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Big Game Hunters in Alberta: Their Activities, Values, and Preferences in Relation to Sustainable Forest Management

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Big Game Hunters in Alberta:

Their Activities, Values,

and Preferences in Relation to

Sustainable Forest Management

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A Report Prepared for the Sustainable Forest Management Network of Centres of Excellence

EXECUTIVE SUMMARY

In order for forest management to be sustainable it must incorporate a variety of social values, understand the impacts of management practices on these values, and be responsive to changing values (Bengston 1994). A study of hunters was initiated by the Sustainable Forest Management Network of Centres of Excellence and the Foothills Model Forest to examine hunter characteristics, the economic value of hunting, and hunters' forest social values and management preferences. This report provides preliminary analysis of hunting expenditures, forest social values, management preferences, knowledge of basic forest-related facts, and socioeconomic characteristics of hunters.

A mail survey was used to collect data from a sample of 3,000 resident big game hunters. Hunting expenditures were measured by respondents estimating what they spent on hunting in 1996. Forest social values were measured using a rating scale that reflects: 1) the utilization of forests for human benefit, referred to as human-centred values, and 2) the inherent worth of forests regardless of their usefulness to humans, referred to as bio-centred values. Attitudes toward forest management were measured using rating scales used previously in studies of campers in Alberta (McFarlane and Boxall 1996; McFarlane and Boxall 1998). True/False questions were used to examine knowledge of basic forest-related facts.

Hunters tended to be bio-centred in their forest values suggesting they value the intrinsic worth of forests. While most hunters do not seem to be opposed to using forests for human needs, they do not agree that human needs should be the only goal of forest management.

A minority of hunters agreed with attitude statements that reflect successful sustainable forest management in Alberta:

- 23% agreed that forests in Alberta are currently being managed successfully to meet present and future needs
- only 11% agreed that current forestry practices produce no long term adverse effects on the environment
- 16% agreed that enough harvested trees are being replaced to meet future timber needs

A minority agreed with forest management objectives that relate to timber production and economic development:

- only 9% agreed that providing jobs and economic development is more important than setting aside forests from logging

- 13% agreed that setting aside forests is not desirable if it means lower wages and fewer jobs
- only 6% thought that forest should be managed mainly for timber and lumber products
- 12% agreed that economic benefits from forestry usually outweigh any negative consequences
- 13% agreed that economic stability of communities is more important than setting aside forests from logging

A majority (72%) agreed that logging forests is acceptable if the forest is not harmed and 58% agreed that when making forest decisions, the concerns of communities close to the forest should be given a higher priority than other communities.

A majority agreed with most statements reflecting protection types of management strategies:

- 83% agreed that legislation should be established to protect endangered species
- 89% agreed that forest management should emphasize a variety of plants and animals
- however, only 41% agreed that representative examples of Alberta's forest regions should be excluded from development such as forestry, oil and gas, and tourism but only 9% agreed that some existing protected areas should be opened for logging

These results suggest that hunters are supportive of a holistic management approach that is consistent with concepts of sustainable forest management.

Respondents spent over $3.2 million on hunting in 1996. Aggregating the expenditures over the population of active hunters (n = 91,232), we estimated that:

- about $172 million was spent by Alberta's big game hunters in 1996

Two segmentation analyses were performed. The first identified respondents who hunted in the Foothills Model Forest (FMF) and compared these respondents with those who did not hunt in the FMF. Differences occurred between the FMF hunters and non-FMF hunters.

- FMF hunters were more involved in hunting, taking more hunting trips, spending more time on trips, and spending more money on hunting
- More FMF hunters had a household member dependent on the forest sector for their economic livelihood, fewer had a university education but they had higher household incomes, and more were residents of Edmonton and the FMF communities

- FMF hunters were more bio-centred, had higher knowledge scores, and were more supportive of some protection oriented management strategies than other hunters

The second segmentation analysis, based on forest social values identified 3 segments: Bio-centred, Moderates, and Human-centred. The segments can be arranged on a continuum from the most to the least bio-centred. Respondents in the Bio-centred group rated the inherent worth of forests higher than respondents in the other segments. Hunters in the Human-centred group rated the inherent worth of forests lowest and the Moderate group was between these two extremes. Differences were observed among the segments on management preferences and socioeconomic characteristics:

- Bio-centred respondents were younger, had the highest proportion of women, lower household incomes, and the highest proportion living in a community with a population of 5,000 or less

- Bio-centred respondents were more involved in hunting, on average taking more overnight and day hunting trips than hunters in the other segments

