area	12 157
Development Control Area	3 585
Provincial Parks	1 661
Total	265 535

Source: Western Newfoundland Model Forest Proposal

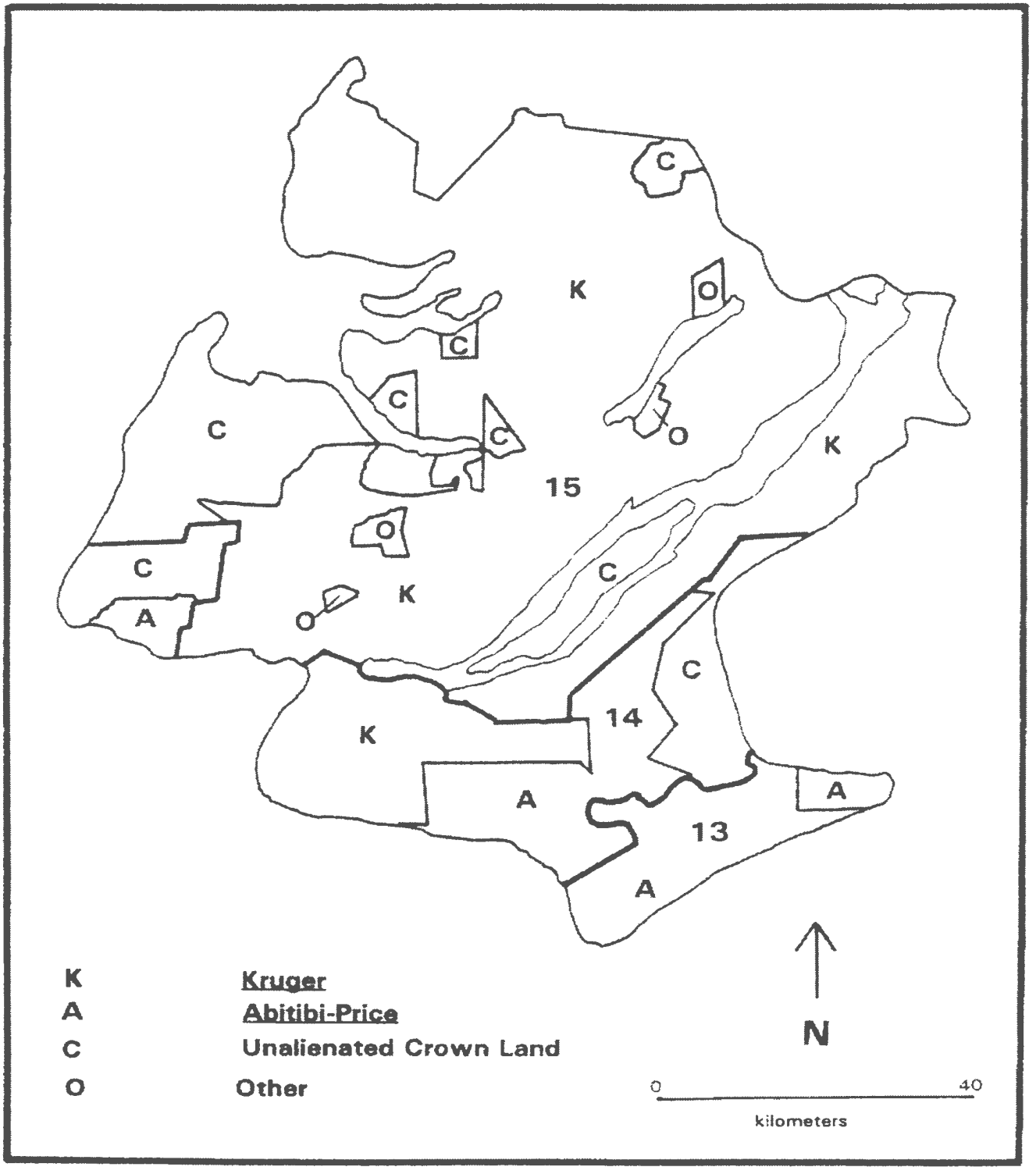


Figure 3.5 Forestry Management Districts 13, 14, 15 and Landownership within the Western Newfoundland Model Forest

Source: Western Newfoundland Model Forest Base Map, Newfoundland Forest Service, Forest Management Division, June 08, 1995.

3.5.4 Transportation Networks

The road network in the model forest is fairly well developed. There are approximately 280 km of paved highways, including the TCH and several secondary highways. As well, the area has one of the most extensive systems of forest access roads in the province, with over 550 km of main haul roads and numerous small operating roads. The most important forest access roads for residents' recreational purposes are Glide Lake, Two Mile Dam Road,Goose Arm, Logger School, and Lady Slipper Roads (WNMF proposal, n.d.).

3.5.5 Recreational Opportunities

Opportunities for recreation are numerous in the model forest. As mentioned, there were five provincial parks in the area: Blow Me Down, Blue Ponds, Stag Lake, Pasadena Beach, and Bottle Cove (Figure 3.6) when this study was carried out. These parks provide opportunities for a variety of camping and day use activities. Marble Mountain ski resort is an important recreation destination for both visitors to and residents of the model forest area. The number of ski visits to Marble Mountain (one skier equals one day) was almost 54 000 in the 1999/2000 season. As well, the Blow Me Down Cross Country Ski Club of Corner Brook and the Pasadena Nordic Ski Club provide extensive groomed cross-country trails. Skiers also use the logging roads of Twelve Mile Dam, Three Mile Dam, and Lady Slipper (WNMF proposal, n.d.). The

number of ski trails in the WNMF has been increased by the inclusion of Gros Morne National Park.

There are favourable conditions for the adventure tourism industry in the model forest as well. The Blow Me Down, Serpentine Lake, and Lewis Hills area is one such area. The Serpentine River is the one of the only major rivers on the island that is still undisturbed by dams, hydro lines, roads, bridges, and other significant human developments. Serpentine Lake is quite close to Corner Brook (less than 20 km away) so there may be potential for recreation development in the area (WNMF proposal, n.d.).

There are ten scheduled salmon rivers in the model forest. The Humber River, which flows into the Bay of Islands at Corner Brook, is considered a world class salmon river and has a long history of recreational salmon fishing. The Atlantic salmon (*Salmo salar*) and brook trout (*Salvelinus fontinalis*) are the two most important species for the recreational fishery of Newfoundland. Recreational fishing is a popular activity for many Newfoundland residents. In 1991, 38.4 percent of Newfoundland residents participated in the activity, compared with a national average of 26.4 percent (Filion et al. 1993).

Hunting is also an important recreational activity in the model forest. Moose management units (MMUs) 5, 6, 7, 8, 11, and 12 all fall at least partially inside the model forest boundaries, and reported harvest of moose in these MMUs in 1990 totalled 2892 animals (Table 3.3). In 1991, 4795 moose licenses (16.4 percent of the island total) were issued for the six MMUs falling wholly or partially within the model forest. More than

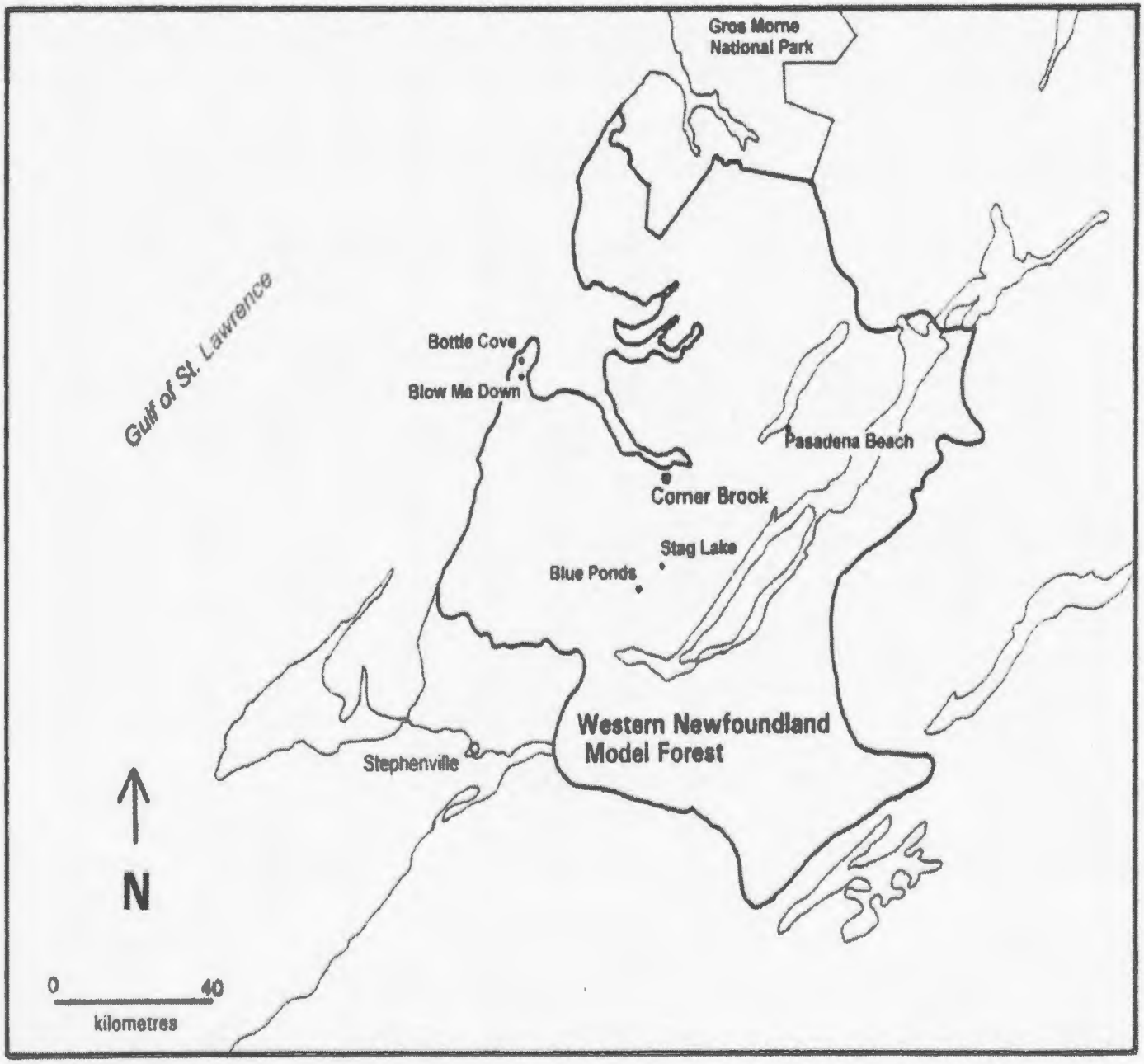


Figure 3.6 Provincial Parks within the Western Newfoundland Model Forest (1994)

9000 hunters may have been involved, as many of the licenses were 2 party licenses. Caribou management area 62 falls partially within the model forest, and in 1991 150 licenses (5.7 percent of the island total) were sold for this area. As well, black bears and snowshoe hares are harvested within the model forest.

3.5.6 Cabin Development and Domestic Fuelwood Cutting

Two recreational activities that have been topics of discussion in the model forest area recently are cabin development and domestic fuelwood cutting. Both traditional activities have become so popular that increased restrictions may become necessary. As these activities, particularly domestic fuelwood cutting, are seen as traditional rights, any restrictions must be imposed carefully (Humphries 1994).

Cabin development ("cabinning") has become such a popular recreational activity in the area that cabin owners have, in some instances, formed associations for maintenance and snowclearing of roads and development of services (WNMF proposal, n.d.). There are several intensive cabin development areas at Bonne Bay Pond, George's Lake, Pinchgut Lake and South Brook. Unfortunately, cabinning has become so popular that some cabins are built without obtaining any necessary permits, sometimes in restricted areas owned by the pulp and paper companies.

Domestic fuelwood cutting is an important source of home heating and lumber for many Newfoundlanders. It is also enjoyed by many as a recreational activity in and of

itself. Domestic fuelwood is used by approximately 40 percent of all households in the model forest (Humphries 1994). Problems include poor utilization, particularly in the case of sawlogs. This occurs when the upper portion of the tree is left behind in the harvesting area because it is small. Overcutting of quotas of both sawlogs and firewood also occurs. There is also a problem with domestic cutting of green timber on pulp and paper company limits (Humphries 1994; Humphries and Humber 1995). This issue must be handled delicately, as the forest is regarded as common property by many Newfoundlanders. Increased restrictions could be strongly opposed by the affected public if not introduced properly and with public input into the process.

The Western Newfoundland Model Forest encompasses many different land uses such as residential, timber, recreation, and protected areas. Managing this large area so as to minimize conflict between the competing uses is essential. As indicated, some key areas of interest include competing forms of recreation, and increased pressure from cabin development and domestic wood harvesting. In providing baseline data on these activities and others, this research study will provide decision-makers with better information to help them make the difficult allocation decisions which lie ahead.

CHAPTER 4: METHODOLOGY

This chapter outlines the methods used in conducting this study. Appropriate use of survey techniques in geographical inquiry is also presented. This chapter then follows an outline suggested by Fowler (1988) for the organized presentation of information about a study's methodology and results. The items in Fowler's outline are:

1. The sampling frame and chance of selection;
2. The sampling procedure including a discussion of the experimental research design;
3. A description of the questionnaire design procedures, including pretesting and subsequent evaluation;
4. The exact wording of the questions analyzed;
5. A description of the interview process including interviewer demographics, previous experience, training and supervisory procedures used during data collection;
6. Field results including information about nonrespondents, response rates, procedures to enlist cooperation and follow up procedures; and
7. Quality control and checking procedures that were used during coding, data entry, and preparing data for analysis.

4.1 Survey Research in Geography

"Survey research is a long-established method of geographical field research which has an ancient and honorable tradition in geography" (Sheskin 1985). Survey research is particularly applicable to the study of human behaviour (Sheskin 1985). Some subdisciplines of geography have made particularly extensive use of survey research, including natural hazard perception, travel behaviour, cognitive distance studies, industrial location, and residential search behaviour (Sheskin 1985). Some recent geographical studies involving survey research include: attitudes of and toward homeless families (Klagge 1994), attitudes and behaviour of private landowners with respect to conservation (Cocklin and Doorman 1994), and people's perceptions of wilderness and the associated implications for management (Kliskey and Kearsley 1993). Survey research was appropriate for the current study of recreation in and attitudes toward the Western Newfoundland Model Forest.

Fowler (1984) stated that "a full-scale probability survey should be undertaken only after it is certain that the information cannot be obtained in other ways and the need for the information is significant." For this study a survey was the only way to obtain the desired information. Social science research in the Western Newfoundland Model Forest is extremely limited, and no other research has been done on resident attitudes, knowledge, or recreation activities. Information on these issues is important in order for the model forest to best serve the needs of the public. In addition, survey research allows

inferences to be made to a larger population through the use of a representative sample. Survey research was a much more appropriate choice than possible alternatives such as using survey data collected by others, rider questions, case studies, or participant observation.

Sheskin (1985) presents one model for the survey mechanism selection process. A survey mechanism should be employed only after defining the research problem, reviewing the literature, and understanding the on-site characteristics of the study area. Several survey techniques exist, including personal interview surveys, mail surveys, telephone surveys, intercept surveys, and dual survey mechanisms. A mail survey was employed in this study, for reasons that will be outlined below.

4.2 Sampling Frame

A sampling frame "is the set of people that has a chance to be selected, given the sampling approach that is chosen" (Fowler 1988). For this study the population of interest was all adult residents of the study area. Unfortunately, no sampling frame exists for such a population. A telephone directory from the study area was used as the sampling frame for this study. There are certain problems with using the telephone directory as a sampling frame. "Telephone directories, in addition to omitting those without telephones and households with unlisted numbers, are also biased against new residents, and may exclude portions of the study or include unwanted territories" (Sheskin

1985). Through a careful examination of the directory, listings not inside the study area were omitted, and all listings in the study area included. Businesses and second lines were removed from the sampling frame as well. The most recent directory available was used in constructing the sampling frame. These precautions are believed to have lessened the problems associated with using telephone directories as sampling frames. While renters and lower income individuals may still have been missed, similar problems would have been encountered with alternative sampling frames such as motor vehicle registration lists. Dillman *et al.* (1974) suggested telephone directories have the advantage of being readily available, free of legal entanglements, and fairly recent in their listings.

Five major factors play a role in the determination of sample size for a given study: constraints such as cost, time, geography, and factors of analysis such as level of accuracy, and subgroup analysis. Printing and mailing costs were covered by a grant from Western Newfoundland Model Forest Inc., which allowed for a relatively large sample size. Sheskin (1985) stated that large sample sizes were needed with geographically dispersed populations as they are likely to be more variable with respect to demographics, attitudes, and beliefs. This was not a factor in the current study, as the population in question falls entirely within the Western Newfoundland Model Forest. The most commonly selected accuracy level for research studies is the 95% confidence level with a confidence interval of +/- 5%, in which one is 95% certain that no estimated percentage is off by more than 5% in either direction. To achieve this level of accuracy a

minimum sample size of 384 is needed (Sheskin 1985); the sample size for this study was 502. As the general public was the population of interest for the study, subgroup analysis was not necessary.

4.3 Sampling Procedure

A dual survey mechanism was used in this study. A telephone contact was used to randomly select the individual within a randomly selected household to participate in the study (nested random sampling). In addition the telephone contact ensured obtaining a correct mailing address. A mail survey was then sent to those who agreed during the telephone contact. A mail survey was chosen for several reasons. As early as 1978 Dillman noted that response rates for personal interview surveys were declining; at the same time response rates for mail and telephone surveys were increasing. Cost was a factor in the choice of a survey mechanism as well; funds were not available to hire personnel to carry out such a large number of personal interviews, or to pay for the large telephone charges that would result from telephone interviews. The design of the survey was better suited to a mail rather than a telephone survey, as a map was included and there were some rather complex questions. In cases with complex questions and illustrations Sheskin (1985) suggests that a mail out survey may be appropriate.

A systematic random sampling technique was used to select individuals from the telephone directory. All businesses, second lines, and listings from outside the study area were removed. Once the number of items in the sampling frame (the telephone book) was determined, a random starting point was selected from a list of random numbers and a sampling interval selected to allow for one complete pass through the sampling frame. This systematic method does not lead to bias; lists such as telephone books that are arranged alphabetically are assumed to be in random order (Sheskin 1985).

4.4 Nonexperimental Research Design

A one group, nonexperimental research design was used. This type of research design does not involve any manipulation by the researcher. "Rather measures are taken on a group of individuals or social entities, and relationships are determined among the measures. These measures can be taken through direct observation, questionnaires, or existing records" (Spector 1981). The research design was a cross-sectional one, with all measurements taken at one point in time (Spector 1981). This type of research design is popular in resource analysis research. Although the use of more complex designs has been suggested (Mitchell 1989), the design chosen was quite appropriate to the current study. The study involved documenting current attitudes, beliefs, and behaviour. The study could be broadened in the future through the use of a longitudinal design if attitude and belief change issues become more important. As social science research is limited

within the model forest, this study provides preliminary baseline data on some of the socio-economic recreational issues in the area.

4.5 Questionnaire Design Procedures

Questionnaire development is a complex process, described by Sheskin (1985) to be "as much an art as a science." Proper questionnaire design should take place over at least a 4 to 6 week period (Sheskin 1985). In this study, questionnaire design occurred over an eight month period.

The research problem was defined as precisely as possible. The primary objective was to identify, document, and analyze the characteristics, attitudes, and expenditures of recreational users of the Western Newfoundland Model Forest. The secondary objective of the study was to identify, document and analyze the public knowledge of the model forest and its uses. Possible questions were then carefully designed to meet the research objectives. The initial questionnaire was designed after studying similar surveys. Some of the attitudinal items were taken from the New Environmental Paradigm (NEP) Scale developed by Dunlap and Van Liere (1978) to measure public environmental concern. Knowledge items and attitude items pertaining specifically to the Western Newfoundland Model Forest were developed using educational information about the model forest that was available to the public. Key informants involved in the model forest program were also consulted during development of these questionnaire items. The initial research

instrument was reviewed by experts in the fields of economics, geography, survey design, and forest management. This multidisciplinary review of the research instrument proved quite beneficial in the formulation of new items and revision of existing ones.

The questionnaire was pretested using a sample of 20 individuals. As a result of the pretest, a map of the study area was developed for inclusion in the final research instrument. It became apparent that if respondents were not very familiar with the model forest, they might have difficulty determining if some of their activities took place inside it. The final research instrument contained mostly close-ended questions. Open-ended questions were used when the range of responses was expected to be large, such as when respondents were asked to list any equipment they used for their recreational activities. Attitudinal items included in the research instrument did contain a neutral category. Nunnally (1957) presented evidence that an even number of alternatives probably provides a more accurate reading of attitudes and a neutral response should be omitted. However, it was decided to include a neutral response so that respondents would not be forced to have opinions about issues if they had not thought about them or if they really did have neutral feelings toward the issue. A 7 point Likert (1932) format of responses ranging from strongly agree to strongly disagree was used for the attitude items. Several belief questions were included to measure respondents' level of knowledge about the Western Newfoundland Model Forest. Attribute or fact questions to gather data on socio-demographic characteristics were included, as were several behavioural items on recreation behaviour. The survey also contained a willingness to pay question, which

measured willingness to participate in a recreational activity despite a specified increase in associated economic costs.

Questions were numbered starting with a 1 in each topical section, so that respondents would not look at the total number of questions and possibly decide not to participate (Sheskin 1985). The questionnaire was designed with easier questions at the beginning (the NEP Scale); the next two sections contained the bulk of the questionnaire, including a map and three tables; and the final section contained potentially sensitive demographic information (Sheskin 1985).

4.6 Interviewing Characteristics

Data collected during an interview can be influenced by characteristics of the interviewer and the interview process (Fowler and Mangione 1990). It is thus important to understand how to select, train, and supervise interviewers. Fowler (1988) suggested that a research study should have many interviewers and a maximum of 50 interviews for each. Because interviewers may become fatigued with the interviewing process, many interviewers doing fewer interviews was recommended. This was not considered to be a serious concern in the current study as the interviewers were not asking any survey questions and were just obtaining a mailing address and implicit acceptance of the survey through a telephone contact. Five research assistants and the principal investigator

conducted interviews. Burn out and attrition were not a concern as all interviews were conducted in approximately nine days.

"For any particular survey, there will be some training required in the specific procedures and objectives of that project" (Fowler and Mangione 1990). There does not seem to be an agreement about exactly how much training is necessary. In general, telephone interviewers receive much shorter training periods, as they can be monitored during the interview process. Minimal training was required for the current study. The primary goal of the telephone contact was to get the respondents mailing address; no survey questions as such were asked via telephone. In addition, interviewers were closely monitored. A morning training session was sufficient, in which interviewers received information on the study's purpose and a standardized telephone script. Interviewers were instructed to read the script exactly as worded, and were given information on possible questions and appropriate responses.

Supervision of the interviewers is also important (Fowler and Mangione 1990). As all interviewers worked from the same suite of offices, they could be closely supervised. When an interviewer was heard straying from the standardized script the problem could be identified and rectified almost immediately.

The telephone contact of potential respondents occurred during a field trip to the Western Newfoundland Model Forest from August 22, 1995 to September 1, 1995. The principal investigator flew to Deer Lake and spent several days (August 22 to August 27) conducting telephone contacts prior to the arrival of the other five members of the

research team. This allowed for any "bugs" to be worked out in the message delivery. The research team was based in the Forestry Field Station in Pasadena, with telephone contacts originating from the Model Forest office in Corner Brook in order to avoid long distance charges. Telephone contacts occurred in the early evening hours, from approximately 5 p.m. to 9 p.m. Monday through Thursday, with Monday evening being the most productive.

4.7 Field Results

Telephone contacts resulted in a positive response to the request for a mailing address approximately 90% of the time. The response rate to the mail survey was 65% (n=502). "For self-administered forms, a two-thirds response rate is considered good, with many surveys attaining very low response rate" (Sheskin 1985). While certain interviewers were faster at obtaining respondents' permission, no significant differences were documented between the six interviewers.

The procedure for the mail survey closely followed the total design method (TDM) as outlined by Dillman (1978). With the use of the TDM, an average response rate of 74% was obtained for 48 TDM mail surveys; no survey achieved less than a 50% response rate. Some of these surveys were quite lengthy, containing 85 to 165 items. The research instrument used in this study contained approximately 100 items. Heberlein and Baumgartner (1978) found that most university-based surveys achieved 62% response

rates. This survey was indicated as being affiliated with Memorial University of Newfoundland, and achieved a response rate slightly higher than the average for university-based research studies.

The follow up procedures are the main characteristics of the TDM. The original mailing is followed with a postcard one week later, a letter with replacement questionnaire at the end of the third week, and a final letter with replacement questionnaire sent by certified mail after seven weeks (Dillman 1978). Most of these procedures were followed in this study.

White envelopes rather than manila envelopes were used as suggested by Sheskin (1985) to avoid the appearance of junk mail. Although personalized hand addressed labels have been recommended (Sheskin 1985), this was not possible due to the large sample size. Envelopes were addressed personally, but were printed on computer labels. The principal investigator signed each postcard and each questionnaire for every mailing in blue ink. This has been called the "pressed blue ball point pen" method (Dillman 1978). Each letter is signed on a soft surface with enough pressure applied with the ball point pen that indentations are left in the paper. This method provides evidence that the signature is real and has been shown to increase the response rate. (Dillman 1978). A postcard reminder was mailed one week after the initial mail out to all individuals. This postcard thanked those individuals who had already returned their questionnaires and reminded those who had not to fill it out and return it in the self-addressed stamped envelope. First class postage was used for all mailings, and attractive stamps were used

on the second and third mailings of the survey as suggested by Sheskin (1985). These mailings occurred four and seven weeks after the initial mailing. The initial mail out occurred on September 14, with the follow up postcard sent on September 20. The second and third mailings occurred on October 11 and November 1 respectively. The return envelopes included with the questionnaires were business reply envelopes. Due to financial and temporal limitations, certified mail and telephone follow ups were not used as the final contact.

Identification numbers were placed on surveys to aid in implementation of follow-up procedures by eliminating the possibility that respondents would return more than one questionnaire. While it has been suggested that the use of an identification number can reduce response rates (Bath 1993), this study received acceptable response rates and nonresponse bias would not seem to be a concern. Concern about nonresponse to mail surveys is usually in reference to traditional response rates of 5 to 20 percent (Fowler 1988). The response rate of 65 percent in this study was several times higher, greatly reducing the possibility of nonresponse bias.

4.8 Quality Control and Checking Procedures

Quality control and checking procedures that are used during coding, data entry, and the preparation of data for analysis are an important aspect of a survey research study (Fowler 1988). All surveys were coded and entered into the computer by the principal

investigator. The first computer run was used to produce simple frequencies of the answers to each question; any unlikely or impossible responses were checked and either verified or corrected (Sheskin 1985). All data were entered and analyzed using SPSS Release 4.1/4.0 on a Vax 4500 mainframe computer. The frequency run indicated that the demographics of the sample were reasonably similar to those of the population of the study area. With the acceptable response rates in this study the likelihood of nonresponse bias was reduced.

One problem with item nonresponse was discovered. A socio-demographic question requesting the respondent's age was apparently misread by a significant proportion of the respondents; the actual question "When were you born" was misread as "Where were you born" This wording problem was not picked up during pretesting. In those cases where there was no answer to a question, the item was assigned a missing value and excluded from the analysis.

There has been a tendency in the past for certain public management agencies to collect socio-economic data with poorly worded and designed questionnaires which often result in poor response rates and minimal data. As discussed, sound social science research involves addressing many methodological issues. A survey such as this one must be carefully constructed and implemented over a long period of time in order to get the best possible results. Attention to methodological detail in this study has resulted in data that is representative of the general public in the communities inside the model forest

and data which effectively addresses the socio-economic research questions posed in this study.

4.9 Statistical Analysis

Much of the analysis for this study involved the use of multivariate statistics. Multivariate statistics can be used when there are many independent variables and/or many dependent variables. This type of analysis is greatly simplified through the use of a statistical software package such as SPSS. In addition, multivariate statistics have proved useful in nonexperimental research such as surveys (Tabachnick and Fidell 1996). In surveys such as the one considered here, many people are surveyed and they answer a large number of questions, resulting in many variables to be analyzed. Much of the complex relationship between these variables could be missed by using only traditional univariate statistics (Tabachnick and Fidell 1996).

The following discussion outlines the various data preparation and checking procedures necessary before performing multivariate statistical analysis. Data screening procedures outlined by Tabachnick and Fidell (1996) have been closely followed throughout this process. Methodological considerations involved in the use of factor and discriminant analysis are also discussed. The chapter concludes with a short description of scale development.

4.10 Data Preparation and Checking

For this study, data preparation and error checking were approached based on requirements for principal components analysis and discriminant analysis. These were the main types of statistical analysis performed on the data. Inspecting the data to ensure that it was entered correctly is important for any subsequent statistical analysis. While proofreading is recommended whenever possible, the large data file for this study precluded use of that method. Instead, the FREQUENCIES command was used to provide descriptive statistics. The results of this analysis are presented in the following chapter. The results were carefully examined to ensure that there were no out-of-range numbers and any missing values were correctly coded as such. An identification number coded on each survey allowed for easy correction of any data entry errors.

Having ascertained that the data file was accurate, the amount and distribution of missing data was evaluated. Once it was determined that the pattern of missing data was essentially random, it was decided to use a missing data correlation matrix. This solution consists of using all available pairs of values to calculate correlations. This solution has drawbacks, in that some correlations will be less stable than others. Instability can result from the fact that each correlation in the matrix can be based on a different number and subset of cases. This can result in eigenvalues from the correlation matrix becoming negative (Tabachnick and Fidell 1996). Tabachnick and Fidell (1996) state that "with a large sample and only a few missing values, eigenvalues are often all positive even if

some correlations are based on slightly different pairs of cases. Under these conditions, a missing data correlation matrix provides a reasonable multivariate solution and has the advantage of using all available data." It was decided that this method was appropriate as negative eigenvalues did not become an issue as a result. In addition, it was possible that other solutions to the missing data problem such as estimation or inserting the mean would result in overfitting during principal components and discriminant analysis.

Normality of the variables used in analysis is also an important consideration. In this instance normality was assessed graphically using frequency histograms (Tabachnick and Fidell 1996). While some variables did deviate moderately from normality, transformation of the offending variables was not performed. It was thought that a slight degradation of the solution was preferable to the difficulty in interpretation that would result from transformation. With regards to performing factor or principal components analysis on nonnormal variables, Tabachnick and Fidell state :

"as long as PCA and FA are used descriptively as convenient ways to summarize the relationships in a large set of observed variables, assumptions regarding the distributions of variables are not in force. If variables are normally distributed, the solution is enhanced."

As discriminant analysis was performed using the approximately normal factor scores as predictors, any problems with normality of variables were no longer an issue.

Identification of univariate and/or multivariate outliers was also completed. Outliers are cases that have such very extreme values on one variable (univariate outliers) or a combination of variables (multivariate outliers) that they can distort results of

analysis. Univariate outliers were tested for using SPSS FREQUENCIES and it was determined that there were none.

Multivariate outliers are much more difficult to identify, and it is almost impossible to do without the aid of a computer (Tabachnick and Fidell 1996). Multivariate outliers were identified by calculating the Mahalanobis distance for each case. This is the distance of a case from the centroid of the remaining cases where the centroid is the point created by the means of all the variables (Tabachnick and Fidell 1996). Mahalanobis distance was found using SPSS REGRESSION. To do this, regression analysis was performed on the variables to be used in analysis using the case number as the dummy dependent variable. The ten cases with the largest Mahalanobis distances were identified through the RESIDUALS subcommand with the OUTLIERS (MAHAL) specification (Norusis 1990). Mahalanobis distance was evaluated as chi squared at $p < 0.001$, with the number of degrees of freedom equal to the number of variables, thirty-five. There were 492 cases remaining when these outliers were removed, so little information was lost through their removal.

The last consideration during the data screening process is the presence of multicollinearity or singularity. Multicollinearity and singularity are problems with a correlation matrix that occur when variables are too highly correlated. Multicollinearity is characterized by very high correlations (.90 or more) between variables, while singularity is created in a correlation matrix when a variable is a combination of two or more of the other variables (Tabachnick and Fidell 1996). The correlation matrix was

screened for singularity by running a factor analysis. Had singularity been a problem, the run would have been terminated by SPSS.

Multicollinearity was tested using the collinearity diagnostics available under SPSS REGRESSION. Using the COLLIN subcommand, a conditioning index is produced, as well as variance proportions associated with each variable. Tabachnick and Fidell (1996) state that criteria for multicollinearity are a conditioning >30 and at least two variance proportions >.50 for a given root number. Using these criteria, multicollinearity was found in the correlation matrix. This result was rectified through the removal of var054, viewing small animals, which was highly correlated with some of the other wildlife-viewing variables, from the analysis.

4.11 Factor Analysis

The terms factor analysis (FA) and principal components analysis (PCA) refer to statistical techniques in which the objective is to identify a relatively small number of factors or components that can be used to represent relationships among sets of interrelated variables (Kim and Mueller 1978; Norusis 1990). Factors or components are formed by variables that are correlated with each other but nearly unrelated to other variables in the analysis; these factors reflect the underlying structure or processes occurring in the data (Tabachnick and Fidell 1996).

The two major types of factor analysis and principal components analysis are exploratory and confirmatory (Kim and Mueller 1978). Exploratory analysis is undertaken when the goal is to describe and summarize data by grouping together variables that are correlated. The variables that are used in the analysis may not even have been chosen with potential underlying processes in mind (Tabachnick and Fidell 1996). In contrast, confirmatory factor analysis is employed when a theory is being tested about underlying structure in the data (Tabachnick and Fidell 1996). In this type of analysis, there are specific expectations concerning the number of factors and their loadings (Kim and Mueller 1978). The analysis performed for this study was exploratory in nature, as it was the first research of its kind to be carried out in the Western Newfoundland Model Forest.

Factor analysis produces factors whereas principal components analysis produces components. The two techniques are very similar, with the major difference involving the variance that is analyzed. In PCA, all the variance in the observed variables is analyzed, while FA analyzes only the shared variance (Tabachnick and Fidell 1996). PCA was used for the current study. Tabachnick and Fidell (1996) recommend PCA if the primary goal is to reduce a large number of variables down to a smaller number of components. Tabachnick and Fidell (1996) state that FA should be used to produce a theoretical solution free of unique error variability, while PCA is the best choice for an empirical summary of the data set. These components are orthogonal, and are recommended for used in other analyses.

The process involved in a factor analysis consists of three main operations: examining and dealing with the limitations in the data, such as outliers and non-normal variables, major analyses such as the number of factors or components to use, and additional analyses such as calculation of factor scores and checking for outlying cases among the factors (Tabachnick and Fidell 1996).

The initial analysis consisted of choosing the variables to be used in the factor analysis, screening the data, and ensuring that the resulting sample size was adequate and the correlation matrix was factorable. Data screening has been discussed in the previous section and will be only briefly revisited here.

Thirty-five variables were chosen for inclusion in the PCA: twelve NEP statements, sixteen questions on the importance of various outdoor recreation activities, and seven socioeconomic questions. These variables were chosen in conjunction with an objective of the study, which was to predict recreation participation based on environmental attitudes and sociodemographics. Issues such as normality of variables and multicollinearity having been dealt with, sample size was then considered. Tabachnick and Fidell (1996) suggest the following regarding sample sizes: fifty is very poor, one hundred is poor, two hundred is fair, three hundred is good, five hundred is very good, and one thousand is excellent. They recommend having at least three hundred cases for factor analysis. Thus, the four hundred and ninety-two cases remaining after multivariate outliers were removed should be sufficient for the analysis.

The factorability of the correlation matrix was then examined. Tabachnick and Fidell (1996) suggest that several correlations of .3 or higher are necessary before a correlation matrix should be used for factor analysis. Examination of the correlation matrix indicated that there were sufficient number of correlations higher than .3. In addition, the anti-image correlation matrix and the Kaiser-Meyer-Olkin measure of sampling adequacy were examined. If the correlation matrix R is indeed factorable, there are mostly small numbers in the off-diagonal elements of the anti-image matrix (Tabachnick and Fidell 1996). Values of .6 or higher for Kaiser's measure of sampling adequacy are required for a good factor analysis. Once redundant (highly correlated) variables were removed from the analysis, thirty-two variables remained in the analysis. The resulting correlation matrix was not singular or multicollinear, most off-diagonal elements of the anti-image correlation matrix were small, and Kaiser's measure of sampling adequacy was 0.79. Given the fact that several variables were removed from the analysis, screening was once again performed for multivariate outliers. Ten cases were removed from the analysis, leaving a sample size of four hundred and eighty-two to be used in factor analysis.

The initial factor analysis was run using principal components extraction and varimax rotation. Orthogonal rotation was chosen as the resulting factors were to be used as independent variables in the subsequent discriminant analysis. Interpretation was facilitated through the use of uncorrelated components (Tabachnick and Fidell 1996). The use of varimax rotation has been argued against in the past (Davies 1971a, Davies 1971b)

on the argument that simplifying the factor structure causes the generalizability of the result to be degraded. However, varimax rotation maximizes the variance between factors, and is a useful rotation method when factor scores will be used in further analyses (Davies 1971a; Tabachnick and Fidell 1996).

The default selection criteria in SPSS extract all components with eigenvalues greater than one. Eigenvalues represent variance. Because the variance that each standardized variable contributes to a principal components extraction is one, a component with an eigenvalue less than one is not as important, from a variance perspective, as an observed variable. Examination of this preliminary analysis revealed that 57.4 percent of the variance was explained by the eight components extracted. One variable, var050 (staying at a cabin) was found to have similar, high loadings for both Component 1 (0.44885) and Component 2 (0.42736). A decision was made to remove this variable from the analysis.

Preliminary analysis suggested the retention of 31 variables for the final PCA, along with varimax rotation. Many methods exist to aid in choosing the number of components. As a first approximation, Tabachnick and Fidell (1996) suggest that the number of components with eigenvalues greater than one will usually be something between the number of variables divided by three and the number of variables divided by five. For the current study this gave an estimate of between 6 and 10 components.

Another method of choosing the appropriate number of components involves an examination of the scree plot of eigenvalues plotted against components. The point

where a line drawn through the points changes slope indicates the approximate number of components (Tabachnick and Fidell 1996). This method is somewhat subjective and for the current study suggested that the appropriate number of components was somewhere between 6 and 8. Tabachnick and Fidell (1996) suggest that if after examination of the scree plot and eigenvalues the number of factors is still not clear, several factor analyses should be performed, each time specifying a different number of factors, repeating the scree test, and examining the residual correlation matrix. The residual correlation matrix is calculated by subtracting the reproduced correlation matrix from the observed correlation matrix. In addition, the number of variables loading highly (.32 or more) on each factor was examined. Interpretation of components defined by only one or two variables can be dangerous (Tabachnick and Fidell 1996). Only the most reliable components were retained for use in the subsequent discriminant analysis; 6 components were retained in the final PCA. These 6 components are interpreted and discussed in Chapter 6, Analytical Results.

Factor scores were computed and saved using the regression method (Norusis 1990). These factor scores were saved for use as IVs in the discriminant analysis. Because PCA extraction was used, the factor scores were exact rather than being estimated. Screening was also done for outlying cases among the components, by examining scatterplots between pairs of factors (Tabachnick and Fidell 1996). Any outlying cases would have appeared along the borders in the scatterplots, but no serious outliers were indicated.

4.12 Discriminant Analysis

Discriminant analysis is a statistical technique that attempts to quantify the prediction process. The goals of discriminant analysis are: to classify cases into one of several mutually exclusive groups on the basis of various characteristics, to establish which characteristics are important for distinguishing among the groups, and to evaluate the accuracy of the classification (Norusis 1990).

The aim of the discriminant analysis in this study was to classify recreation activity participants using the previously calculated factor scores as predictors. Respondents' group membership was known; the three mutually exclusive groups were consumptive recreationists, nonconsumptive recreationists, and nonparticipants. Participation in consumptive activities such as hunting was hypothesized to be the key factor dividing the groups; as such, participation in even one consumptive activity resulted in a person being classified as a consumptive recreationist, whether or not they participated in nonconsumptive activities as well.

A direct discriminant function analysis was performed on the data using the six factor scores from the previous analysis. Once cases with missing values were excluded from the analysis, 220 cases remained to be analyzed. The consumptive group contained 136 cases, 40 cases belonged to the nonconsumptive group, and 44 cases were nonparticipants. No problems are posed by unequal sample sizes in the groups; the only requirement is that the sample size of the smallest group should exceed the number of

predictors (Tabachnick and Fidell 1996). With 6 predictors in the analysis, no problems were encountered due to unequal group sizes.

Data requirements for discriminant analysis are similar to those for other multivariate statistics, and have thus been previously discussed and dealt with in the data screening section of this chapter. In addition, any problems that might have been caused through the use of nonnormal predictor variables have been averted through the use of approximately normally distributed factor scores as predictors.

Results of the discriminant analysis, including an interpretation of the significant discriminant functions and classification results are presented in Chapter 6. Group membership is also dichotomized in an attempt to improve the classification rate. This process involved collapsing the nonconsumptive and nonparticipant groups together and performing discriminant analysis based on only two groups.

4.13 Scale Development

Two scales were developed for use in the current study. The first, KNOWSCOR, contained 13 items designed to test respondents' knowledge about the Western Newfoundland Model Forest (Table 4.1). The reliability of the scale was tested using Cronbach's Alpha, which gave a reliability estimate of 0.86. A reliability estimate of 0.60 is considered acceptable (Nunnally 1970). Table 4.2 presents the intercorrelations between the 13 knowledge items.

Table 4.1. Items used in Formation of Knowledge about Western Newfoundland Model Forest Score*

Variable	Item
var015:	1.The Western Newfoundland Model Forest is: (a) a provincial park (b) a national park (c) a World Heritage Site (d) a Demonstration Forest (e) a Community Forest (f) none of the above (g) not sure
var016:	2. What threatened species can be found in the Western Newfoundland Model Forest?
var017:	3. Timber cutting occurs inside the Western Newfoundland Model Forest.
var018:	4. How many Model Forests are there in Newfoundland?
var019:	5. How many Model Forests are there in Canada?
var020:	6. Which of the species below can be found inside the Western Newfoundland Model Forest: Beaver?
var021:	7. Which of the species below can be found inside the Western Newfoundland Model Forest: Pine Marten?
var022:	8. Which of the species below can be found inside the Western Newfoundland Model Forest: Moose?
var023:	9. Which of the species below can be found inside the Western Newfoundland Model Forest: Labrador Duck?
var024:	10. Which of the species below can be found inside the Western Newfoundland Model Forest: Red Squirrel?
var024:	11. Parts of which forest management districts make up the Western Newfoundland Model Forest?
var026:	12. Recreation is not encouraged inside the Western Newfoundland Model Forest.
var027:	13. Timber is the only valuable resource in the Western Newfoundland Model Forest.

*Responses recoded to correct and incorrect answers

Table 4.2. Correlations Between Variables in KNOWSCOR

	var015	var016	var017	var018	var019	var020	var021	var022	var023	var024	var025	var026
var016	-0.0231											
var017	0.1291	0.3158										
var018	0.0878	0.3362	0.2493									
var019	0.2236	0.1726	0.2609	0.3971								
var020	0.0618	0.5232	0.2981	0.2922	0.1219							
var021	0.0733	0.6665	0.3501	0.3351	0.1512	0.7471						
var022	0.0979	0.5602	0.3601	0.2852	0.1321	0.8735	0.7887					
var023	0.0832	0.2556	0.1952	0.1765	0.0771	0.2837	0.2781	0.3014				
var024	0.0497	0.4021	0.2992	0.1759	0.1558	0.5155	0.4834	0.5055	0.1762			
var025	0.1887	0.1275	0.1607	0.2715	0.4051	0.1025	0.1084	0.0941	0.1498	0.1585		
var026	0.1509	0.2628	0.4316	0.3146	0.2373	0.4078	0.3292	0.3623	0.2105	0.2792	0.1688	
var027	0.0671	0.4731	0.3116	0.3065	0.1427	0.4923	0.4798	0.4801	0.1475	0.3506	0.0502	0.4331

The second scale contained 14 statements designed to measure attitudes toward specific issues surrounding the model forest (Table 4.3). Responses to the statements were on a scale from 1 to 7 (strongly disagree to strongly agree) and were coded so that disagreeing with the statement indicated a pro-development attitude, while agreeing indicated a pro-conservation attitude. Where necessary, answers were flipped (eg, 7 would equal 1) for consistency. Reliability of the scale was estimated with Cronbach's alpha, which was equal to 0.74. Correlations between the 14 statements are given in Table 4.4. In Chapter 6, oneway analysis of variance is used to test for differences between the three recreation participation groups (consumptive, nonconsumptive, and nonparticipants) on both scales.

4.14 Conclusion

This chapter has considered the data requirements and methodological considerations involved in the statistical analysis performed in this study. The data was screened for problems such as accuracy, missing data, normality, and multicollinearity, and all concerns were addressed and problems rectified. Steps in the principal components analysis and discriminant function analysis for the study were then described in detail. The chapter concluded with a short description of the two scales developed from some of the survey questions.

Table 4.3. Items Used in the Formation of the Attitude Toward Model Forest Issues Score*

Variable	Item
var029:	1. Cabin development should be restricted to a few selected areas.
var030:	2. There should be no limits on the amount of wood that can be cut for domestic use.
var031:	3. Replanting is necessary after an area has been logged.
var032:	4. Clearcutting is a suitable harvesting method for some areas.
var033:	5. Spraying is sometimes necessary to protect against insect damage in the forest.
var034:	6. The Newfoundland pine marten must be protected.
var035:	7. Hunting should be allowed inside the Western Newfoundland Model Forest.
var036:	8. Recreational fishing should be allowed inside the Western Newfoundland Model Forest.
var037:	9. Mining should be allowed inside the Western Newfoundland Model Forest.
var038:	10. Domestic wood harvesting should be allowed inside the Western Newfoundland Model Forest.
var039:	11. It is important to have a model forest.
var040:	12. Too many trees are being cut in the Western Newfoundland Model Forest.
var041:	13. Domestic wood harvesting inside the Western Newfoundland Model Forest is resulting in habitat loss for wildlife.
var042:	14. Commercial wood harvesting inside the Western Newfoundland Model Forest is resulting in habitat loss for wildlife.

*Responses measured on a 7 point scale from strongly disagree (1) to strongly agree (7).

Table 4.4. Correlations Between Variables in ATTSCORE

	var029	var030	var031	var032	var033	var034	var035	var036	var037	var038	var039	var040	var041
var030	0.1573												
var031	0.0577	-0.0141											
var032	0.0427	0.0604	0.1038										
var033	0.0077	0.0305	-0.0445	0.1745									
var034	0.1505	0.0966	0.2102	-0.0027	-0.0865								
var035	0.2054	0.1061	0.1563	0.0362	0.0281	0.0468							
var036	0.1389	0.0706	0.0628	0.0822	0.1236	-0.0514	0.6732						
var037	0.1446	0.1952	0.1216	0.2192	0.0424	0.1126	0.4408	0.4069					
var038	0.2214	0.1596	0.2373	0.1035	0.0884	0.1239	0.5462	0.4752	0.5084				
var039	0.1846	0.1753	0.1661	0.0366	-0.1291	0.3381	0.1564	0.0012	0.2007	0.2163			
var040	0.1229	0.0555	0.3063	0.0837	0.0639	0.2442	0.0012	0.0091	0.0734	0.1824	0.3138		
var041	0.2736	0.1134	0.2972	0.0087	-0.0053	0.2609	0.2634	0.2059	0.0763	0.3864	0.2746	0.5209	
var042	0.1811	0.1163	0.3572	0.1356	0.0458	0.2637	0.0021	-0.0369	0.1428	0.1942	0.3809	0.6381	0.5576

CHAPTER 5: PRELIMINARY DESCRIPTIVE RESULTS

This chapter has been divided into five main sections: the first considers respondents' attitudes toward the environment, the second indicates the level of general knowledge respondents have about the model forest, and the third illustrates respondents' opinions on specific issues as they relate to the model forest. The fourth and fifth sections consider recreational activities and expenditures on these activities in the model forest area. Most results are presented graphically and only briefly discussed within the text. This chapter will present results only; discussion of the results in the context of other research findings and implications for resource management are contained in the next chapter.