- The Moderate group had the highest proportion of hunters living in Edmonton or Calgary and fewer individuals living in an area with a population of 5,000 or less

- The Human-centred group had the lowest proportion of women

- Differences occurred among the segments on most forest management preferences:

- The Bio-centric group was more supportive of statements related to protection oriented management strategies than the Human-centred or Moderate groups

- The Bio-centred group was less supportive of economic development and timber oriented management and viewed current management as being less sustainable than the Human-centred or Moderate groups

- The Human-centred respondents generally were less supportive of statements relating to protection of forests, more supportive of economic development and timber oriented management, and viewed current management as being more sustainable than the other groups

- The Moderate groups management preferences were generally between the two extremes of the Bio-centred and Human-centred groups

- Moderate respondents had more of the forest-related facts correct than Human-centred respondents suggesting that knowledge might be associated with forest social value orientations

These results suggest that hunters are not homogeneous in their value orientations and that segments based on values also differ on some socioeconomic factors, hunting involvement, and management preferences.

This study has provided among the first analysis of forest social values and management preferences of a stakeholder group using the boreal forest in Alberta. Results suggest that hunters support a holistic approach to natural resource management that considers multiple values. These users of the boreal forest represent a range of values and preferences. Those most involved in hunting and those who hold bio-centred forest values tend to be the least tolerant of economic development and timber oriented management, suggesting that subtypes of hunters will be affected differently by changes in the forest. Future analysis will include a comparison of the forest social values of hunters with other forest users groups such as campers and the general Alberta population. To understand and be able to predict how segments of society or recreationists will react to management actions a multivariate analysis that examines variables influencing values and preferences will be performed.

INTRODUCTION

The Sustainable Forest Management Network of Centres of Excellence (SFM-NCE) was established in 1995 with the primary goal of developing and transferring technologies for the sustainable management of Canada's boreal forest. The SFM-NCE adopted the definition of sustainable forest management practices as those that "maintain and enhance the long term health of our forest ecosystems for the benefit of all living things, both nationally and globally, while providing environmental, economic, social and cultural opportunities for the benefit of present and future generations" (Sustainable Forest Management Network of Centres of Excellence n.d.).

The Model Forest Program is a national program established to provide insights into and to implement the concepts of sustainable forest management (Foothills Model Forest 1997). In order for forest management to be sustainable it must incorporate a variety of social values, understand the impacts of management practices on these values, and be responsive to changing values (Bengston 1994). The Foothills Model Forest (FMF), located in west central Alberta, is one of ten Model Forests established across Canada in 1992. One goal of the FMF is to bring a wide range of forest users and stakeholders together in an effort to better accommodate a broad range of forest values (Foothills Model Forest 1997).

In 1997, the SFM-NCE and the FMF undertook a collaborative study to examine social values and forest management preferences of one non-timber user group of the boreal forest and assess the potential impacts of management changes on these values. This report presents descriptive results from a mail survey of big game hunters in Alberta. Specifically, we examine hunters forest social values, preferences for forest management, knowledge of forest-related facts, socioeconomic characteristics, hunting expenditures, and hunting trip information.

Forest values

To sustain economic, social, and cultural opportunities in forest management professionals need a broad understanding of forest values. Values information in forest management has traditionally been dominated by economic valuation of commodity production and public forests have been managed largely to maximize these values. The commodity management scenario emphasizes economic growth, control over nature, sustainability of timber supply, and experts such as professional foresters in decision making (Bengston 1994). However,

these utilitarian, human-oriented values are changing to a more non-utilitarian, biocentric-orientation whereby forests and ecosystems have intrinsic value regardless of commodity outputs, there are limits to economic growth, and decision making is based on broader public input (Bengston 1994; Jackson 1986; Steel et al. 1994).

Given these changing forest values, successful forest management will depend on understanding and predicting forest values and reflecting these in management decisions (Bengston 1994). Much conflict in forest management is the result of changing forest values in society and the inability of traditional managers to respond to these changes. To align new management strategies with societal values managers need to broaden their understanding of forest values beyond the economics of commodity production and need to consider a diversity of values (Bengston 1994).

What are forest social values?

Each academic discipline (e.g., economics, sociology, psychology, etc.) uses different definitions and takes different approaches to studying values. Bengston (1994) suggests that values should be examined using several approaches because each has a unique contribution to make in understanding the diversity of values. This multiple disciplinary approach is being taken in the SFM-NCE Socio-economic Program and the Foothills Model Forest Socio-economic Research Program. Previous socio-economic studies by the SFM-NCE and the FMF have involved economic valuation (market and non-market) and sociological approaches to valuing natural resources. The current study takes a social-psychological approach to examine values associated with the boreal forest.