5.1 Attitudes Toward the Environment

The first section of the research instrument contained questions intended to measure respondents' attitudes toward the environment in general. Evidence suggests that these "primitive beliefs" may affect specific attitudes and behaviours (Stern et al 1995). It is possible that attitudes toward specific model forest issues and recreation behaviour are influenced by these fundamental environmental attitudes. The New Environmental Paradigm Scale (Dunlap and Van Liere 1978) was used to measure respondents' attitudes toward the environment (Table 2.1). Respondents were asked to indicate whether they

agreed with each statement using a seven-point scale ranging from strongly disagree (1) to strongly agree (7). The NEP Scale has met with previous success in a Canadian context. Edgell and Nowell (1989) used the scale in a study of wildlife and environmental beliefs in British Columbia. Results indicated significant differences in environmental attitudes between commercial fishers and the general public and environmentalists. Edgell and Nowell (1989) suggested that this information could be used in resolution of wildlife management conflicts.

Most respondents agreed with the statement that we are approaching the limit to the number of people that the earth can support. More than 70 percent of respondents agreed to some extent, with 22 percent strongly agreeing. Slightly more than 22 percent disagreed with the statement, with 6.8 percent of respondents strongly disagreeing. Approximately 6 percent neither agreed nor disagreed with the statement (Figure 5.1).

Response to the second statement was even more positive. Approximately 90 percent of respondents agreed that the balance of nature is very delicate and easily upset, while about 8 percent disagreed (Figure 5.2). More than 57 percent of respondents disagreed with the statement that mankind was created to rule over the rest of nature (Figure 5.3). Slightly more than 32 percent agreed with the statement. Response to the next statement was much more supportive; nearly 90 percent of respondents felt that when humans interfere with nature it often produces disastrous consequences (Figure 5.4). Respondents also agreed that economic health requires development of a steady

state economy. Approximately 90 percent of respondents agreed, more than 40 per cent strongly. Less than 6 percent of respondents disagreed with the statement (Figure 5.5).

Respondents did not appear to reach such a consensus on the next statement, that humans have the right to modify the environment to suit their needs. Almost 35 percent of respondents agreed with the statement, while 5 percent neither agreed nor disagreed and the remainder (slightly more than 60 percent) disagreed (Figure 5.6). Nearly all respondents (almost 97 percent) agreed that humans must live in harmony with nature in order to survive; in fact, more than 65 percent strongly agreed with the statement. Only 3 percent of respondents disagreed (Figure 5.7). More than half of respondents (nearly 60 percent) disagreed with the statement that plants and animals exist primarily to be used by humans, while more than 35 percent agreed with the statement and nearly 5 percent expressed neutral feelings (Figure 5.8).

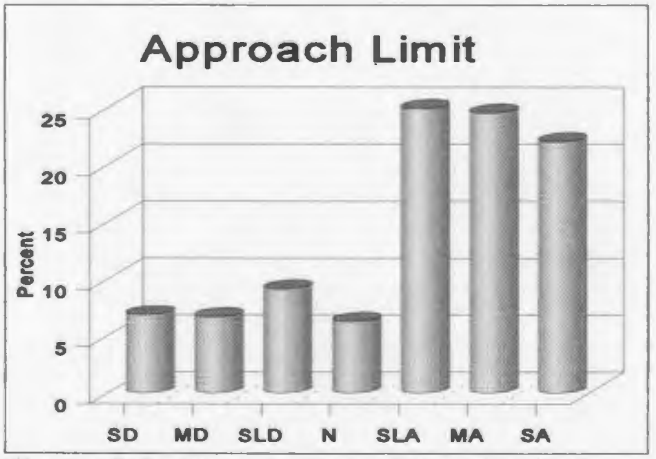


Figure 5.1. We are approaching the limit to the number of people the earth can support

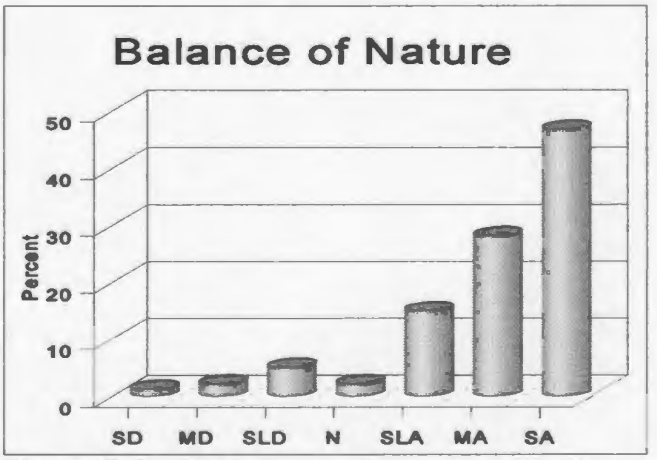


Figure 5.2. The balance of nature is delicate and easily upset.

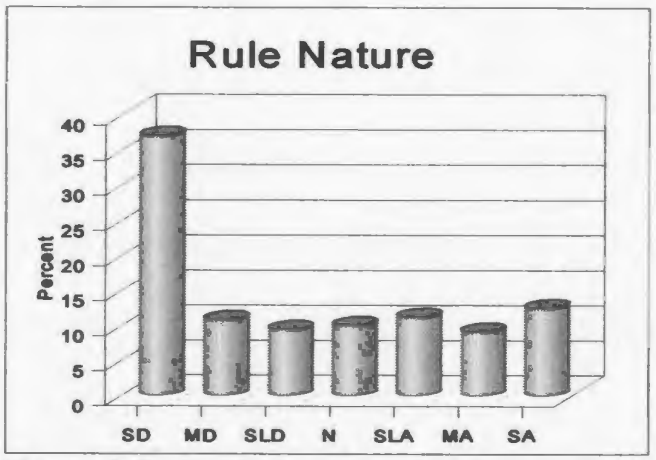


Figure 5.3. Mankind was created to rule over the rest of nature.

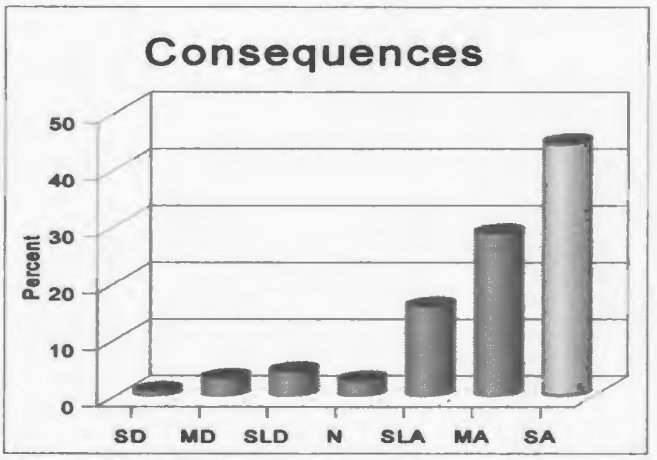


Figure 5.4. When humans interfere with nature it often produces disastrous consequences.

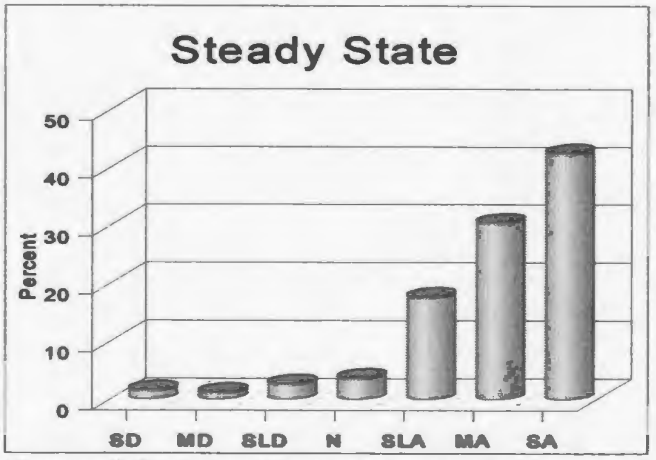


Figure 5.5. To maintain a healthy economy we will have to develop a "steady state" economy where industrial growth is controlled.

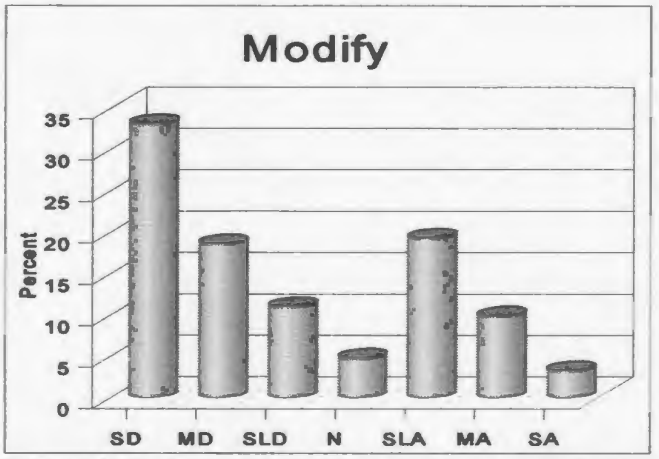


Figure 5.6. Humans have the right to modify the natural environment to suit their needs.

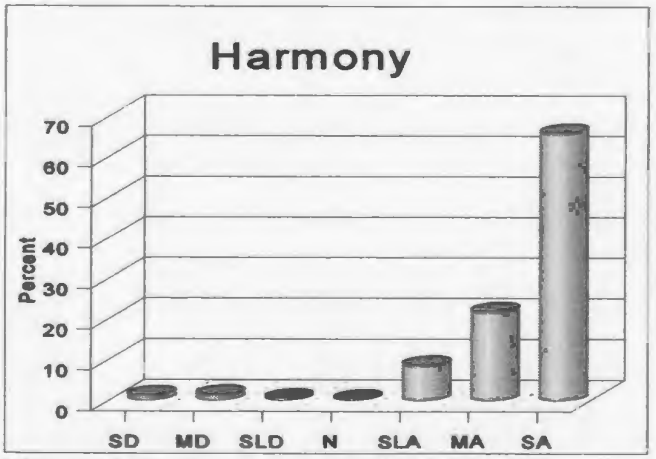


Figure 5.7. Humans must live in harmony with nature in order to survive.

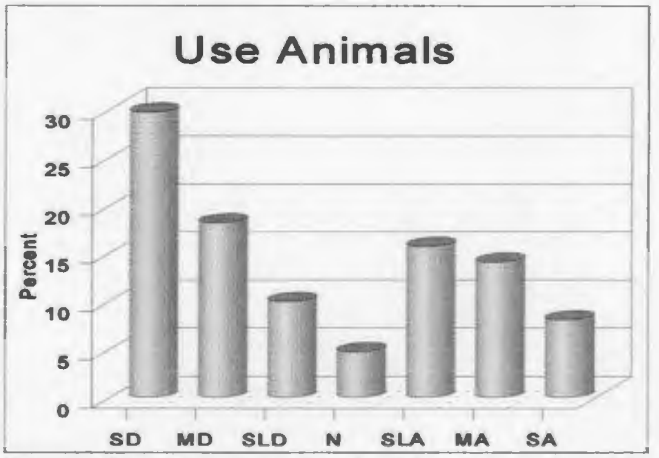


Figure 5.8. Plants and animals exist primarily to be used by humans.

The majority of respondents (more than 83 percent) agreed that the earth is like a spaceship with only limited room and resources. Almost one half (44.6 percent) of respondents strongly agreed, while approximately 10 percent disagreed and 7 percent neither agreed nor disagreed (Figure 5.9). Respondents also felt that there are limits to growth beyond which our industrialized society cannot expand. More than 80 percent of respondents agreed with the statement, 7.5 percent had neutral feelings, and 11 percent disagreed (Figure 5.10). Respondents also felt that mankind is severely abusing the

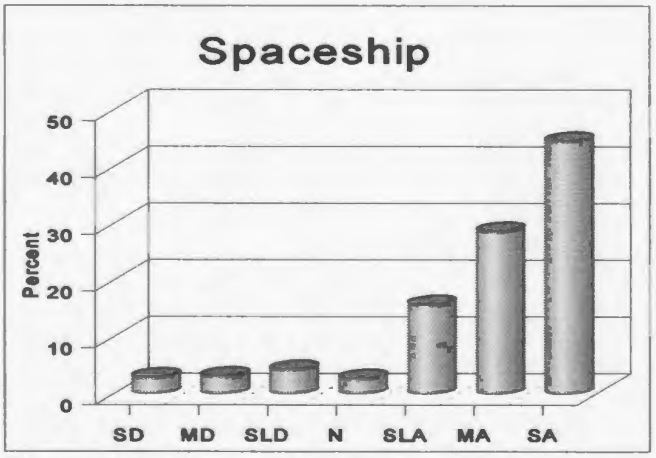


Figure 5.9. The earth is like a spaceship with only limited room and resources.

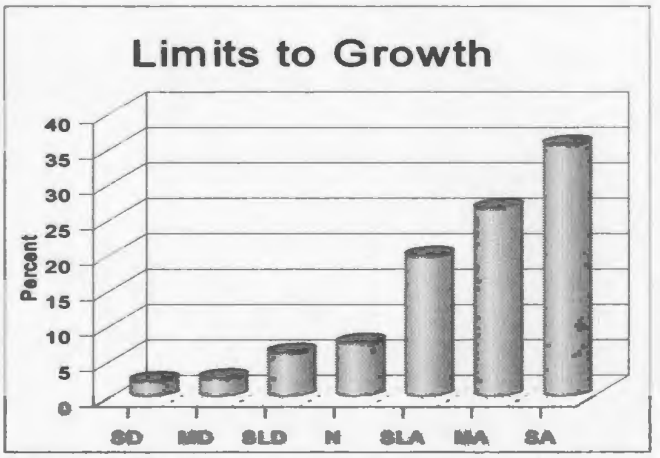


Figure 5.10. There are limits to growth beyond which our industrialized society cannot expand.

environment (Figure 5.11). Nearly 95 percent agreed with the statement to some extent, while only 4 percent disagreed and 1 percent expressed neutral feelings. Most respondents rejected the idea that humans need not adapt to the environment. More than 80 percent of respondents disagreed with the statement, 8 percent agreed, and 4 percent neither agreed nor disagreed (Figure 5.12).

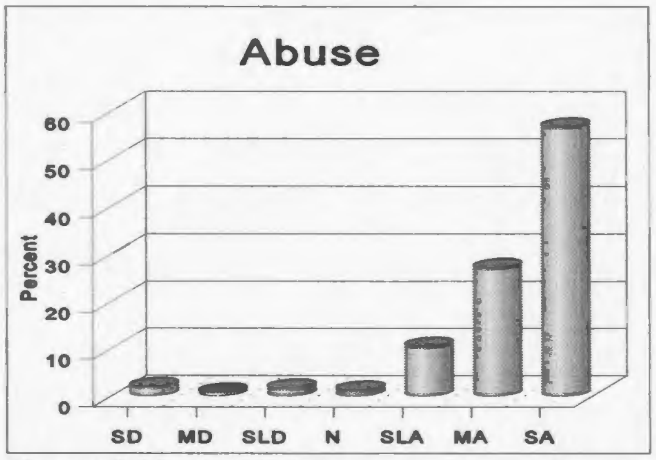


Figure 5.11. Mankind is severely abusing the environment.

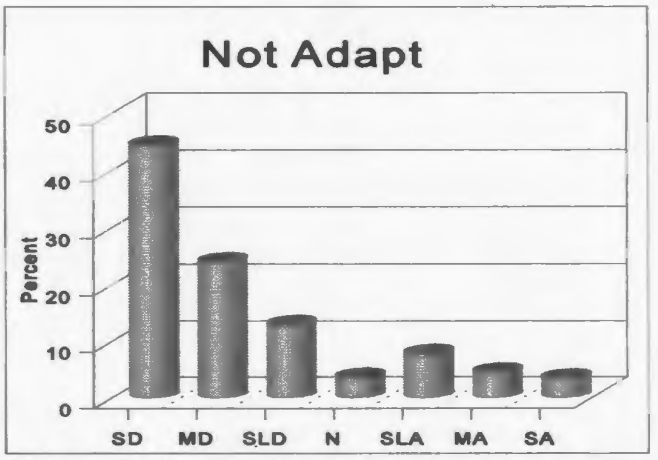


Figure 5.12. Humans need not adapt to the environment because they can remake it to suit their needs.

The NEP Scale is designed so that agreement with items 1, 2, 4, 5, 7, 9, 10, and 11 will indicate acceptance of the NEP, while agreement with items 3, 6, 8, and 12 indicate rejection of the NEP. Results indicated that respondents were very consistent with regards to environmental attitudes (Table 5.1). Average item scores ranged from 4.97 to 6.43 on a seven-point scale for items that indicated acceptance of the NEP (Table 5.2). This indicates that on average these items were slightly to strongly agreed to by respondents. Consistent with this pattern, items 3, 6, 8, and 12 had average scores ranging from 2.33 to 3.33, indicating that respondents disagreed with the statements. Average responses to all 12 items indicated NEP acceptance. NEP acceptance refers to a pro-environment attitude, and the higher the score the stronger the attitude.

Table 5.1. Percent agreement and disagreement with NEP items*

Item	% Agreement	% Disagreement
1	71.4	22.5
2	89.7	8.3
3	32.8	57.2
4	89.1	8.2
5	90.7	5.5
6	32.5	62.7
7	96.2	3.2
8	37.6	57.6
9	89.1	10.3
10	81.8	10.7
11	94.5	4.3
12	15.4	81.2

* Note that percentages will not sum to 1.00 as those who neither agreed nor disagreed are not included

Table 5.2. Average Item Scores for the NEP*

Item	Mean	Standard Deviation
1	4.97	1.80
2	5.98	1.34
3	3.25	2.21
4	5.94	1.34
5	5.96	1.27
6	3.01	1.94
7	6.43	1.08
8	3.33	2.12
9	5.79	1.57
10	5.62	1.48
11	6.26	1.18
12	2.33	1.68

* Note that 1.00=strongly disagree and 7.00=strongly agree.

5.2 Knowledge of the Western Newfoundland Model Forest

Respondents were questioned about their level of knowledge of the Western Newfoundland Model Forest. A list of these items is shown in Table 4.1. The first item asked respondents how knowledgeable they felt they were about the Western Newfoundland Model Forest. Nearly 18 percent of respondents stated that they had never heard of the model forest. Approximately 50 percent felt they were somewhat to very knowledgeable, however, only 3 percent said they were very knowledgeable about the model forest. The remainder stated they had little knowledge about the model forest (Figure 5.13).

Respondents were unsure as to what type of forest the model forest was (Figure 5.14). Given the choices of provincial park, national park, world heritage site, demonstration forest, community forest, none of the above, and not sure, only 5.4 percent identified the correct response, "none of the above." More than 30 percent of respondents were not sure, while 48 percent of respondents incorrectly identified the model forest as a demonstration forest, perhaps because of the presence of such a forest in Gander. The majority of respondents (70 percent) recognized that the pine marten was the threatened species found inside the model forest. Approximately one quarter of respondents indicated that they were not sure (Figure 5.15).

Many respondents did not realize the working forest function of the model forest. Less than 40 percent of respondents responded correctly to the statement that timber

cutting occurs inside the Western Newfoundland Model Forest. More than 20 percent of respondents thought timber cutting did not occur inside the model forest, and 40 percent were not sure (Figure 5.16). Most respondents (70 percent) were also not sure how many model forests there were in Newfoundland. More than 28 percent of respondents chose the correct response (there is one) while less than one percent of respondents chose each of six, ten, and fourteen as possible answers. Nearly 90 percent of respondents were not sure how many model forests there are in Canada, while less than 7 percent indicated that there are ten. The other respondents incorrectly indicated that there were one, six, or fourteen.

As the pine marten is an endangered species in Newfoundland and an important species in the model forest, one item asked respondents about their knowledge of the existence of the pine marten in the model forest. More than 75 percent of respondents knew that the pine marten could be found inside the model forest. About 23 percent of respondents were not sure, while a little over 1 percent thought pine marten were not found there (Figure 5.17).

Recreational use of the model forest was the subject of the next item. Respondents were asked to respond true, false, or not sure to the statement "Recreation is not encouraged inside the Western Newfoundland Model Forest." Approximately 16 percent of respondents believed that recreation is not encouraged inside the model forest, while 42 percent thought the statement was false and 42 percent were not sure (Figure 5.18). Most respondents (68 percent) recognized that timber is not the only valuable

resource inside the model forest, while 27 percent were not sure. About 5 percent thought timber was the only valuable resource (Figure 5.19). The majority of respondents (79 percent) indicated that public input is necessary for management of the model forest.

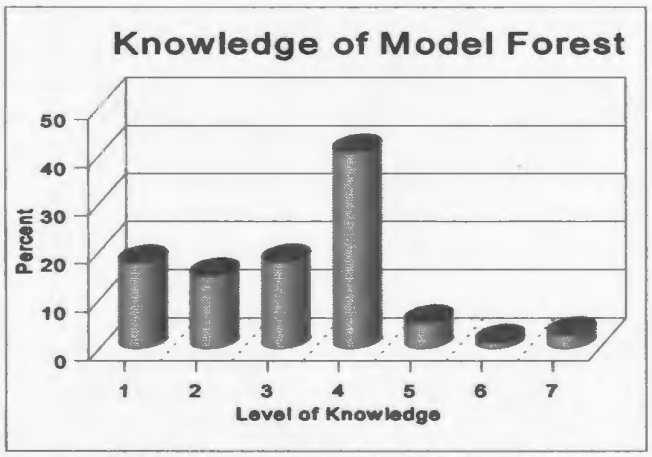


Figure 5.13. Knowledge of Model Forest
1=Never Heard of It
4=Somewhat Knowledgeable
7=Very Knowledgeable

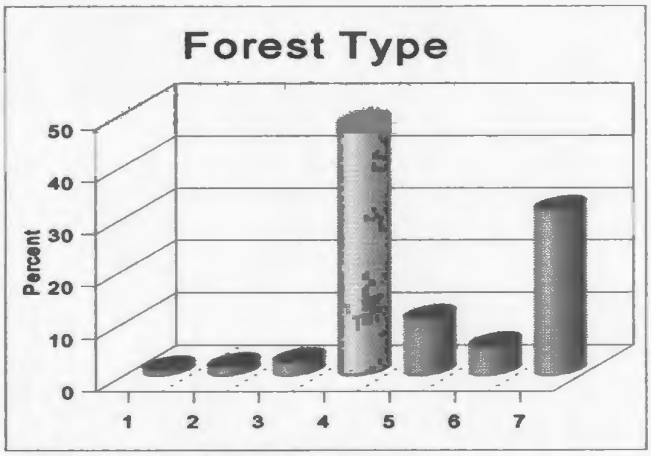


Figure 5.14.. Type of Forest
1= Provincial Park
2=National Park
3=World Heritage Site 4=Demonstration Forest
5=Community Forest
6=None of the Above
7=Not Sure

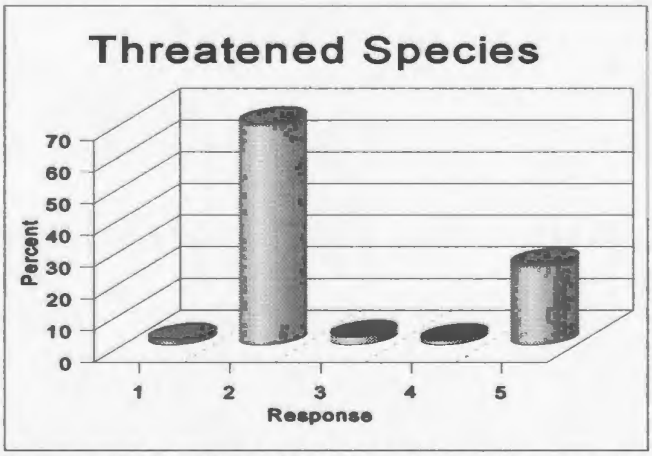


Figure 5.15. What threatened species can be found inside the Western Newfoundland Model Forest?
1=Labrador Duck 2=Pine Marten
3=Caribou 4=Newfoundland Wolf
5=Not Sure

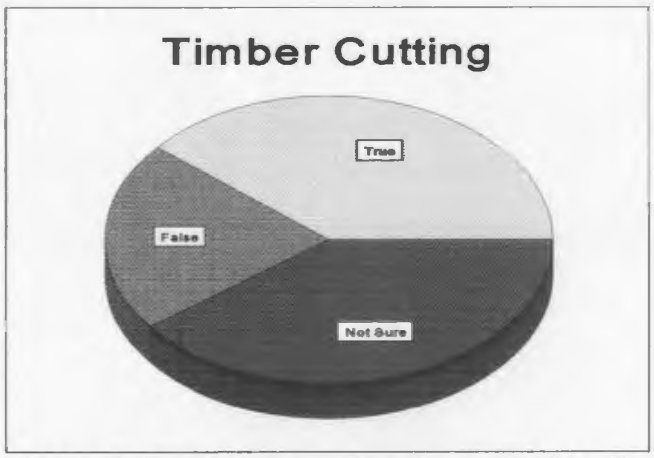


Figure 5.16. Timber Cutting Occurs Within the Model Forest.