Values, as used in this study, represent the fundamental elements in a person's belief system. These values are the basis of attitudes and preferences and are very stable and difficult to change. These forest values are referred to as held values and have been defined as "relatively enduring conceptions of the good related to forests and forest ecosystems" (Bengston 1994). Although held values are stable and difficult to change in an individual, in society these values evolve and change over time. Aggregating individual values and tracking these over time provides an indication of changing societal values.

Held values reflect a philosophical view of how forests should be managed and they provide an indication of the acceptance of the management approach taken by natural resource

managers (Steel et al. 1994). Two basic types of held forest values have been distinguished in the literature. They have been referred to as instrumental and intrinsic (Bengston 1994), instrumental and non-instrumental (Xu and Bengston 1997), and anthropocentric and biocentric (Steel et al. 1994). Instrumental and anthropocentric values refer to those values associated with the utilization of forests for products and services that satisfy human wants and needs. This is a human-centred approach to natural resource management with forests being defined in terms of the resources they provide for humans. In our study we refer to these as human-centred values. Intrinsic, non-instrumental, and biocentric values refer to the worth of something as an end in itself regardless of its usefulness to humans. These values assume that nature has inherent worth and that human uses and benefits are not necessarily the most important uses of the forest (Steel et al. 1994). In our study we refer to these values as bio-centred values.

Bio-centred values have received much less attention and legitimacy in forest management than human-centred values. However, it is the bio-centred values that are increasing in importance in our society (Xu and Bengston 1997) and have led to conflict between land managers and other stakeholders (e.g., Cramer et al. 1993; Kennedy 1985). The lack of understanding and incorporation of these values in forest management has manifested itself in public protests against traditional forms of management and legal action against the forest industry. People whose value orientation is primarily bio-centred may become more involved in forest issues because of the threat of loss of something for which they perceive as having no substitutes (Xu and Bengston 1997). In order to make forest management more responsive to a broad range of social values and thus, increase social acceptability, it is essential to increase our understanding of the bio-centred values of various stakeholder groups and to monitor these over time (Bengston 1994).

The forest social values discussed above are not mutually exclusive. Rather, the dichotomous classifications have been arrayed on a continuum with human-centred at one end and bio-centred at the other and individuals segmented into subgroups based on having more of a human-centred or bio-centred orientation towards forests (Steel et al. 1994).

These value orientations or subgroups have been associated with forest management and policy preferences by a number of researchers. Bio-centred individuals are more likely to oppose timber oriented management objectives than human-centred individuals (Steel et al. 1994). Certain segments of society have been associated with value orientations. For example, some

studies show that women are more concerned about the environment (Jones and Dunlap 1992; Mohai 1992) and hold stronger bio-centred values than men (Steel et al. 1994). Individuals with higher levels of education are more likely to have pro-environmental attitudes (Jones and Dunlap 1992) and hold bio-centred values (Steel et al. 1994). Age has also been associated with environmental attitudes with younger individuals having more concern and being more bio-centred (Jones and Dunlap 1992; Steel et al. 1994). Individuals who are associated with interest groups may hold divergent forest social values. For example, people who rely on the forest sector for their economic livelihood are more likely to view forests as a means of providing commodities for human use and support managing forests for timber production. People belonging to environmental organizations value forests for their intrinsic value and are more supportive of protection oriented management strategies (Steel et al. 1994). This suggests that forest social values can be used to segment people based on their value orientations. Certain socioeconomic characteristics might be associated with these value orientations or subgroups and may be used to predict how segments of society or individual stakeholder groups will react to forest management activities and policies.

Relevance of values information

While scientific information can inform natural resource management decisions, it is the values of society that guide which scientific facts are relevant and important (Steel et al. 1994). Bengston (1994) outlines three uses of values information. First, values information helps managers establish forest management goals and strategic guidelines. By understanding the relative importance of the values of stakeholders, managers can develop goals that satisfy social values and be able to justify goals and guidelines. Second, knowing values of various stakeholder groups will help managers predict how stakeholders will react to management practices and what groups will be positively or negatively impacted by changes in management. Third, values information can help in dealing with conflicts over forest management by understanding the nature of the conflict. For example, are there differences in the fundamental values of the stakeholders involved or is the conflict over something that is more easily resolved such as differences in how to manage for a *particular* forest value? Values information does not provide a right answer. It is a tool that helps guide management decisions by providing an indication of the acceptance of the philosophical approach to management, what management actions are

socially acceptable, which stakeholders will agree or disagree with these actions, and help predict the potential impact of actions on various stakeholder groups.