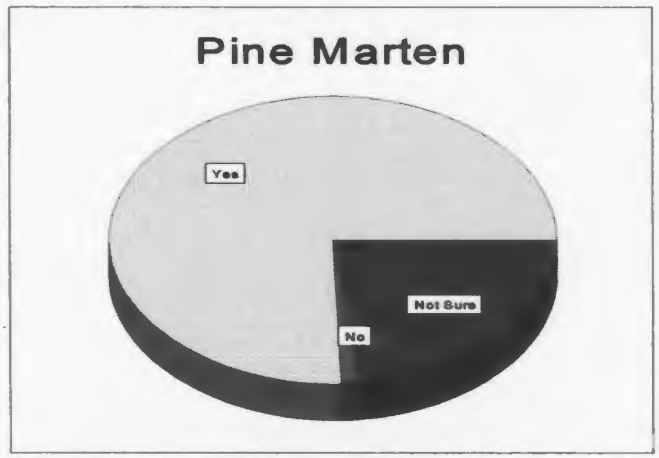


Figure 5.17. Presence of Pine Marten in the Western Newfoundland Model Forest

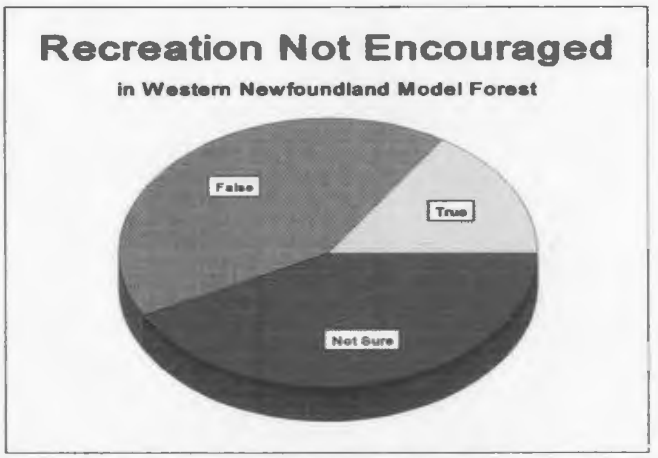


Figure 5.18. Responses to the statement "Recreation is not encouraged inside the Western Newfoundland Model Forest."

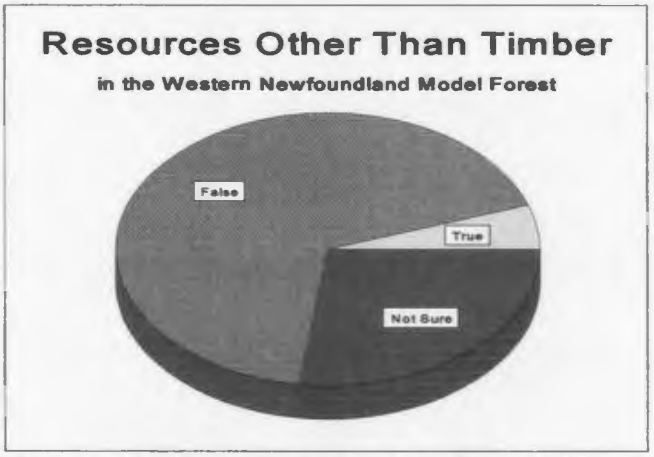


Figure 5.19. Responses to the statement "Timber is the only valuable resource inside the Western Newfoundland Model Forest."

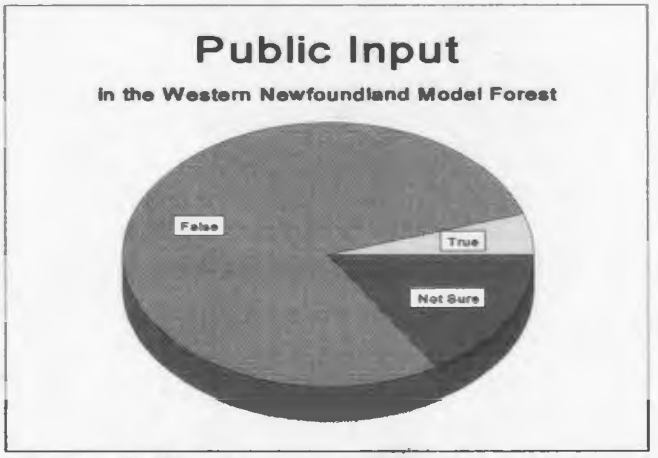


Figure 5.20. Responses to the statement "Public input into the Western Newfoundland Model Forest is not necessary."

Sixteen percent of respondents were not sure, and 5.2 percent thought public input was not necessary (Figure 5.20).

5.3 Model Forest Issues

Respondents were given fourteen statements regarding specific issues having to do with the model forest and asked to indicate how they felt about them on a seven point

scale ranging from strongly disagree (1) to strongly agree (7). The statements considered such issues as commercial activities, recreational activities, and pine marten (Table 4.3).

5.3.1 Commercial Activities inside WNMF

Most respondents (85 percent) strongly agreed that replanting is necessary after an area has been logged; in total 93 percent agreed to some extent. Slightly more than five percent disagreed, while just over one percent neither agreed nor disagreed (Figure 5.21). There was more disparity between responses on the issue of clear cutting. Approximately 39 percent of respondents said clear cutting was not a suitable harvesting method, while 51.5 percent felt it was suitable. Those who disagreed with clear cutting were more vehement, as 23.6 percent strongly disagreed, while of those 51.5 percent who agreed, only 12.7 strongly agreed. About 10 percent of respondents had neutral feelings on the issue (Figure 5.22). Nearly 90 percent of respondents agreed that spraying is sometimes necessary to protect against insect damage (Figure 5.23). Nine percent of respondents disagreed with spraying, while 2 percent neither agreed nor disagreed.

More than half of the respondents (56 percent) disagreed with mining inside the model forest. Almost one third (30 percent) agreed with mining, and a rather high percentage, 14 percent, did not agree or disagree (Figure 5.24). This result is interesting in light of the fact that residents were opposed to the development of a wilderness reserve in the model forest as it would conflict with mining opportunities in the area. This may

be an example where political decision-making was influenced by a small but vocal lobby group rather than based on data representative of the entire constituency.

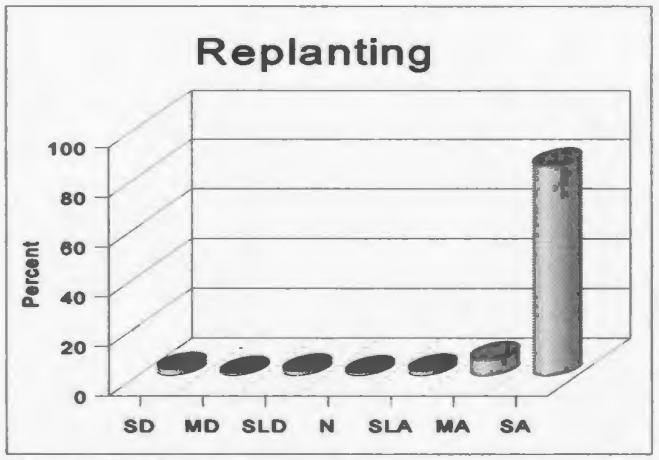


Figure 5.21. Replanting is necessary after an area has been logged.

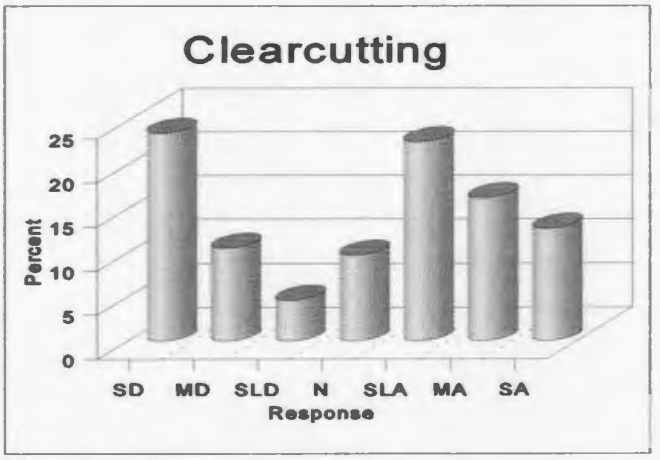


Figure 5.22. Clearcutting is appropriate in some areas.

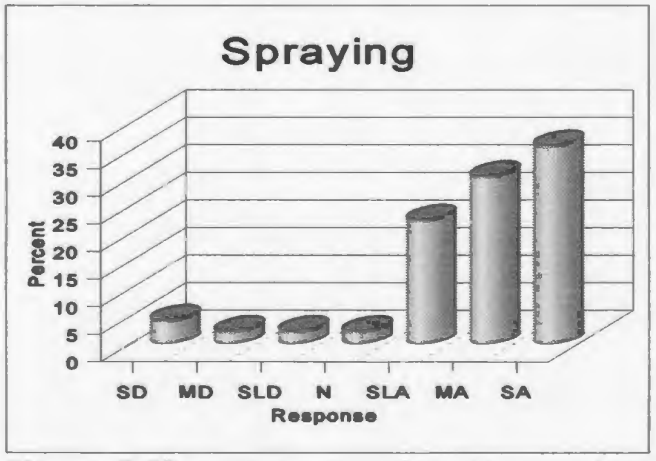


Figure 5.23. Insect spraying is sometimes necessary.

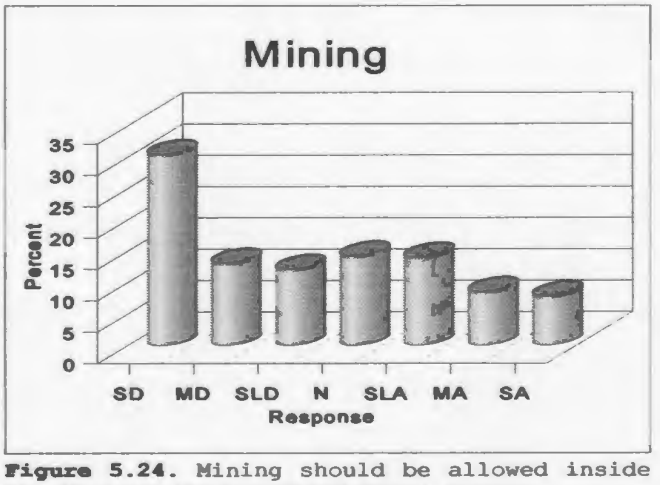


Figure 5.24. Mining should be allowed inside the Western Newfoundland Model Forest.

Many respondents (64 percent) felt that too many trees are being cut in the Western Newfoundland Model Forest (Figure 5.25). Less than eight percent disagreed, while more than a quarter of respondents (29 percent) neither agreed nor disagreed with

the statement. More than 77 percent of respondents felt commercial wood harvesting is resulting in wildlife habitat loss. Six percent of respondents disagreed, while 16 percent neither agreed nor disagreed with the statement (Figure 5.26).

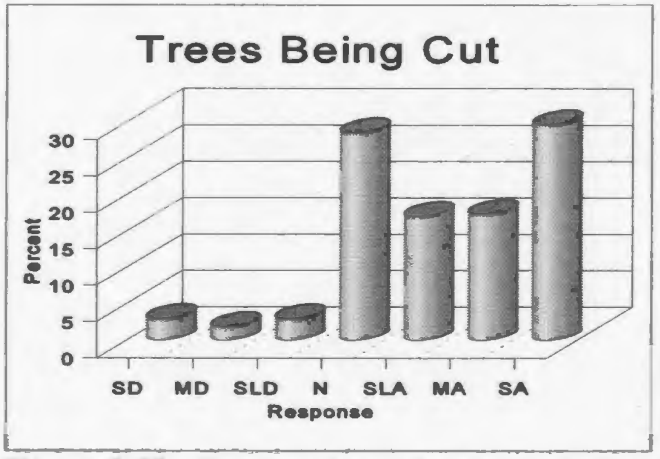


Figure 5.25. Too many trees are being cut in the Western Newfoundland Model Forest.

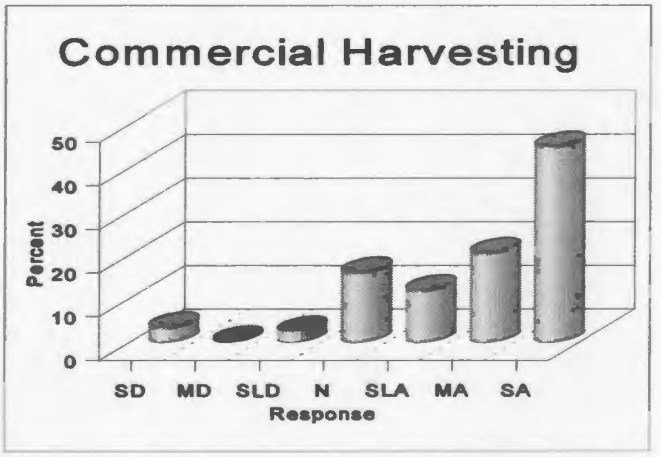


Figure 5.26. Commercial wood harvesting is resulting in wildlife habitat loss.

5.3.2 Recreational Activities inside the WNMF

Nearly one third of respondents (32.7 percent) strongly agreed that cabin development should be restricted to a few selected areas, and 80 percent of respondents agreed with the statement to some extent. Approximately 15 percent felt that cabin development should not be restricted, while 5 percent held a neutral attitude on the subject (Figure 5.27). Almost 82 percent of respondents disagreed with the statement that there should be no limits on the amount of wood that can be cut for domestic use. Approximately 16 percent agreed that there should be no limits, while 2 percent neither agreed nor disagreed (Figure 5.28).

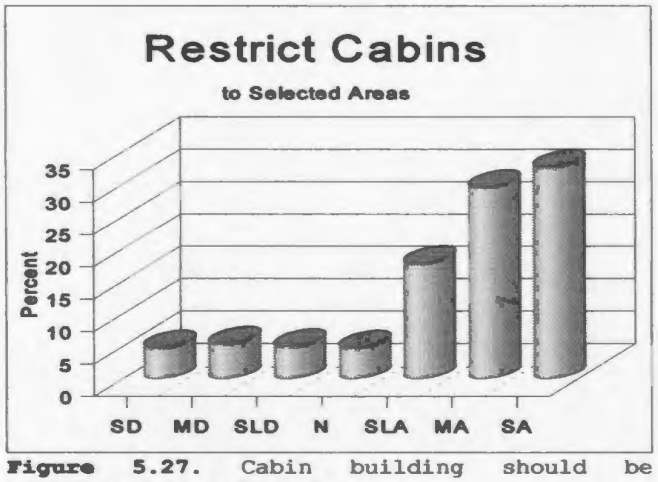


Figure 5.27. Cabin building should be restricted to selected areas.

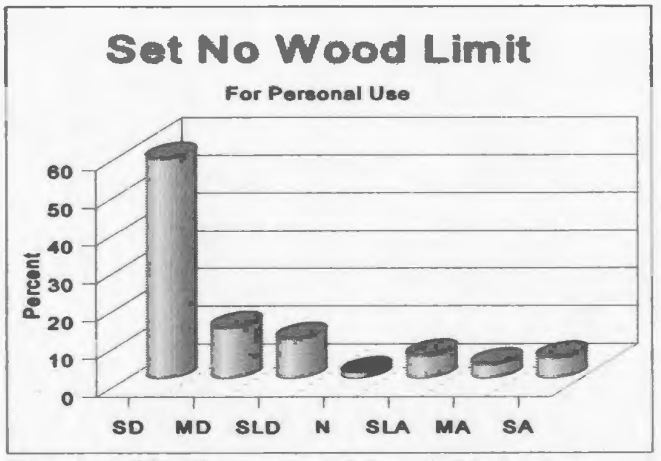


Figure 5.28. There should be no limits on wood cutting for personal use.

Respondents were more divided on the issue of hunting inside the model forest (Figure 5.29). Approximately 35 percent of respondents felt hunting should not be allowed inside the model forest, while 52 percent supported hunting within the model forest; 13 percent did not agree or disagree. Support for fishing was much stronger; about 73 percent of respondents thought fishing should be allowed inside the model forest. Approximately 7 percent disagreed, while the remaining 10 percent neither agreed nor disagreed with fishing in the model forest (Figure 5.30).

Opinions were divided on the issue of domestic wood harvesting. Forty-six percent of respondents disagreed with the practice of domestic wood harvesting in the model forest; 25 percent strongly disagreed. At the same time, 40 percent agreed with the practice while 14 percent had neutral feelings (Figure 5.31). Almost two thirds of respondents (65.3 percent) felt domestic wood harvesting is resulting in habitat loss for

wildlife; 25 percent strongly agreed with the statement. Fifteen percent of respondents disagreed, and almost 20 percent had neutral feelings on the subject (Figure 5.32).

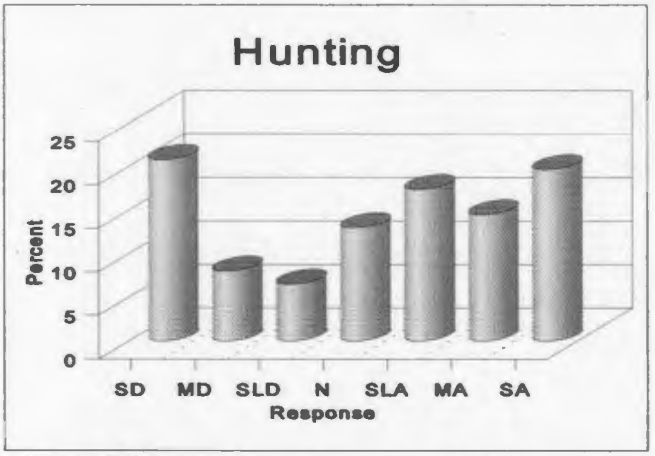


Figure 5.29. Hunting should be allowed in the Western Newfoundland Model Forest.

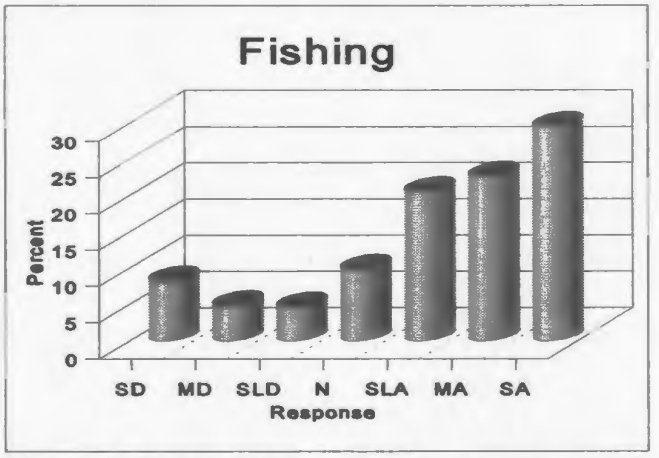


Figure 5.30. Fishing should be allowed inside the Western Newfoundland Model Forest.

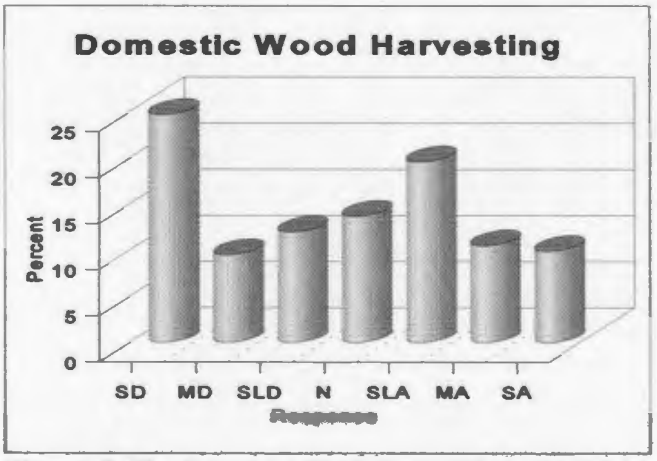


Figure 5.31. Domestic Wood Harvesting should be allowed in the Western Newfoundland ModelForest.

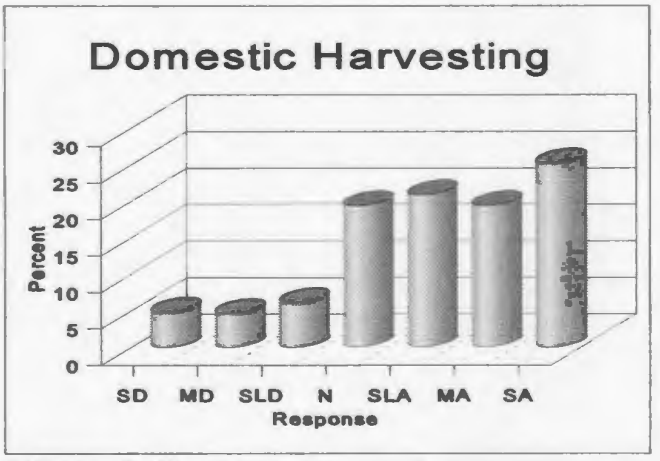


Figure 5.32. Domestic wood harvesting is resulting in wildlife habitat loss.

5.3.3 Pine Marten and the Model Forest Program

Respondents strongly supported pine marten protection. Sixty-nine percent of respondents strongly agreed that the Newfoundland pine marten should be protected; in

all, nearly 94 percent agreed to some extent. Approximately 2 percent disagreed with pine marten protection, while the other four percent neither agreed nor disagreed (Figure 5.33). Most respondents strongly support the model forest concept. More than half (52.7 percent) strongly agreed that it is important to have a model forest; in total 90 percent of respondents agreed to some extent while 2 percent disagreed. Eight percent had neutral feelings regarding the importance of the model forest (Figure 5.34). As has been illustrated, however, most respondents do not fully understand what a model forest is.

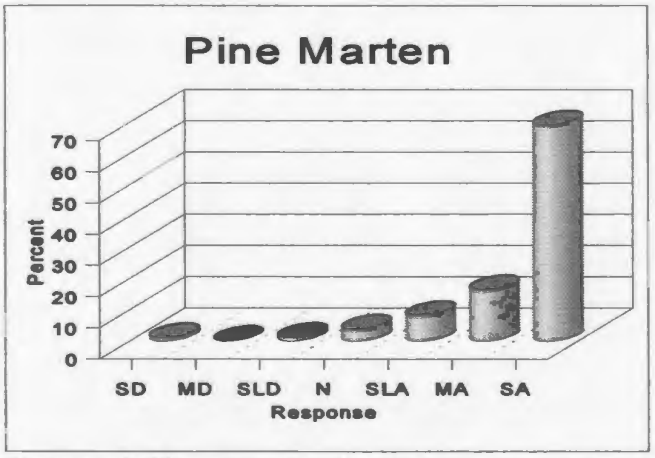


Figure 5.33. The Newfoundland pine marten should be protected.

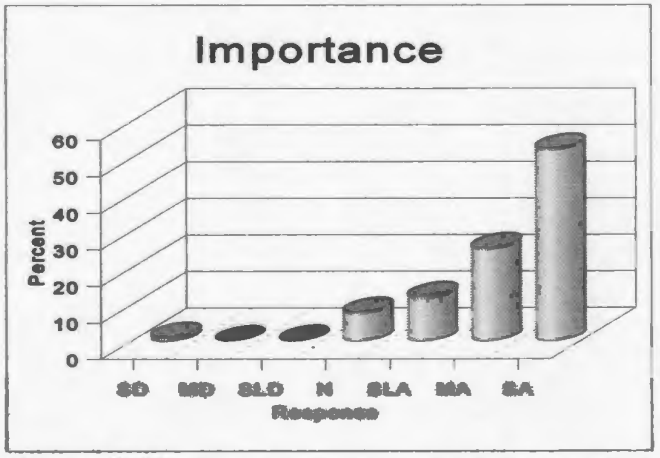


Figure 5.34. It is important to have a model forest.

5.4 Importance of Recreational Activities

The range of recreational activities important to respondents was diverse, from snowmobiling to hunting to hiking, and some activities seemed to be more important to people than others. Respondents were asked to indicate how important 16 different recreational activities were to them , using a seven point scale where 1 indicated an

activity was not at all important, 4 indicated it was somewhat important, and 7 indicated it was very important to them. Results are shown graphically in Figures 5.35 to 5.50.

The first activity considered, snowmobiling, was not at all important to 32.7 percent of respondents, while 18 percent said snowmobiling was somewhat important to them and 22.6 percent said it was very important (Figure 5.35). Fishing was also quite important to respondents, with 31.3 percent stating it was very important and 19.7 percent stating it was somewhat important. Fishing was not at all important to 18 percent of respondents (Figure 5.36).

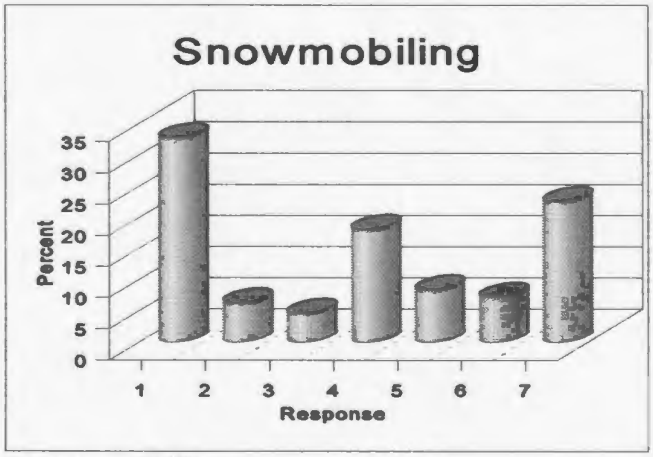


Figure 5.35. Personal importance of snowmobiling.

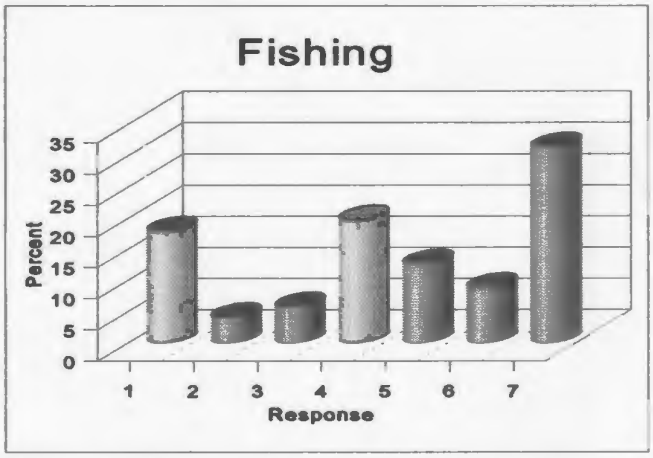


Figure 5.36. Personal importance of fishing.

Hunting large animals was very important to 26.4 percent of respondents; 12 percent indicated the activity was somewhat important and 42 percent indicated that it was not at all important to them (Figure 5.37). Hunting small animals (Figure 5.38) seemed slightly less popular; it was not at all important to 50 percent of respondents, while 17 percent indicated it was somewhat important and 12 percent stated that it was

very important to them. Hunting water birds was very important to 8 percent of respondents, and somewhat important to 10 percent of respondents. Approximately 63 percent of respondents said the activity was not at all important to them (Figure 5.39). Six percent of respondents indicated that hunting other birds was very important to them while 9 percent said it was somewhat important. Two thirds of the respondents (66.5 percent) said the activity was not at all important to them (Figure 5.40). Trapping was not at all important to 82 percent of respondents, 10 percent stated the activity was "somewhat" to "very" important to them (Figure 5.41). Staying at their own or a friend's cabin was somewhat important to 20 percent of respondents, and 35 percent of respondents stated that it was very important to them. This activity was not at all important to 20 percent of respondents (Figure 5.42). Camping was also considered important by many respondents; almost 75 percent stated that the activity was "somewhat" to "very" important to them.

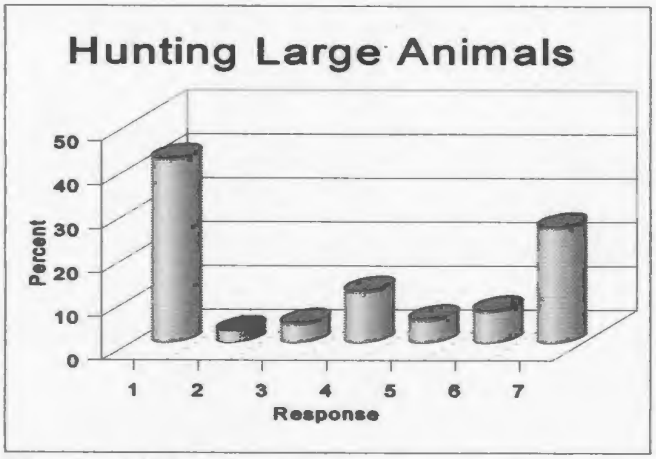


Figure 5.37. Personal importance of hunting large animals.

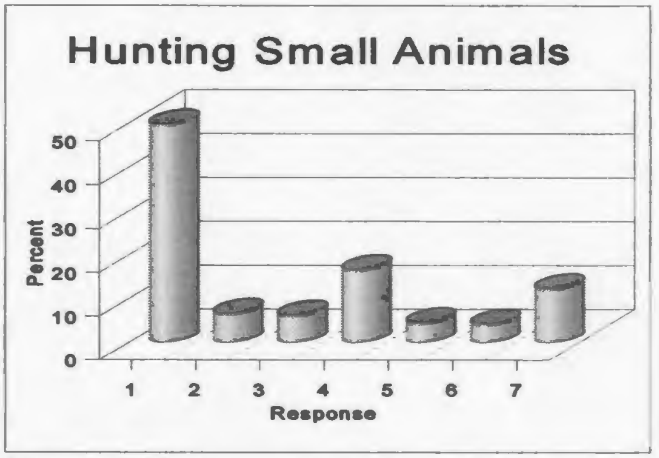


Figure 5.38. Personal importance of hunting small animals.

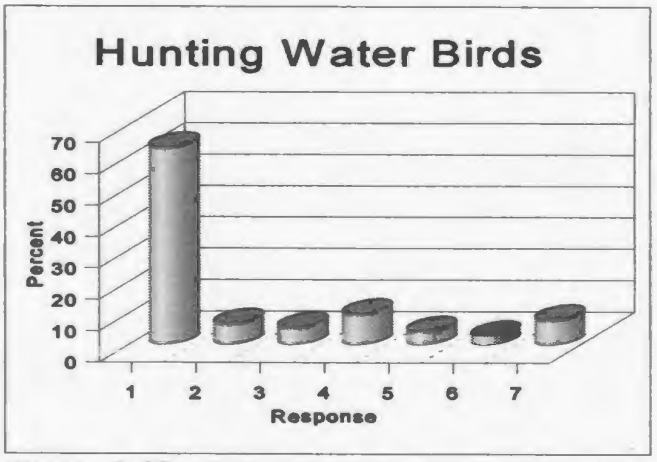


Figure 5.39. Personal importance of hunting water birds.

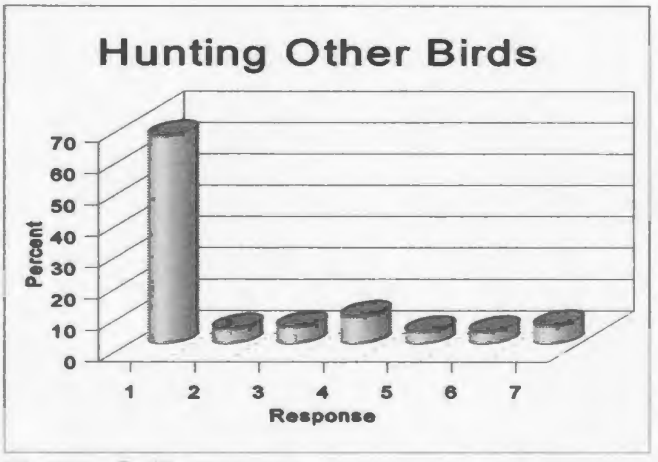


Figure 5.40. Personal Importance of hunting other birds.

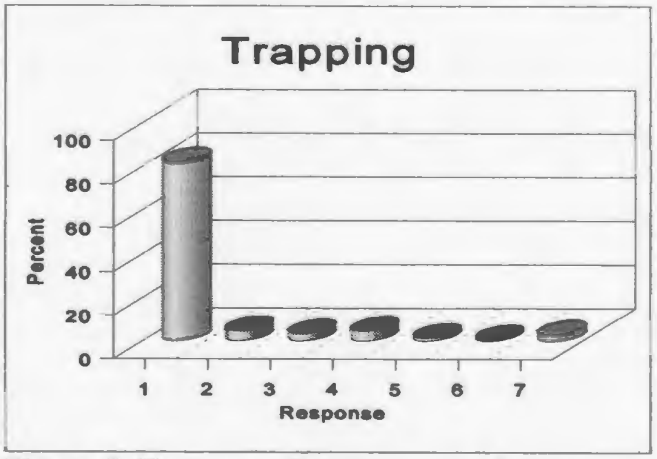


Figure 5.41. Personal importance of trapping.

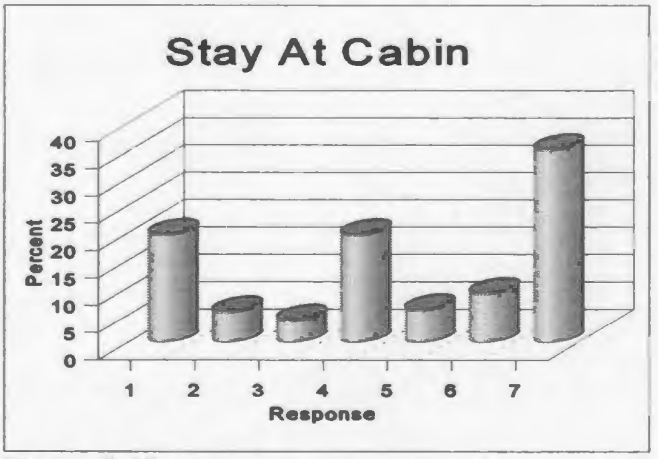


Figure 5.42. Personal importance of staying at a cabin.

Seventeen percent indicated that the activity was not at all important to them. (Figure 5.43). Many respondents (26.5 percent) indicated that hiking was a very important recreational activity for them (Figure 5.44). Almost 20 percent said hiking was somewhat important, while 17 percent said it was not at all important to them.

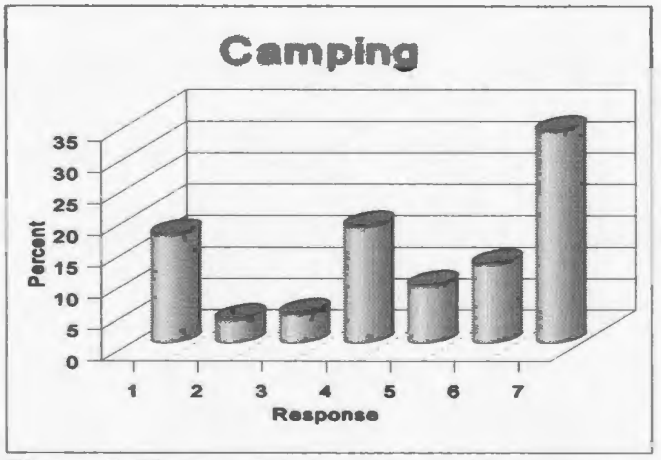


Figure 5.43. Personal importance of camping.

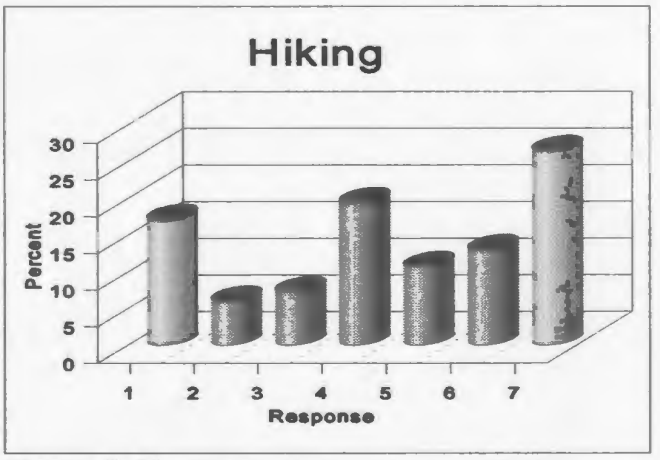


Figure 5.44. Personal importance of hiking.

Wildlife viewing is an important recreational activity for respondents as well. Many respondents (36 percent) stated that viewing large animals was very important to them, while 19 percent said it was somewhat important, and 13 percent said it was not at all important to them (Figure 5.45). Percentages were similar for viewing small animals. Thirty-four percent of respondents said the activity was very important to them, while 20 percent said it was somewhat important and 13 percent said it was not at all important to them (Figure 5.46). Viewing birds seemed to be slightly less popular. Approximately 31 percent of respondents indicated that the activity was very important to them, while 19 percent indicated that it was somewhat important and 16 percent said it was not at all important to them (Figure 5.47). Thirty percent of respondents indicated that viewing

other animals was a very important recreational activity to them , while 22 percent said it was somewhat important and 14 percent said the activity was not at all important to them (Figure 5.48).

Almost half of the respondents (47 percent) stated that wood cutting was not at all important to them. The activity was somewhat important to 14 percent of respondents and 10 percent stated that it was very important (Figure 5.49). More than a third of respondents (35 percent) indicated that cross country skiing was not at all important to them, while half (50.9 percent) rated the activity as "somewhat" to "very" important to them (Figure 5.50).

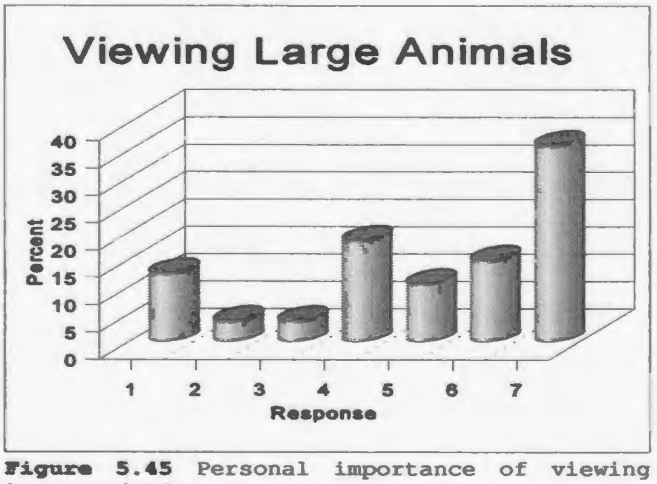


Figure 5.45 Personal importance of viewing large animals.

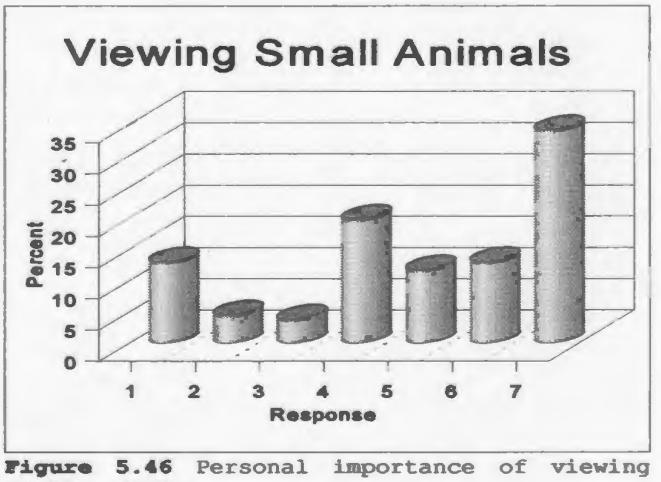


Figure 5.46 Personal importance of viewing small animals.

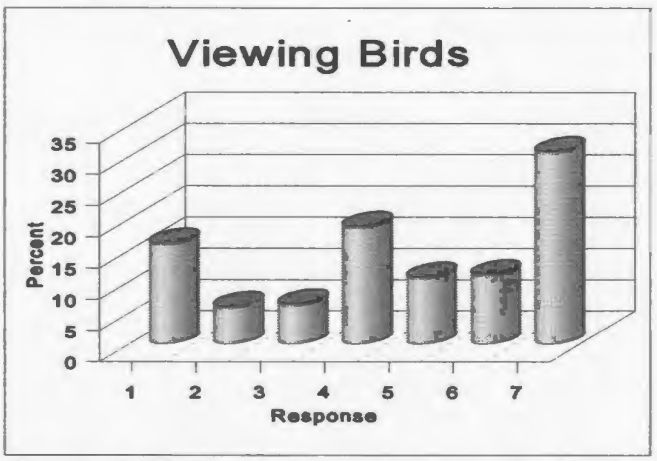


Figure 5.47. Personal importance of viewing birds.

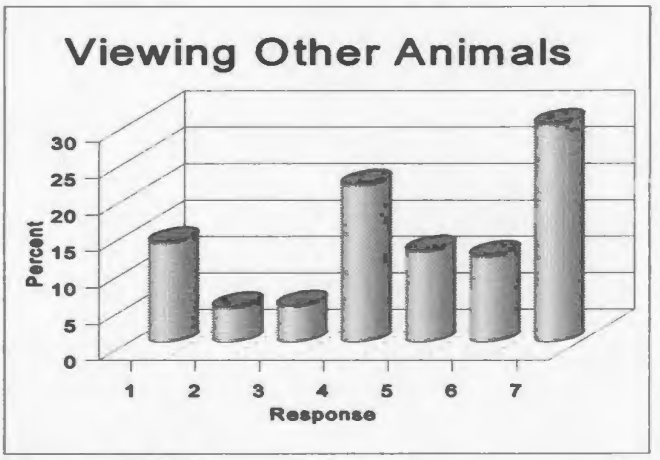


Figure 5.48. Personal importance of viewing other animals.

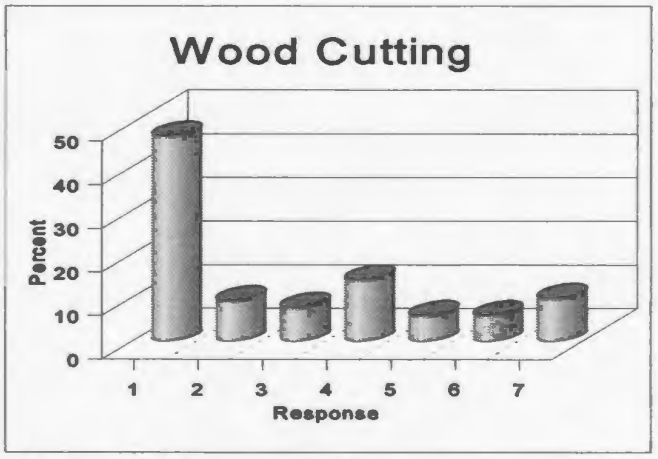


Figure 5.49. Personal importance of wood cutting.

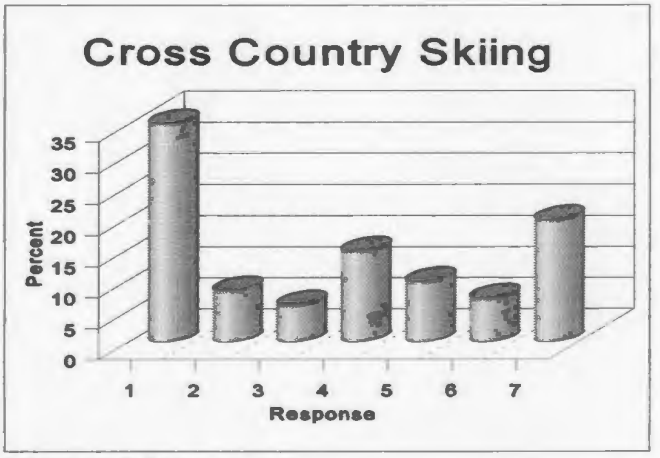


Figure 5.50. Personal importance of cross-country skiing.

Importance of recreational activities results are summarized in Table 5.3. Nonconsumptive recreational activities seem to be important to a larger percentage of respondents, particularly viewing large animals and staying at a cabin (Table 5.3). The only consumptive activity that compared to the nonconsumptive activities in importance was recreational fishing, which was extremely important to 31.3 percent of respondents. This finding is consistent with the results of the 1991 Survey on the Importance of

Wildlife to Canadians, in which 38.4 percent of Newfoundland residents indicated that they had participated in recreational fishing (Filion et al 1993).

Table 5.3. Relative Importance of Recreational Activities in the Western Newfoundland Model Forest.

Activity	Percent Responding "Very Important"	Percent Responding "Not at all Important"
Viewing Large Animals	35.9	12.5
Staying at a Cabin	35.4	19.8
Viewing Small Animals	34.1	13.0
Camping	33.8	17.3
Fishing	31.3	17.9
Viewing Birds	30.8	16.1
Viewing Other Animals	30.0	13.8
Hiking	26.5	17.1
Hunting Large Animals	26.4	41.9
Snowmobiling	22.6	32.7
Skiing	19.6	35.0
Hunting Small Animals	12.3	49.7
Wood Cutting	9.9	47.0
Hunting Water Birds	8.1	62.8
Hunting Other Birds	6.0	66.5
Trapping	3.0	81.8

5.5 Participation in and Expenditures upon Recreation Inside the Model Forest

Respondents participated in a wide range of activities inside the model forest. They were given a list of 16 recreational activities, and asked to indicate if they had participated in the activity inside model forest boundaries in the previous 12 months (from September 1994 to September 1995). Information was also requested on days of participation, operating and capital expenses, and any equipment used. The term "operating expenses" referred to those incurred for gas, food, or other such items, while "capital costs" referred to one time expenses for durable goods such as snowmobiles or skiis. Average price of snowmobiles, skiis, etc. is also given, but should be considered separately from capital costs for the 1994-1995 season, as it refers to ownership, not purchase in the year in question.