METHODS

The sample

One of the obvious and traditional non-timber uses of the boreal forest is hunting. Hunting was chosen as a non-timber activity because of its ubiquitous distribution in the boreal forest and the direct linkage of the forest industry to the activity through forestry's effects on the production of wildlife habitats. Unlike other non-timber uses such as camping or hiking, hunting is not restricted by the necessity for particular facilities or services and hunting often occurs in close proximity to industrial forestry activities. Forestry activities can improve hunting opportunities by providing new access routes and improving habitat for some big game species. However, forestry can also have a negative impact on the hunting experience by reducing scenic quality or by increasing the potential for congestion and crowding through improved access and more hunters visiting an area. Thus, hunters constitute an important user group in the boreal forest and their values and management preferences and the impact of forestry activities on hunting opportunities should be important considerations in natural resource management decisions.

A sample of 3,000 Alberta residents who held a moose, elk, or black bear hunting license in 1996 was drawn at random from the hunting license data base maintained by Alberta Environmental Protection. The database contains a record of everyone who holds a hunting license in Alberta. A total of 94,639 Alberta residents held a big game license in 1996.

The questionnaire

A questionnaire was developed to collect information on hunting trips, hunting expenditures, forest social values, attitudes toward forest management, knowledge of forest-related facts, and socioeconomic data. The initial questionnaire was tested using a focus group and a revised version was tested by mailing it to a small sample of hunters. The final questionnaire was mailed to the 3000 hunters in June 1997. About one week later a reminder postcard was sent and about 4 weeks after the initial mailing a second questionnaire was sent to those who had not yet responded. An incentive of a prize draw for one of twenty $25 gift

certificates from an outdoor/hardware store was used to encourage a response. A total of 1,731 questionnaires were returned. Adjusting for questionnaires that could not be delivered, this represents a 61% response rate. This response rate is typical of those obtained in hunter surveys (e.g., Decker et al. 1980; Decker and Connelly 1989).

Trip logs

Hunting trip information was collected by respondents completing a log of their 1996 big game hunting trips. The log collected information on the Wildlife Management Unit (WMU) where they hunted, the species hunted, number of similar trips to the same area in 1996, total nights and total days spent on hunting trips, and the number of years since the respondent first hunted in the WMU. Respondents completed separate logs for overnight and day trips.

Hunting expenditures

Expenditure information was collected on the approximate cost of food (e.g., restaurant meals, groceries, beverages), travel (e.g., gas, rented vehicles, vehicle repairs), supplies (e.g., ammunition, clothing), license fees, and lodging (e.g., hotel, motel, cabin, and camp fees) for big game hunting activities in 1996. The cost of equipment (e.g., guns and accessories, bows, binoculars, off-highway vehicles, calls) purchased in 1996 especially for hunting was also collected.

Forest social values

Two broad categories of forest social values were used to measure hunters' value orientations. Based on the work of Steel et al. (1994) and Xu and Bengston (1997) statements were developed to reflect bio-centred and human-centred orientations toward forests. The bio-centred statements included items on the rights of nonhuman species, existence value, and spiritual significance of forests. The human-centred statements included items on the use of forests to benefit humans. Respondents rated a series of 15 statements on a 5 point scale ranging from "strongly disagree" to "strongly agree."

Management preferences

To examine the social acceptability and preferences of forest management practices a scale to measure attitudes toward forest management was developed based on a scale used previously in Alberta (McFarlane and Boxall 1996; McFarlane and Boxall 1998). Items were developed to measure an individual's preferences for forest management by using statements about the protection of forest resources, economic development and timber oriented management, and the sustainability of current forest management in the province. Respondents rated a series of 15 statements on a 5 point ranging from "strongly disagree" to "strongly agree."

Knowledge of forest-related facts

Respondents familiarity with basic forest-related facts was measured based on questions contained in *tree*via, a forest trivia game produced by the Canadian Council of Forest Ministers, and questions developed by consulting experts in forest management. Respondents answered 13 statements as True, False, or Not sure. A composite knowledge score was calculated for each respondent by summing the number of correct responses. The maximum score possible was 13.

Socioeconomic characteristics

Information was collected on respondents age, gender, number and age of people living in the household, area of residence, membership in hunting and conservation organizations, economic dependence on the forest sector, education, and 1996 household income.