Snowmobiling. A large percentage of those surveyed (40.7 percent) indicated that they had participated in snowmobiling in the model forest in the last twelve months (Figure 5.51). This is interesting as only 22.6 percent of respondents said that this activity was very important to them. Slightly more than a third (35 percent) of respondents listed a snowmobile as equipment they used during recreational activities. Of those who participated in snowmobiling, the average number of days or partial days spent snowmobiling was 19.64. Average operating costs incurred for participation were $202.20, while average capital costs were $2064.43 per participant. The average price

paid for snowmobiles was $4441.71 and the average age of snowmobiles used by participants was 5.74 years. The purchase of used snowmobiles by some respondents results in the slightly low average price for snowmobiles.

Fishing. Approximately 40 percent of respondents stated that they had fished inside model forest boundaries in the last twelve months (Figure 5.52). Eight percent of respondents listed a fishing rod as equipment they used during recreational activities. Of those who participated in recreational fishing, the average number of days or partial days spent participating was 13.40. Average operating costs incurred during participation were $134.47 per participant, while average capital cost were $199.58. The average price paid for fishing rods/equipment was $250.46 and the average age of the equipment was 4.89 years.

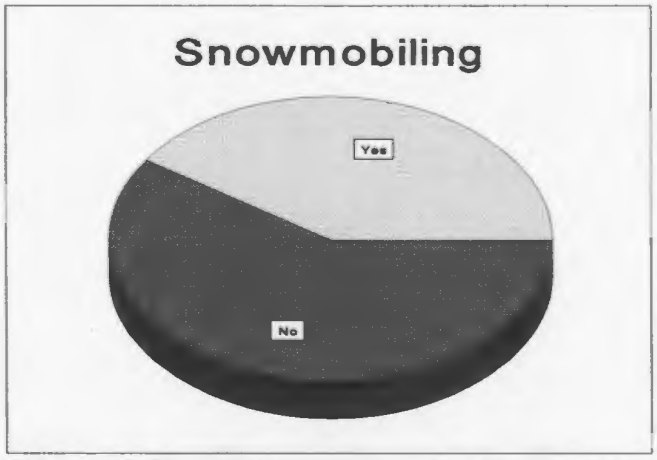


Figure 5.51. Participation in Snowmobiling Inside the Western Newfoundland Model Forest

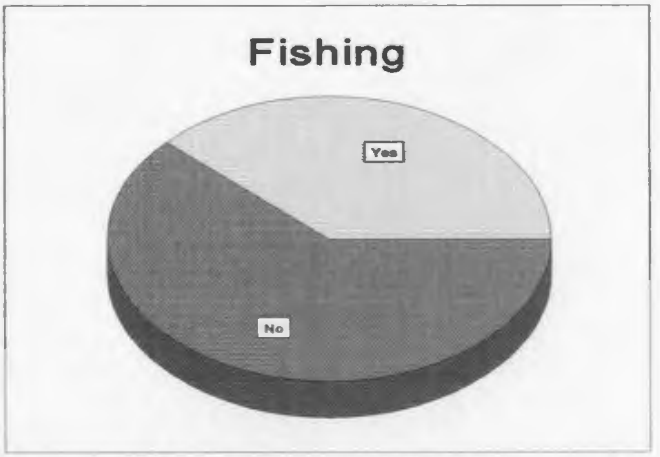


Figure 5.52. Participation in Fishing Inside the Western Newfoundland Model Forest.

Hunting Large Animals. Almost one quarter of those surveyed (24 percent) hunted large animals inside the model forest in the last 12 months (Figure 5.53). Slightly more respondents (26.4 percent) stated this activity was very important to them; this difference may be due to inability to procure a hunting license in the season prior to the survey. Twenty-one percent of respondents listed a rifle or shotgun as equipment they used during their recreational activities. Of those who hunted large animals, an average of 9.99 days or partial days were spent participating. Operating costs incurred averaged $170.03 per participant, while capital costs averaged $520.00. The cost of rifles/shotguns averaged $543.66, and the average age of a rifle/shotgun was 10.80 years.

Hunting Small Animals. Approximately 11 percent of those surveyed had hunted small animals inside model forest boundaries in the preceding 12 months (Figure 5.54). Of those who participated, an average of 15.54 days or partial days were spent hunting small animals. Average operating costs per hunter were $106.89, and capital costs averaged $313.71.

Hunting Water Birds. Five percent of respondents had hunted water birds in the model forest in the previous 12 months (Figure 5.55). An average of 14.89 days or partial days per participant were spent hunting water birds. Operating costs incurred averaged $61.18 per hunter, and capital costs averaged $441.18.

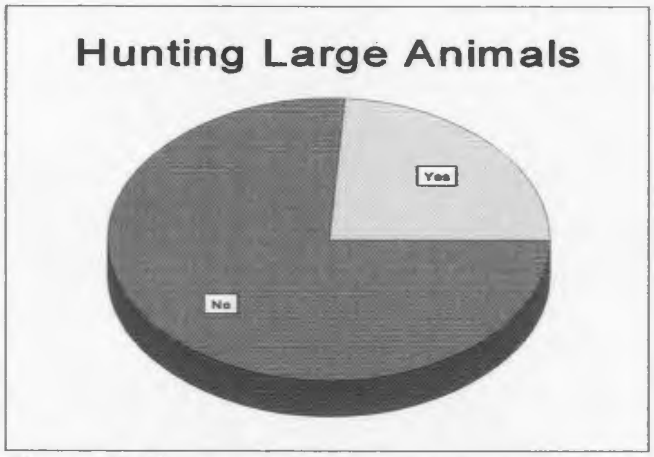


Figure 5.53. Participation in Hunting Large Animals Inside the Western Model Newfoundland Forest

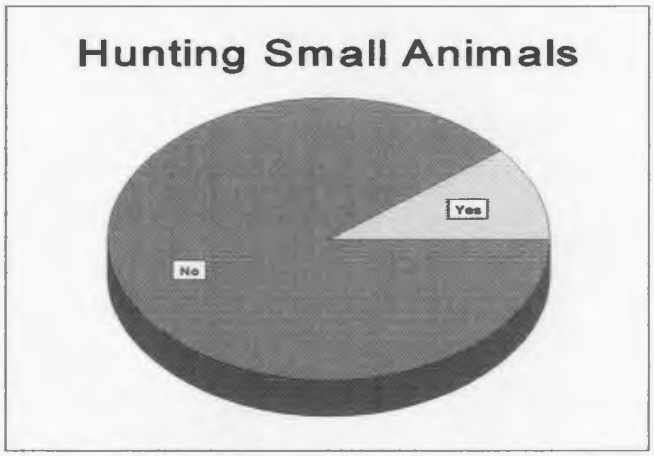


Figure 5.54. Participation in Hunting Small Animals Inside the Western Newfoundland Model Forest

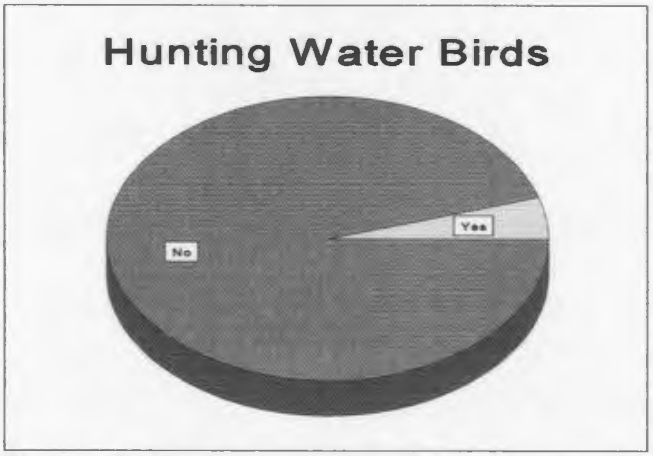


Figure 5.55. Participation in Hunting Water Birds Inside the Western Newfoundland Model Forest

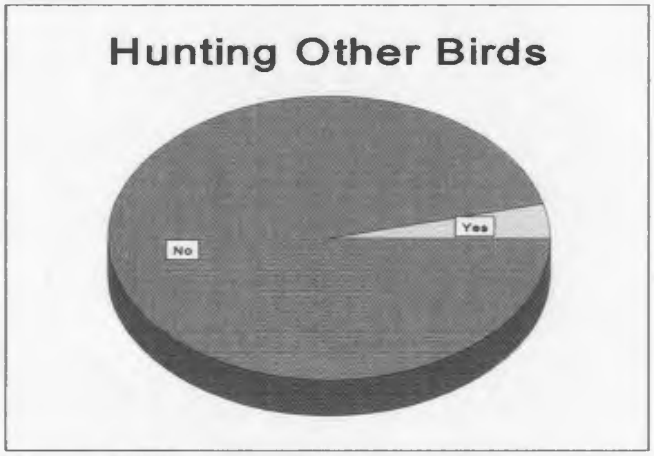


Figure 5.56. Participation in Hunting Other Birds Inside the Western Newfoundland Model Forest

Hunting Other Birds. Four percent of respondents had hunted birds other than waterfowl inside the model forest in the last year (Figure 5.56), which is fairly consistent with the finding that 6 percent of respondents said the activity was very important to them. The average participant spent 8.43 days hunting other birds. Operating costs incurred averaged $60.00 per participant, while capital costs averaged $500.42.

Trapping. Slightly more than one percent of respondents (n=5) had trapped inside the model forest in the preceding 12 months (Figure 5.57). The average number of days or partial days spent trapping was 9.75. Operating costs incurred averaged $20.00, while capital costs averaged $40.00.

Staying at a Cabin. Staying at a cabin, either their own or a friend's, was participated in by 44 percent of respondents (Figure 5.58). Of those who participated, an average of 16.53 days or partial days were spent staying at a cabin. An average of $217.29 was spent to cover operating costs during the stay, and capital costs incurred averaged $305.04 per participant. Costs of cabin construction were not a focus of this item, as only capital costs in the year preceding the survey are considered here.

Camping. One quarter of those surveyed stated that they had camped inside the model forest in the preceding 12 months (Figure 5.59). Approximately 10 percent of respondents indicated using a camper during their recreational activities, and 9.4 percent indicated that they used some type of camping equipment. Of those who participated, an average of 10.92 days or partial days were spent camping inside the model forest. Operating costs incurred averaged $188.36, while capital costs averaged $673.66. Campers cost an average of $4049.59 and were 10.74 years old on average. Camping equipment cost an average of $262.16 and was 4.77 years old.

Hiking. Approximately 28 percent of respondents had hiked in the model forest in the previous 12 months (Figure 5.60). Participants spent an average of 7.36 days or partial

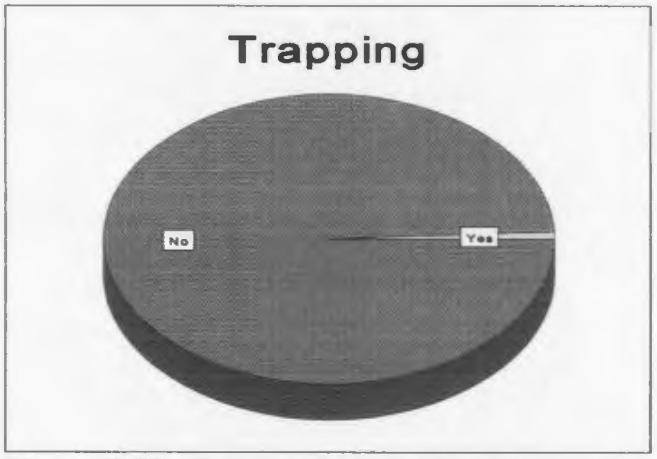


Figure 5.57. Participation in Trapping Inside the Western Newfoundland Model Forest.

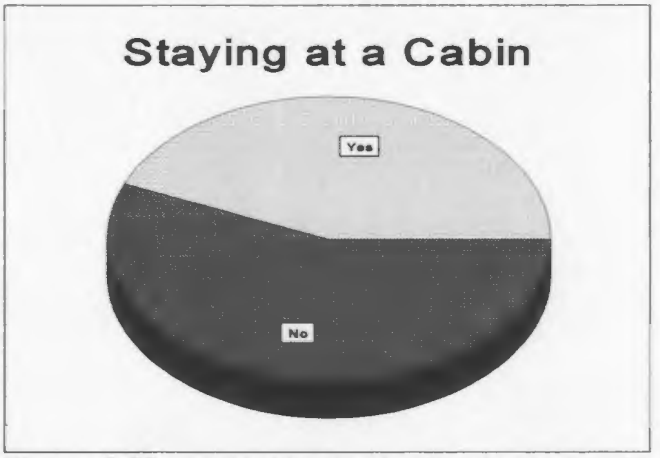


Figure 5.58. Participation in Staying at One's Own or a Friends Cabin Inside the Western Newfoundland Model Forest.

days hiking. Operating costs of participating averaged $48.07, and capital costs averaged $115.84 per participant.

Wildlife Viewing - Large Animals. Nearly 22 percent of those surveyed had participated in viewing large animals in the model forest during the preceding 12 month period (Figure 5.61). This is lower than the 36 percent of respondents who stated that viewing large animals was very important to them. Participants spent an average of 7.95 days or partial days viewing large animals, and incurred operating costs averaging $45.00 and capital costs averaging $200.45 per participant.

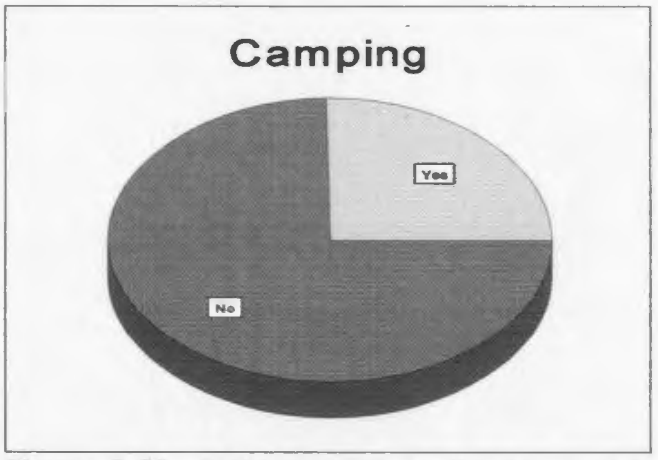


Figure 5.59. Participation in Camping Inside the Western Newfoundland Model Forest

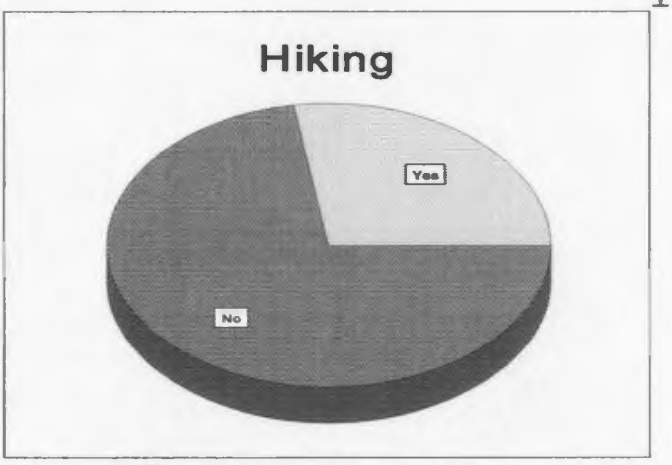


Figure 5.60. Participation Hiking Inside the Western Newfoundland Model Forest

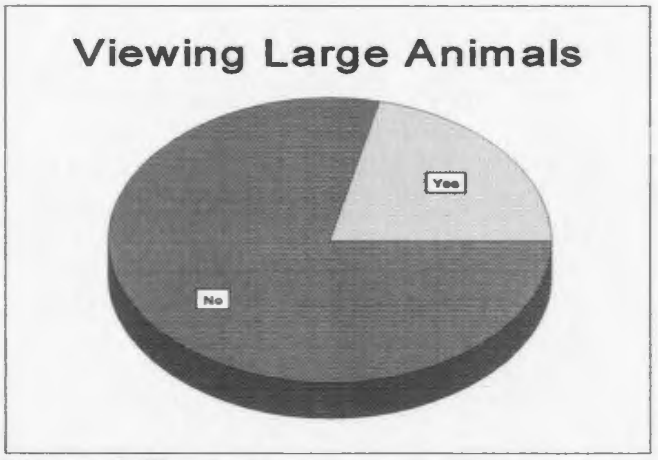


Figure 5.61. Participation in Viewing Large Animals Inside the Western Newfoundland Model Forest

Wildlife Viewing Small Animals. Sixteen percent of respondents had viewed small animals inside model forest boundaries in the previous year (Figure 5.62). Those who participated spent an average of 10.60 days viewing small animals. Operating costs for participation averaged $30.67, and capital costs averaged $124.91 per participant.

Wildlife Viewing - Birds. Viewing birds inside the model forest was participated in by 18 percent of respondents (Figure 5.63). Importance figures were considerably higher, with 31 percent of respondents stating that the activity was very important to them. Those who participated spent an average of 14.30 days or partial days involved in the activity. Operating costs averaged $34.07 per participant and capital expenses averaged $137.79 per participant.

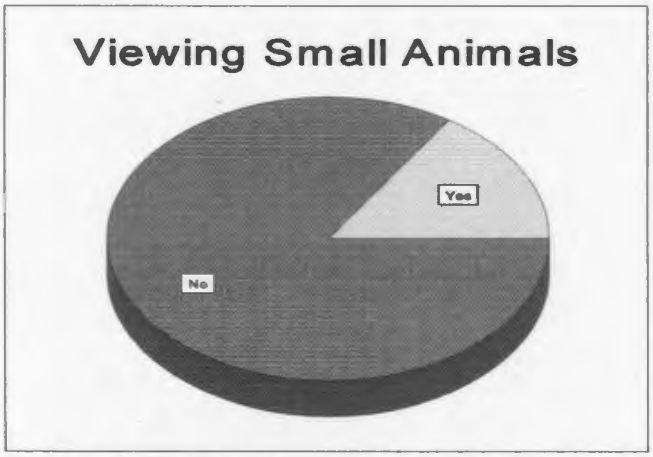


Figure 5.62. Participation in Viewing Small Animals Inside the Western Newfoundland Model Forest.

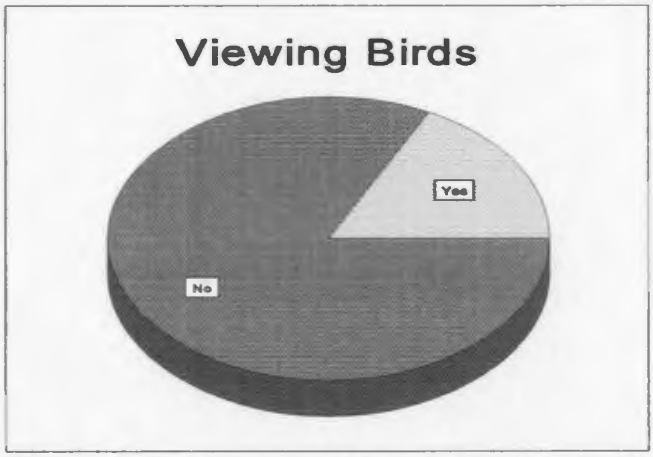


Figure 5.63. Participation in Viewing Birds Inside the Western Newfoundland Model Forest

Wildlife Viewing - Other Animals. Some respondents (14.8 percent) participated in viewing other animals inside the model forest in the previous year (Figure 5.64). Of those who participated, an average of 10.95 days or partial days were spent viewing other animals. Participants incurred operating costs averaging $44.57 and capital costs averaging $108.37.

Wood Cutting. Sixteen percent of respondents had cut wood inside model forest boundaries in the preceding 12 months (Figure 5.65). Two percent of respondents listed a chainsaw as equipment used during their recreational activities; chainsaws cost an average of $358.63 and averaged 3.75 years old. Participants spent an average of 11.47 days or partial days cutting wood inside the model forest. Operating costs averaged $108.90 and capital costs averaged $694.07 per participant.

Cross Country Skiing. More than one fifth of those surveyed (21.1 percent) of respondents had participated in cross country skiing inside the model forest in the previous year (Figure 5.66). Twelve percent of respondents listed skiis as equipment they used during their recreation participation. Skiis cost an average of $289.15 and were 6.65 years old. It should be noted that this figure refers to any skis owned, while the capital cost figure for 1994-1995 would only include skis purchased in the 1994-1995 season. Participants spent an average 11.46 days or parts of days cross country skiing inside the model forest and incurred $56.62 in operating costs and $150.64 in capital expenses per participant.

Other Activities and Equipment. Respondents indicated participation in many other recreational activities as well, such as mountain climbing, boating, and mountain biking. Equipment listed as being used for recreation participation included boats, trucks, ATVs, downhill skiis, and other equipment.

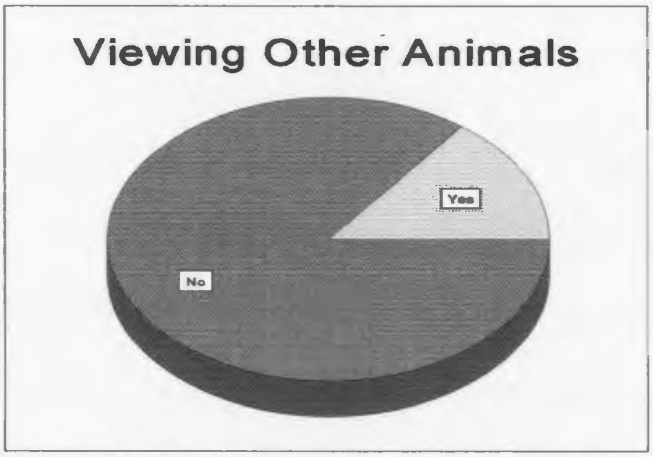


Figure 5.64. Participation in Viewing Other Animals Inside the Western Newfoundland Model Forest

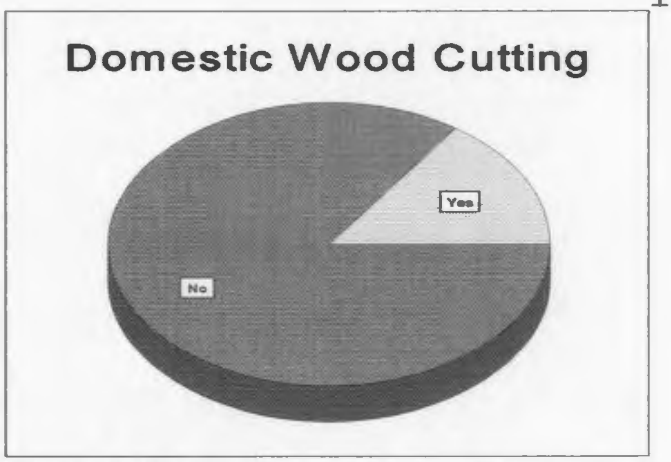


Figure 5.65. Participation in Domestic Wood Cutting Inside the Western Newfoundland Model Forest

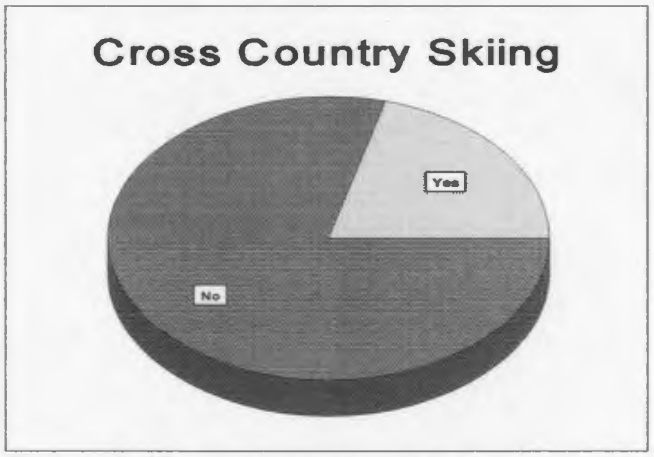


Figure 5.66. Participation in Cross Country Skiing Inside the Western Newfoundland Model Forest.

"Cabinning" seems to be the most popular recreational activity among respondents, with 44 percent indicating participation. The second most popular activity, snowmobiling, was participated in by 41 percent of respondents; this activity had the most time devoted to it at an average of 19.6 days per participant (Table 5.4). As might be expected given the results in the importance section, consumptive recreational activities seemed slightly less popular than some nonconsumptive ones. Exceptions to

this pattern included fishing, which had the third highest participation rate, and hunting large animals, which was more popular than camping, skiing, or the various viewing activities (Table 5.4). Expenditures were significant for all activities (Table 5.4), but seemed to be higher for activities such as hunting large animals which involve license fees and equipment than for activities such as hiking or wildlife viewing which do not necessarily entail a monetary outlay.

The importance of recreational activities in this part of Newfoundland is obvious from the study results. While traditional consumptive activities such as hunting remain popular, it is particularly interesting to note the popularity of nonconsumptive activities. The nontimber value of Newfoundland's forested areas, in particular the WNMF, is illustrated by the popularity of activities such as hiking, camping, and wildlife viewing.

Table 5.4. Participation and Expenditure for Recreation in the Western Newfoundland Model Forest

Activity	Percent Participation	Days Spent Participating	Operating Costs ($)	Capital Costs ($)
Staying at a Cabin	44	16.5	217.29	305.04
Snowmobiling	41	19.6	202.20	2064.43
Fishing	40	13.4	134.47	199.58
Hiking	28	7.4	48.07	115.84
Camping	25	10.9	188.36	673.66
Hunting Large Animals	24	10.0	170.03	520.00
Viewing Large Animals	22	8.0	45.00	200.45
Cross-Country Skiing	21	11.5	56.62	150.64
Wildlife Viewing - Birds	18	14.3	34.07	137.79
Wood Cutting	16	11.5	108.90	694.07
Viewing Small Animals	16	10.6	30.67	124.91
Viewing Other animals	15	11.0	44.57	108.37
Hunting Small Animals	11	15.5	106.89	313.71
Hunting Water Birds	5	14.9	61.18	441.18
Hunting Other Birds	4	8.4	60.00	500.42
Trapping	1	9.8	20.00	40.00

CHAPTER 6. ANALYTICAL RESULTS

This chapter presents the results of the statistical analysis performed for this study. Principal components analysis (Tabachnick and Fidell 1996) was used to reduce the 35 variables in the analysis to 6 orthogonal, normally distributed components for use in discriminant function analysis. The components developed using principal components analysis are discussed and interpreted. This discussion is followed by a presentation of the results of discriminant function analysis, which was used to classify respondents into one of three mutually exclusive groups, consumptive recreationists, nonconsumptive recreationists, and nonparticipants. The chapter concludes with the results of the oneway analysis of variance performed on the attitude and knowledge scores to see if scores differed among the three groups of respondents. Discussion of the results and the implications in light of the study objectives are reserved for the final chapter.

6.1 Results of Principal Components Analysis

As outlined in the methodology chapter, several different analyses were performed on the data in an effort to determine the most suitable number of components to use to represent the data for this study. An examination of the scree output (Figure 6.1), one type of analysis, shows that the selection of six components is indeed

appropriate as the slope of a line connecting the points in the plot would change between the sixth and seventh points (Tabachnick and Fidell 1996). As well, a pairwise plot of factor loadings is shown in Figure 6.2. The clustering of points at the ends of the axes, with most other points near the origin, indicates that orthogonal rotation was the appropriate choice for the data, and that the factors are fairly well defined.

Factor or component interpretation involves trying to understand the underlying dimension that unifies the group of variables loading on it. For this study, variables with loadings of .32 or larger on a component were interpreted; Tabachnick and Fidell (1996) recommend that a minimal loading of 0.32 be used. The higher a variable "loads" on a component, the more the variable is a pure measure of that component. Loadings and communalities for this study are shown in Table 6.1. Most variables did load highly on one factor. In Table 6.2, variables are listed in the order in which they contribute to components; names are suggested for the components based upon the types of variables that load on them. Component 1 consisted of 10 variables, component 2 of 5 variables, component 3 had 8 variables, and component 4 had 4 variables, while components 5 and 6 comprised 3 and 4 variables, respectively.

Table 6.1 also shows the communalities (h^2) for the variables. The communality for a variable is the variance accounted for by the components, calculated as the sum of squared loadings for a variable across the components (Tabachnick and Fidell 1996). For

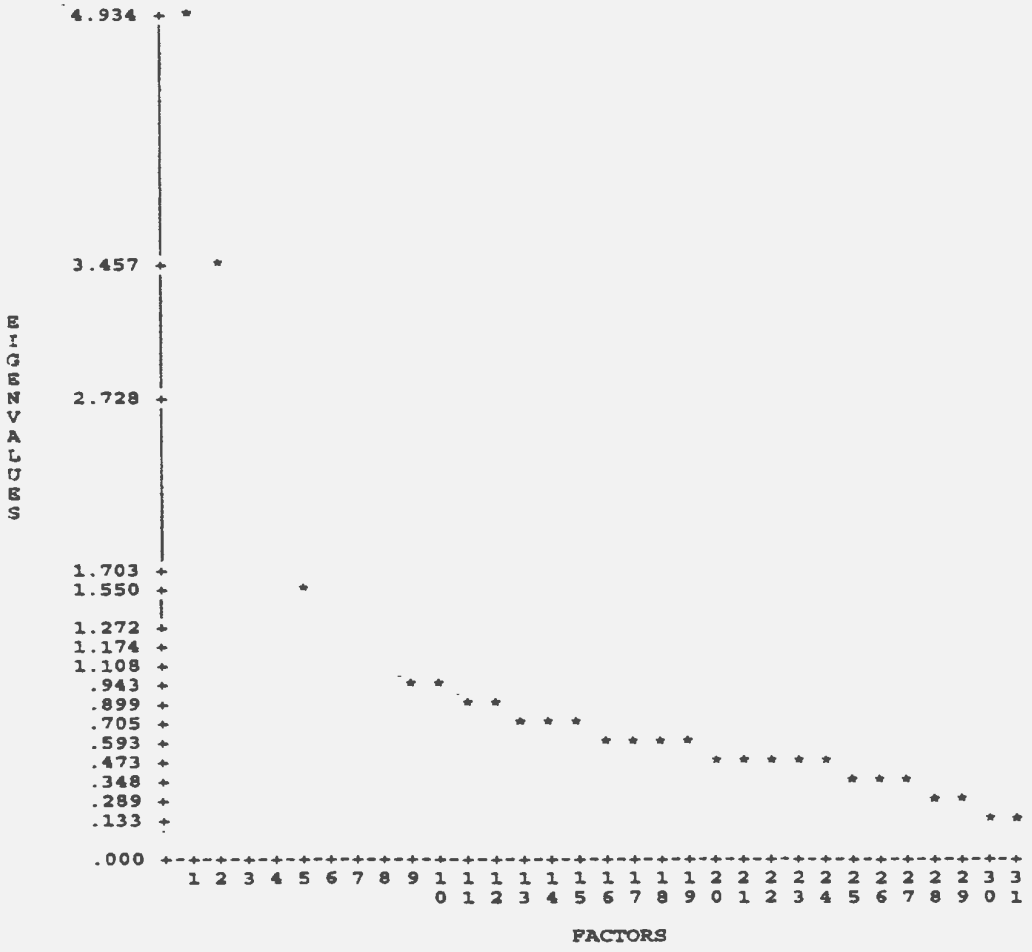
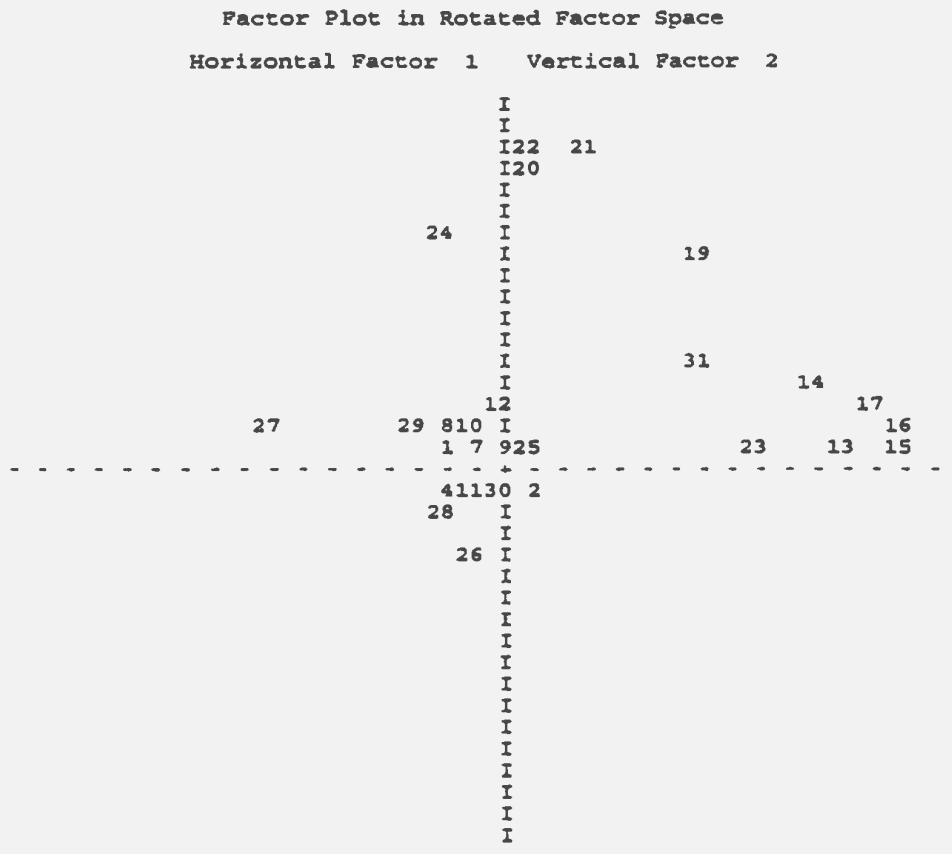


Figure 6.1. Scree Plot of Components Against Eigenvalues



Symbol	Variable	Coordinates	Symbol	Variable	Coordinates
1	VAR002	(-.06948, .05615)	2	VAR003	(.08691, -.03755)
3	VAR004	(-.06254, .04716)	4	VAR005	(-.10334, -.01055)
5	VAR006	(.03379, .01761)	6	VAR007	(-.04295, .07717)
7	VAR008	(-.04650, .06035)	8	VAR009	(-.07020, .09047)
9	VAR010	(.01705, .03086)	10	VAR011	(-.02020, .09353)
11	VAR012	(-.02103, -.04270)	12	VAR013	(.03929, .16661)
13	VAR043	(.73554, .03356)	14	VAR044	(.69239, .21608)

Figure 6.2. Plot of Factor Loadings for Components 1 and 2

the most part, variables were well defined by the factor solution. Only one variable, attendance on the model forest bus tour, had a very low communality.

A few of the variables used in the factor analysis were complex, meaning that they loaded on more than one factor. For example, importance of camping as a recreational activity loaded on both the consumptive and nonconsumptive components, indicating that it is an important activity for both types of recreationists. The belief that interference with nature can lead to disastrous consequences loaded most highly on component 3, balance of nature and limits to growth; but it also helped define a traditionalist factor: older, less educated respondents who felt strongly about this issue as well as the maintenance of a steady state economy (Table 6.2).

The main purpose of the principal components analysis in this study was to calculate factor scores. Factor scores are estimates of the scores survey respondents would have received on each of the components had they been measured directly. The large number of variables was reduced to six approximately normally distributed orthogonal components for use in discriminant function analysis. Factor scores were calculated using the regression method, and as mentioned in the previous chapter are exact rather than estimated due to the mathematical nature of principal components analysis.

Table 6.1. Factor Loadings, Communalities (h^2) and Percentage of Variance Explained for Principal Components Extraction and Varimax Rotation.

Item	C1	C2	C3	C4	C5	C6	h^2
importance of hunting small animals	.85	--	--	--	--	--	.74
importance of hunting large animals	.84	--	--	--	--	--	.71
importance of hunting water birds	.77	--	--	--	--	--	.62
importance of snowmobiling	.74	--	--	--	--	--	.57
importance of fishing	.64	--	--	--	--	--	.54
importance of woodcutting	.56	--	--	--	--	--	.39
importance of trapping	.56	--	--	--	--	--	.38
importance of recreational issue	.45	--	--	--	--	--	.40
gender	-.43	--	--	--	--	--	.24
importance of viewing large animals	--	.84	--	--	--	--	.78
importance of viewing birds	--	.84	--	--	--	--	.74
importance of hiking	--	.78	--	--	--	--	.67
importance of cross-country skiing	--	.64	--	--	--	--	.50
importance of camping	.43	.58	--	--	--	--	.58
delicate balance of nature	--	--	.71	--	--	--	.51
we are abusing the environment	--	--	.68	--	--	--	.51

Item	C1	C2	C3	C4	C5	C6	h^2
limits to growth	--	--	.66	--	--	--	.46
earth is like a spaceship	--	--	.66	--	--	--	.54
interference means disastrous consequences	--	--	.56	--	--	.35	.47
approaching earth's limit	--	--	.53	--	--	--	.35
harmony with nature	--	--	.51	--	--	--	.32
steady state economy	--	--	.44	--	--	.42	.38
plants and animals exist for man	--	--	--	.74	--	--	.62
mankind rules nature	--	--	--	.70	--	--	.55
right to modify environment	--	--	--	.67	--	--	.48
need not adapt to environment	--	--	--	.49	--	--	.43
income	--	--	--	--	.79	--	.63
education	--	--	--	--	.70	-.38	.68
outdoor club membership	--	--	--	--	.37	--	.21
age	--	--	--	--	--	.71	.55
model forest bus tour	--	--	--	--	--	--	.10
percent of variance	15.9	11.2	8.8	5.5	5.0	4.1	

Table 6.2. Order, by Size of Loadings, in Which Variables Contribute to Components.

Component 1: Importance of Consumptive Activities

importance of hunting small animals
importance of hunting large animals
importance of hunting water birds
importance of snowmobiling
importance of fishing
importance of woodcutting
importance of trapping
importance of recreational issue
sex
importance of camping*

Component 2: Importance of Nonconsumptive Activities

importance of viewing large animals
importance of viewing birds
importance of hiking
importance of cross country skiing
importance of camping*

Component 3: Balance of Nature and Limits to Growth

delicate balance of nature
we are abusing the environment
limits to growth
earth is like a spaceship
interference means disastrous consequences*
approaching earth's limit
harmony with nature
steady state economy

Component 4: People Over Nature

plants and animals exist for man
mankind rules nature
right to modify the environment
need not adapt to the environment

Component 5: Socioeconomics

income
education*
outdoor club membership

Component 6: Traditionalist Component

age
education*
steady state economy
interference means disastrous consequences*

*complex variable

6.2 Results of Discriminant Analysis

After identifying the 6 components, direct discriminant function analysis was performed using these components as predictors of membership in three groups. The three groups were consumptive recreationists, nonconsumptive recreationists, and nonparticipants.

As there were three groups, two discriminant functions were produced (Tabachnick and Fidell 1996). The maximum number of discriminant functions that can be produced is one less than the number of groups, although not all functions produced will necessarily be significant. The two discriminant functions produced in this analysis were significant, and had a combined chi-squared of 124.53, $p < .0001$. After removal of the first function, there was still strong association between groups and predictors, chi-

squared=19.22, p = .0018. The two discriminant functions accounted for 87 percent and 13 percent, respectively, of the between group variability (see Table 6.3).

Table 6.3. Canonical Discriminant Functions

Fcn Eigenvalue	Pct of Variance	Cum Pct	Canonical Corr	After Fcn	Wilks' Lambda	Chi-square	df	Sig
			:	0	.559577	124.533	12	.0000
1* .6339	87.12	87.12	.6229 :	1	.914313	19.216	5	.0018
2* .0937	12.88	100.00	.2927 :					

*Marks the canonical discriminant functions remaining in the analysis.

Figure 6.3 and the canonical discriminant functions shown in Table 6.4, show that the first function maximally separates consumptive participants (Group 1) from nonconsumptive participants (Group 2) and nonparticipants (Group 3).

The pooled within-groups correlations between the discriminating variables and canonical discriminant functions (Table 6.5) shows that Component 1 (Importance of Consumptive Activities) and Component 4 (People Over Nature) correlate most highly with the first function. Component 5 (Socioeconomics), Component 2 (Importance of Nonconsumptive Activities), Component 6 (Traditionalist Component) and Component 3 (Balance of Nature and Limits to Growth) correlate most highly with the second function.

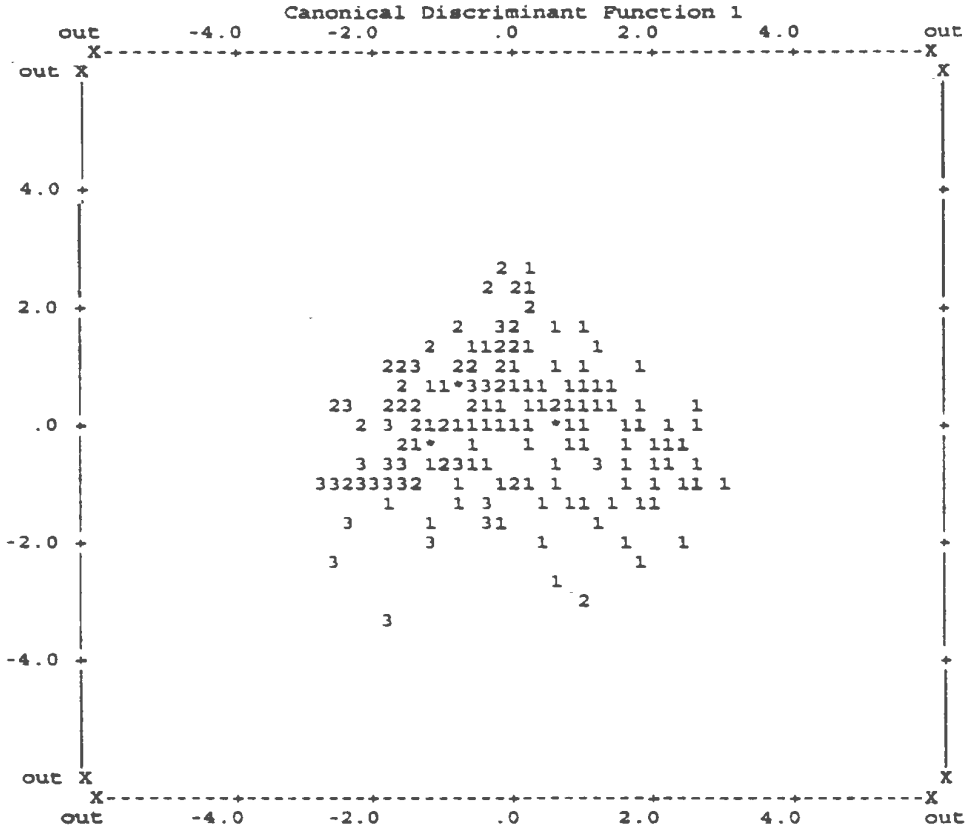


Figure 6.3. All Groups Scatterplot for Functions 1 and 2

Table 6.4. Canonical Discriminant Functions Evaluated at Group Means

Group	Func 1	Func 2
1	.61308	-.03910
2	-.77298	.57241
3	-1.19227	-.39952

Table 6.5. Pooled Within-Groups Correlations between Discriminating Variables and Canonical Discriminant Functions

	Func 1	Func 2
FACTOR1	.84580*	-.51857
FACTOR4	.04742*	-.02481
FACTOR5	.32184	.63980*
FACTOR2	.12571	.49260*
FACTOR6	-.21856	-.29405*
FACTOR3	.06617	.14433*

* denotes largest absolute correlation between each variable and any discriminant function.

This pattern of correlations can be further interpreted. The best predictors for distinguishing between consumptive participants and the other two groups (the first function) are components 1 and 4. Consumptive participants have a higher score on Component 1 (mean =.35539) than either nonconsumptive participants (mean =-.86495) or nonparticipants (mean =-.74256). Similarly consumptive participants have higher scores on Component 4 (mean =.08018) than nonconsumptive participants (mean =.00041) or nonparticipants (mean =.00456). Components 2, 3, 5, and 6 show that the

means for Group 3 (nonparticipants) are most different from the means for the other two groups on these components (Table 6.6). These patterns of correlations are not surprising, as they indicate that consumptive participants feel that consumptive activities are more important than the other groups do, and that nonparticipants find recreational activities less important than participants do. They also have less positive attitudes toward the environment than either of the groups of recreation participants.

Table 6.6. Group Means for the Six Components used as Discriminating Variables.

	Group		
Component	1	2	3
1	.35539	-.86495	-.74256
2	.09689	.22556	-.31294
3	.18470	.18156	.02916
4	.08018	.00041	.00458
5	.30856	.25533	-.47911
6	-.14393	-.03566	.29621

The purpose of the discriminant analysis was to predict group membership using the 6 components as predictors. As illustrated in Table 6.7, 67 percent of cases were correctly classified, with a high of 70.5 percent correctly classified as nonparticipants, and a low of 57.5 percent of nonconsumptive recreationists correctly classified. This result can be better interpreted when compared to the classification rate expected by chance,

without the use of discriminant function analysis. When the groups are not of equal size and when each group is randomly assigned the number of cases equal to its size, the expected percent of correct classifications is found by squaring the proportion in each group and then summing the squares. In the current study, the expected percent would be $(.62)^2 + (.18)^2 + (.20)^2 * 100 = 45$ percent. One can evaluate the model by comparing its proportion of errors (1 - .67 = .33) to the proportion of errors that would occur if cases were classified randomly (1 - .45 = .55). Using discriminant function analysis reduced the proportion of errors by [(.55 - .33)/ .55] * 100=40 percent.

Table 6.7. Classification Results for Discriminant Function Analysis

Actual Group	No. of Cases	Predicted Group Membership 1	2	3
Group 1 CONSUMPTIVE	136	94 69.1%	26 19.1%	16 11.8%
Group 2 NONCONSUMPTIVE	40	5 12.5%	23 57.5%	12 30.0%
Group 3 NONPARTICIPANTS	44	4 9.1%	9 20.5%	31 70.5%

Percent of "grouped" cases correctly classified: 67.27%

An examination of Table 6.7 shows that much of the misclassification in the model is a result of nonconsumptive participants being misclassified as nonparticipants (30 percent of nonconsumptive participants were misclassified in this way). To a lesser

extent, nonparticipants were misclassified as nonconsumptive participants (20.5 percent were misclassified in this way). In an attempt to improve the classification rate of the model, the groups were dichotomized. In this dichotomized analysis, nonconsumptive recreationists and nonparticipants were combined in one group. The classification rate for this new model was 76.8 percent, as shown in Table 6.8. Separation of the two groups was very good, as shown in Figure 6.4. The classification rate was much higher than could be expected by chance; random classification would result in 52 percent of cases being correctly classified. The proportion of errors was reduced by 52 percent in this dichotomized model. In the dichotomized model, the consumptive participants were no longer the group most likely to be correctly classified, as had been the case in the three group model.

Table 6.8. Classification Rates for Dichotomized Discriminant Function Analysis

Actual Group	No. Of Cases	Predicted Group Membership	
		1	2
Group 1 CONSUMPTIVE	136	101 74.3%	35 25.7%
Group 2 NONCONSUMPTIVE	84	16 19.0%	68 81.0%

Percent of "grouped" cases correctly classified: 76.82%

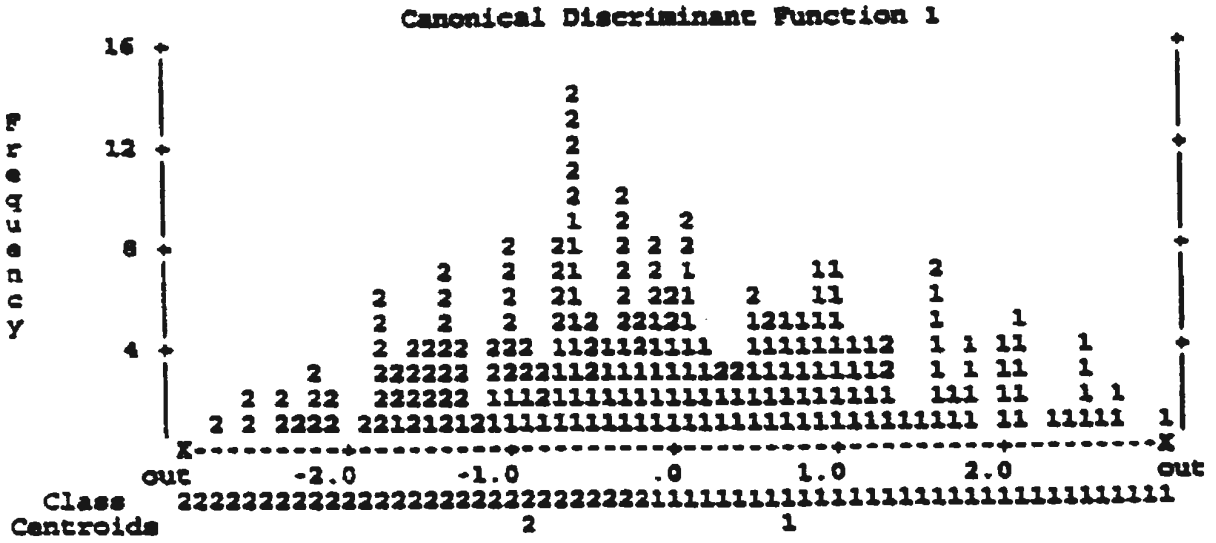


Figure 6.4. All Groups Stacked Histogram for Dichotomized Discriminant Function Analysis, Where 1=Consumptive and 2=Nonconsumptive

6.3 Analysis of Variance Results

Analysis of variance was used to compare group means for the attitude toward the Western Newfoundland Model Forest score (ATTSCORE) and the knowledge about the Western Newfoundland Model Forest score (KNOWSCOR) for the three groups of recreationists. Analysis of variance, or ANOVA, compares differences among scores within each group to differences between groups using group means. If these two estimates of variance do not differ appreciably, one concludes that all of the group means came from the same sample distribution of means, and that any slight differences among them are due to random error. If the group means are quite different, it is concluded that they were drawn from different sampling distributions of means and the null hypothesis

that the means are the same is rejected (Tabachnick and Fidell 1996). ANOVA provides a way to compare 3 or more groups in a unified procedure, thus reducing the chance of type I error caused by multiple t-tests.

Values for ATTSCORE could range from 14 to 98, where lower scores would indicate a pro-development attitude and higher scores would indicate a pro-conservation attitude. Mean values for ATTSCOR were 65.78 for consumptive recreationists, 68.5 for nonconsumptive recreationists, and 66.7 for nonparticipants. No two groups were found to be significantly different at the .05 level for ATTSCORE, indicating that in contrast to what was hypothesized, consumptive recreationists were no more development-oriented than the other two groups. For KNOWSCOR, the results were different. Values for KNOWSCOR could range from 0 to 13, with the score corresponding to the number of correct responses to the knowledge questions. The means were 6.0 for consumptive recreationists, 4.8 for nonconsumptive recreationists, and 4.4 for nonparticipants. In this case, consumptive recreationists were found to be significantly different from both nonconsumptive recreationists and non participants at the .05 level. In other words, consumptive recreationists were found to know more about the model forest than other respondents.

The preceding discussion has outlined the results of the principal components analysis, discriminant function analysis, and analysis of variance for this study. Results indicated that 6 components were appropriate to represent the data. Also, it was shown that recreation participation could indeed be predicted by the component scores.

Attitudes toward recreational activities and the environment as well as socioeconomics formed the components. Analysis of variance then revealed no significant difference in attitudes toward model forest issues between groups, while consumptive recreationists were shown to have a greater amount of knowledge about the model forest than either consumptive recreationists or nonparticipants. Implications of these results in light of study objectives are discussed in the final chapter.

CHAPTER 7. DISCUSSION AND CONCLUSIONS

The purpose of this chapter is to highlight key findings from the survey of model forest residents. These findings are then considered in comparison to several other studies from Canada and the United States. In the final section of this chapter, the objectives of the study are revisited as they relate to the objectives of the Western Newfoundland Model Forest. Direction for future research and for building upon this study to address socio-economic issues is also offered.

7.1 Key Findings of the Study

7.1.1 Attitudes Toward the Environment

As hypothesized, respondents tended to have very strong, consistently positive attitudes toward the environment. Responses to all twelve statements of the NEP scale indicated acceptance of the NEP (Table 5.1). Respondents agreed most strongly with statement number 7 (Table 2.1), that humans must live in harmony with nature in order to survive. The average score for this item was 6.43, indicating moderate to strong agreement. Only 3 percent of respondents disagreed with the statement. The strongest disagreement was with statement 12 (Table 5.1), that humans need not adapt to the environment because they can remake it to suit their needs. The average score for the

item was 2.33, indicating slight to moderate disagreement. Only 8 percent of respondents agreed with the statement. Overall, the positive attitudes toward the environment and concern shown for the environment should allow managers to place environmental protection issues higher on the priority list within forest resource management than has traditionally occurred.

7.1.2 Knowledge About the Western Newfoundland Model Forest

It was hypothesized that model forest residents would be quite knowledgeable about the WNMF due to the stated high priority of education within the WNMF objectives and the Model Forest Bus Tour; however, this was found not to be the case. Results indicate that the majority of respondents know very little about the Western Newfoundland Model Forest. Nearly 18 percent of respondents had never heard of the model forest despite living within its boundaries, and only 3 percent felt very knowledgeable about the model forest. The working forest function of the model forest was also unfamiliar to respondents. Less than 40 percent correctly stated that timber cutting occurs in the model forest. Approximately 16 percent of respondents believed recreation was not encouraged inside the model forest. Despite their lack of knowledge, respondents still seemed to support the model forest concept. Approximately 90 percent of respondents feel it is important to have a model forest, and 79 percent feel public input is necessary for management of the model forest. To date, however, active public

involvement that is truly representative of the entire resource constituency has been extremely limited within the Western Newfoundland Model Forest. In addition, the use of social science in resource management research, which is necessary to truly understand these attitudes and beliefs, has not been fully addressed.

When the knowledge items were combined into a scale measuring total model forest knowledge, the lack of knowledge on the part of the public became obvious. Values on the scale could range from 0 to 13, corresponding to the number of correct responses. While the difference was statistically significant, there was not as great a difference as might have been expected between the 3 groups. The highest score was achieved by consumptive recreationists, who scored 6.0 out of 13. Nonconsumptive recreationists and nonparticipants scored only 4.8 and 4.4 respectively. These results suggest the need for an effective educational program targeted to improve public knowledge of the nature of the model forest. The high level of support for the model forest concept suggests that such a program would be very positively received by the public.

7.1.3 Opinions on Model Forest Issues

Many important issues surrounding the model forest, such as cabin development and insect spraying, were important to respondents. As hypothesized, strong opinions existed. While "cabinning" is the most popular recreational activity of all those

considered in the survey, 80 percent of respondents agreed that cabin development should be restricted to a few selected areas. Similarly, despite the prevalence of domestic wood harvesting, approximately 82 percent of respondents disagreed with the statement that there should be no limits on the amount of wood cut for domestic use. This apparent acceptance of limits on domestic wood harvesting is in contrast to some beliefs about Newfoundlanders' attitudes. Newfoundlanders have been classified as having very consumptive and utilitarian attitudes in the past, but these attitudes would certainly seem to be changing. While these issues have received some recent consideration by management, results from this study suggest that they are very important to the residents of the model forest and should receive immediate attention.

Harvesting methods within the model forest were questioned by some respondents. Approximately 64 percent felt that too many trees are being cut inside the model forest. Clear cutting was opposed by 39 percent of respondents, while 51.5 percent felt it was a suitable harvesting method for some areas. Ninety-three percent of respondents believed replanting is necessary after an area has been logged. Approximately 90 percent of respondents agreed with spraying to protect against insect damage. Beliefs about the benefits of replanting and spraying, if not consistent with scientific knowledge, should be targeted by educational efforts. For example, with such strong support being shown for replanting, thinning programs could be looked at negatively by the public if no information is given to explain the necessity of the thinning process.

Recreational activities in the model forest are not supported by all residents. Approximately 35 percent of respondents felt hunting should not be allowed inside the Western Newfoundland Model Forest. Interestingly, only 7 percent of respondents felt this way about recreational fishing.

When these opinion items were recoded and combined into a developmentalist-conservationist scale, pro-conservation attitudes on the part of the public became apparent. The values scale could range from a low of 14 (a very pro-development attitude) to a high of 98 (a very pro-conservation attitude). No significant difference was found in the attitudes of consumptive recreationists, nonconsumptive recreationists, or nonparticipants, who scored 65.8, 68.5, and 66.7 respectively. These results indicate a similarity in attitudes between nonconsumptive users, consumptive users, and nonparticipants where most people might have expected wide differences. It appears that the public would be very supportive of conservation policies, particularly for such issues as fuelwood harvesting and cabin development, regardless of their recreation preferences.

7.1.4 Importance of Recreational Activities

Nonconsumptive wildlife-related activities such as wildlife viewing were quite important to many respondents. For example, 36 percent of respondents stated that viewing large animals was very important to them and only 13 percent said the activity was not at all important to them. "Cabinning" was also a very important activity; 35

percent of respondents stated that this activity was very important to them, and 20 percent said it was somewhat important.

Important consumptive activities included recreational fishing, which was quite important to more than 30 percent of respondents, and hunting large animals, an activity considered very important to 26.4 percent of respondents. The least important recreational activity was trapping, which was not at all important to 82 percent of those surveyed.

7.1.5 Participation and Expenditure on Recreational Activities

Respondents participated in a wide variety of recreational activities in the model forest during the twelve month period prior to the survey. While the traditional trio of "huntin', fishin', and campin'" did indeed have the expected high participation rates, nonconsumptive activities such as hiking and wildlife viewing were popular as well. According to the Survey on the Importance of Wildlife to Canadians (Filion et al 1993), participation in nonconsumptive wildlife related recreation has stabilized in most areas of Canada. However, in Newfoundland participation rates in such activities are still on the increase (Filion 1993) and results from this study suggest that the model forest may be an important area for such activities. The three most popular activities were cabinning, snowmobiling, and fishing, which all had at least 40 percent participation. Trapping was the least popular recreational activity, with just 1 percent participation.

Operating expenditures were highest for cabinning and snowmobiling, presumably due to costs for food in the case of cabinning and gasoline for snowmobiling. Capital costs were highest for snowmobiling, most probably because of snowmobile purchases. In general, consumptive activities such as the various types of hunting involved higher expenditures than nonconsumptive activities, probably because of greater requirements for equipment and licenses.

7.1.6 Prediction of Recreation Participation

Understanding environmental attitudes and attitudes toward the environment proved useful in predicting recreational behaviour. Factor analysis showed that the NEP Scale did indeed measure 2 underlying dimensions of environmental attitudes. When combined with demographic characteristics and attitudes toward recreation, these environmental attitudes successfully discriminated between consumptive recreationists, nonconsumptive recreationists, and nonparticipants, as hypothesized. The connection between environmental attitudes and recreation participation has implications for management in that it can indicate how various policies will be received by various user groups such as hunters or skiers. For example, while it has traditionally been assumed that hunters have very utilitarian attitudes toward the environment, this study has shown that consumptive users do not feel any differently toward the environment than other recreationists do, indicating that policies restricting certain hunting activities would in all

likelihood be viewed positively by the affected users. Contrary to what was hypothesized, it was found that attitudes did not differ amongst nonconsumptive recreationists, consumptive recreationists, and nonparticipants.

The results suggest that most residents of the model forest area feel strongly toward the environment. While knowledge about the model forest is very limited, specific model forest issues are perceived as important, as is the model forest concept. The traditional consumptive recreational activities, along with cabining and camping, are important to residents, but more nontraditional activities such as hiking and wildlife viewing are quite popular as well. In contrast to what was hypothesized, consumptive recreationists did not seem to be any more pro-development than nonconsumptive recreationists or nonparticipants.

7.2 Comparisons to Other Studies

7.2.1 Attitudes Toward the Environment

As illustrated in Table 5.2, respondents had strong, consistent environmental attitudes and showed an overwhelming acceptance of the NEP, with mean scores ranging from 4.97 to 6.43 on the seven point scale. Similar results were found in another Canadian study (Edgell and Nowell 1989). Individuals randomly selected from the Victoria, British Columbia telephone directory had an average score of 3.3 on the four

point scale used in that study (where 4=strongly agree, 3=mildly agree, 2=mildly disagree, and 1=strongly disagree) (Edgell and Nowell 1989). Both studies illustrated strong positive attitudes toward the environment.

Reading et al (1994) performed attitude comparisons between residents of the Greater Yellowstone Ecosystem in a manner somewhat similar to the current study. Whereas this study in the model forest compared environmental attitudes of consumptive recreationists, nonconsumptive recreationists, and nonparticipants, Reading et al (1994) compared attitudes between hunters and nonhunters, and members of conservation and wildlife organizations and nonmembers. In contrast to the current study, in which no difference was found in attitude scores, and consumptive recreationists were most knowledgeable, Reading et al (1994) found that hunters scored higher on the utilitarian and libertarian scales than did nonhunters, while members of conservation or wildlife organizations received higher ecosystem management and knowledge scores than did nonmembers.

Results of the two studies also differed with regards to opinions on use restrictions. The current study found respondents very supportive of restricted use; for example, 80 percent believed cabin development should be restricted to certain areas. Over half disagreed with mining inside the model forest, and 46 percent felt domestic wood harvesting should not be allowed inside the model forest. In contrast, two-thirds of GYE residents were unwilling to limit timber harvesting to protect the GYE if it harmed

local economies, and respondents were also opposed to restrictions on visiting the national parks and forests in order to protect the GYE (Reading et al 1994).

7.2.2 Knowledge of the Surrounding Environment and Resource Issues

In this study, the majority of respondents indicated that they knew very little about the Western Newfoundland Model Forest. Nearly 18 percent of respondents had never heard of the model forest despite living within its boundaries, and only 3 percent felt very knowledgeable about the model forest. Similarly, Reading et al (1994) asked residents of the GYE how much they knew about the GYE. Less than half (47%) responded that they knew "very much" to "a moderate amount" about the GYE, 31.5 percent stated that they knew only "a little," and the remaining 21 percent indicated that they knew"not much" or "hardly anything at all."

7.2.3 Importance of Recreational Activities

Importance of recreational activities was considered in a 1985 study of attitudes of organized groups of recreationists and resource management professionals in the United States toward fire management policies (Gardner et al 1985). Wilderness experience was considered extremely important by 47 percent of the forest users surveyed, but fishing was considered extremely important by only 17 percent. Respondents rated hunting

among the lowest of possible forest uses, with 13 percent saying it was extremely important. Respondents in the current study placed much more emphasis on consumptive activities. Hunting large animals was very important to 26.4 percent of respondents; 12 percent indicated that the activity was somewhat important. Similarly, more than 30 percent of respondents in the model forest sample felt that recreational fishing was very important.

7.2.4 Recreational Participation

The phenomenon of declining hunting participation has been documented in numerous studies in recent years. For example, Heberlein (1991) stated that hunting participation had declined by up to 30 percent in the last decade in some of the western United States. Applegate (1975, 1984) found that the percentage of active hunters in the New Jersey population declined from 9.3 percent in 1972 to 4.9 percent in 1982. The Survey on the Importance of Wildlife to Canadians found a similar decline in Canadian hunting participation from 1981 to 1991 (Filion et al 1993). In contrast to the national average of 7.4 percent, the Survey on the Importance of Wildlife to Canadians found that 19.9 percent of Newfoundland residents hunted during 1991, and that participation was relatively stable over the decade (Filion et al 1993). This high level of participation in hunting is echoed in the current study, in which 24 percent of respondents hunted large

animals, 11 percent hunted small animals, 5 percent hunted water birds, and 4 percent hunted other birds.

In 1984, a study of wildlife related activities, attitudes, and knowledge in Newfoundland was done by B. L. Hill. Results of that study indicated that 26 percent of Newfoundland and Labrador residents had hunted in 1981 and 1982. Big game was hunted by 14.3 percent of respondents, small game by 13.2 percent, waterfowl by 8.8 percent, and other birds by 10.8 percent (Hill 1984). While hunting large mammals seemed more popular in the current study and bird hunting more common in the Hill study, the results indicate that patterns of hunting participation were quite similar between the model forest region and the province as a whole. The results also further support the statement that hunting participation has remained stable in Newfoundland over the past fifteen years. It may also indicate that the model forest is an important area for such activities.

Results similar to the current study were found in an Ontario community forest (Payne 1994). Fishing, hunting, camping, snowmobiling, and walking were the top five activities reported by respondents in that study. Fishing, hunting, and camping form a traditional trio that is still dominant in the 6/70 Community Forest region. A significant difference between the two studies concerns cabining (referred to as cottaging in the Ontario study) which ranked tenth in the Ontario study and first in the current study, perhaps due to differing regulations regarding cabin development and costs of acquiring and maintaining cabins.

7.3 Directions for Future Research

7.3.1 Applied Opportunities

Socio-economic research is vital for the success of the Western Newfoundland Model Forest. Research of this nature is central to the strategic goals of developing an integrated resource management planning process for the province and instilling a greater awareness of forest resource management in the various publics. A survey such as this one of the affected publics is a useful means of public involvement in the forest management planning and decision-making process but should only be considered the first step in a continual process that requires human dimensions research to become fully integrated in to the daily decision-making. Information is now available on patterns of recreation and expenditure of model forest residents, as well as public opinion on model forest issues and public knowledge about the model forest and forest resource management. In addition, a model for predicting recreation behaviour on the basis of environmental attitudes and demographics was developed. This predictive model provides an understanding of the factors affecting patterns of use that have been documented. Understanding the motivations behind behaviour will help managers better address public concerns.

To date, there has been very little additional socio-economic research conducted in the model forest. Similar to the numerous biophysical studies that are required to

ensure proper understanding of findings, many additional socio-economic questions surround the model forest. An examination of the relevant socio-economic literature suggested questions on patterns of use, expenditures, motivations, and satisfactions of users, and changes in these over time. Many of these topics have been broached in this study, however, much work remains to be done. As this study has illustrated, a full assessment of public involvement and educational efforts would be beneficial to model forest managers as there is an apparent lack of knowledge about the model forest and a lack of understanding of forest ecosystem management. Once educational goals are developed, research could be completed to test the effectiveness of the educational media made available to the public. Are the necessary messages indeed being relayed to the relevant publics? This information is important for the public involvement and educational objectives of the model forest.

Facilitation vision exercises with various interest groups and publics in the model forest area would also be of use to management. Further studies of attitudes and opinions of key groups such as hunters, skiers, hikers, or wood harvesters could then be considered in relation to the wants and needs of the general public. This type of information is important for efficient and equitable resource allocation decisions.

Residents of the model forest are not the only people affected by the model forest. Studies remain to be done on visitors to the model forest and residents of the province as a whole. A preliminary survey of visitors to the model forest has already been

implemented as a component of the model forest bus tour (Pieda 1994). Further development of this survey might be a viable means of information acquisition.

Further economic questions remain to be answered. Having acquired information on expenditures of model forest users, what is the effect of those expenditures on the local economy? Can any increase or decrease in economic activity be attributed to the presence of the model forest in the area? Would users be willing to spend more than they do to participate in activities in the model forest, indicating opportunities for increased revenue generation? These economic issues could be addressed locally or regionally, perhaps being integrated into the new economic zones for the province.

7.3.2 Methodological Contribution

The results of study have promising implications for further research. The focus on the general public in a resource-related study such as this one is still relatively unusual, as most studies focus on a particular user group such as skiers or recreational fishers. This study's high response rate has shown that nonparticipants and others are very concerned with resource-related issues and should not be overlooked during resource management decision making. Indications are that further studies of the general public and nonparticipants should be undertaken.

An additional contribution of the study is its illustration of the use of stringent data checking and analysis. While data checking to ensure the accuracy of data is standard

in social science research, additional checking, removal of outliers, and so on improved the results of data analysis and resulting conclusions in this study. Adherence to strict procedures such as those outlined by Tabachnick and Fidell (1996) ensure the reliability of results, as well as enhancing their credibility. As social science research becomes more methodologically rigorous, the results of studies such as this one will become more accepted. A major barrier to the acceptance of social science in resource management has been that many managers have had little respect for traditional research methods such as surveys (Decker et al 1987). The method of data collection and analysis in this study is an example of a carefully executed social science in resource management study. An opportunity exists to improve the credibility of social science research by following procedures similar to those used here.

The statistical techniques used here are also somewhat unique, and are highly suitable to research of this type. Discriminant analysis was shown to be very effective in determining recreational participation group membership. In addition, the use of components resulting from PCA were used as predictors, dismissing the issue of normality that can plague survey research. Normality is not a requirement for PCA, and the resulting factor scores are relatively normally distributed. Complicated transformation of data in order to normalize it can make results difficult to interpret. Further opportunities exist to explore the use of PCA and discriminant analysis in social science studies.

7.3.3 Theoretical Implications

The use of the New Environmental Paradigm Scale to predict recreation participation is a somewhat unique application, illustrating the connections between environmental attitudes and recreation behaviour. Many attitude-behaviour studies have examined attitudes toward a particular behaviour for behaviour prediction (Fishbein and Ajzen 1980), rather than more general environmental attitudes.

As discussed in Chapter 2, the NEP Scale has been extensively used to study a variety of publics and specific user groups. The scale was developed more than two decades ago, and it is quite plausible that the scale is beginning to become less relevant, or that more original ways to apply it must be found if it is to provide a contribution to knowledge. Opportunities do exist to use the scale in unique ways, such as in connection with additional measures.

Tarrant and Green (1999) have used the NEP in conjunction with several other scales: the environmental concern (EC) scale (Weigel and Weigel 1978), the awareness of consequences (AC) scale (Stern Dietz, and Kalof 1993), the forest value (FV) scale (Steel, List, and Schindler 1994) and the Roper Organization scale (1990). The study by Tarrant and Green used only one scale per respondent, and had low response rates. Opportunities exist to attempt to replicate their study in other areas, in the hopes of attaining a higher response rate, as well as to use the NEP in addition to one or more of the other scales, using more than one scale per respondent. It might be possible to

ascertain how the different scales are related, and if they measure the same basic underlying attitudes.

7.4 Implications for Forest Management within the WNMF

Several implications for forest management within the WNMF are suggested by the results of this study. Public involvement and educational issues surrounding the model forest should be reexamined. Information that is essential to the public should be identified and a method of relaying the information developed and implemented. Research on visitors to the model forest and residents of the province as a whole should be implemented. As it has been shown that nonconsumptive recreational activities are important to model forest users, increased attention should be focused on these activities. Traditionally, management emphasis has been placed on consumptive users such as wood harvesters and hunters. This research could take many directions such as motivations and satisfaction connected with the recreation experience, crowding issues, and perceptions of environmental impacts.

This research study provides preliminary baseline data on socio-economic variables in the model forest. Alone it cannot address all the research questions which should be addressed to provide a comprehensive understanding of socio-economic issues. The study, though, offers baseline data on attitudes, knowledge, expenditures, and participation patterns from a representative sample of residents living within the model

forest. The full benefit of this research can be obtained by extending this study over time. A longitudinal study would provide managers with the ability to conduct attitudinal and belief monitoring and understand how the human dimension changes with different forestry practices, policies, and actions, and different educational efforts. Traditionally, managers have placed emphasis on biophysical research studies, but with a public that increasingly wants to be involved in the decision-making process, this emphasis should change toward more research in understanding the human component of the resource management equation.

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