Segmentation analyses

Two segmentation analyses were performed (Fig. 1). Because one aspect of the study involved the examination of hunters in the Foothills Model Forest (FMF), respondents were divided into those who hunted in the FMF and those who did not. The FMF was chosen as a landbase to examine the relationship between industrial forestry and hunting activity because of: 1) excellent biophysical and Geographic Information Systems (GIS) data that can be linked with hunting trip information in the current study; and 2) interest from the FMF in understanding non-timber values of forest users.
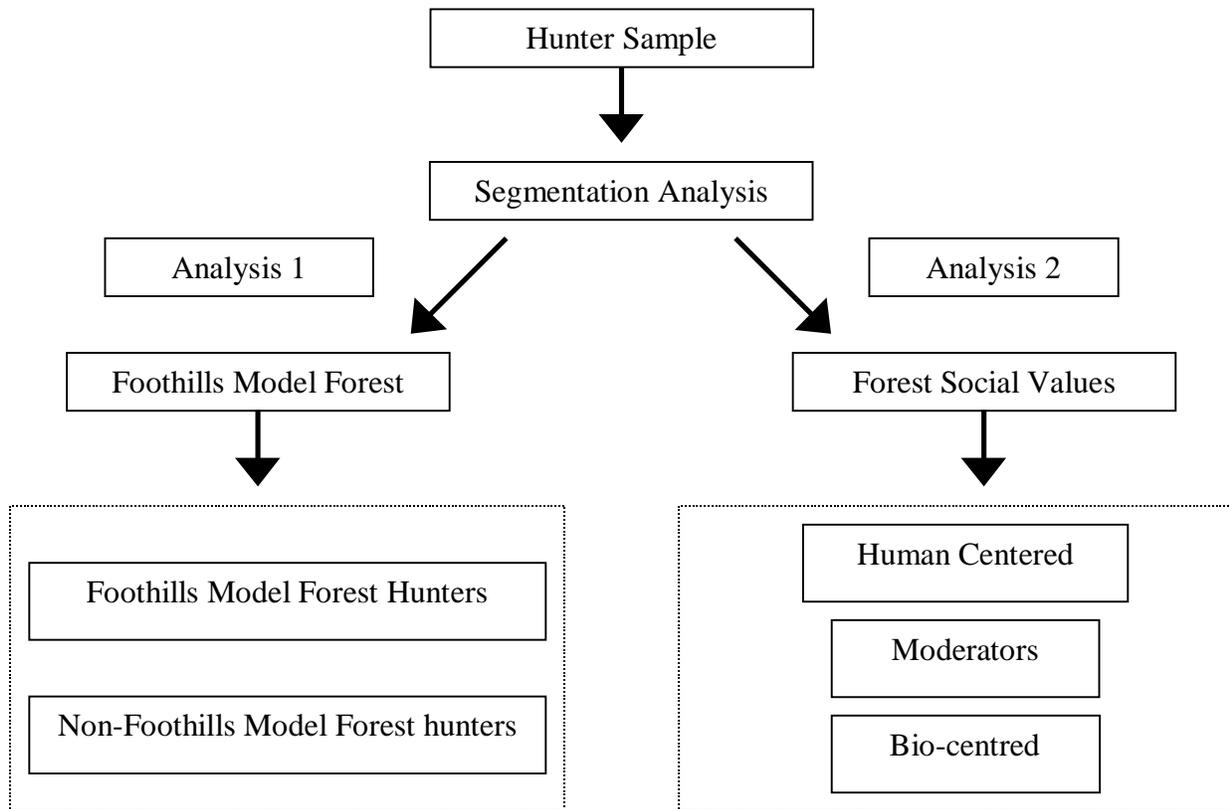
Figure 1. Schematic Representation of Data Anaylsis

The FMF consists of over 2.7 million hectares situated in west central Alberta. It contains a variety of land management scenarios including Jasper National Park (a World Heritage Site) and the Willmore Wilderness Park. The majority of the model forest outside of these protected areas is public land administered by the Province of Alberta and includes the Weldwood of Canada, Hinton Division, Forest Management Agreement, oil and gas developments, and coal mining. In addition to resource extractive industries, the area has spectacular scenery, abundant fish and wildlife and a wealth of recreational opportunities that are enjoyed by local residents and tourists.

Foothills Model Forest (FMF) hunters are defined as hunters who took at least one hunting trip to one or more of the 13 Wildlife Management Units (WMU) that wholly or partially intersect the FMF. The 13 WMUs are: 340, 342, 344, 346, 352, 436, 437, 438, 439, 440, 442, 444, and 446 (Fig. 2).

The second segmentation was based on a cluster analysis of the forest social values scale. This analysis was performed to identify hunter segments with differing forest value orientations.
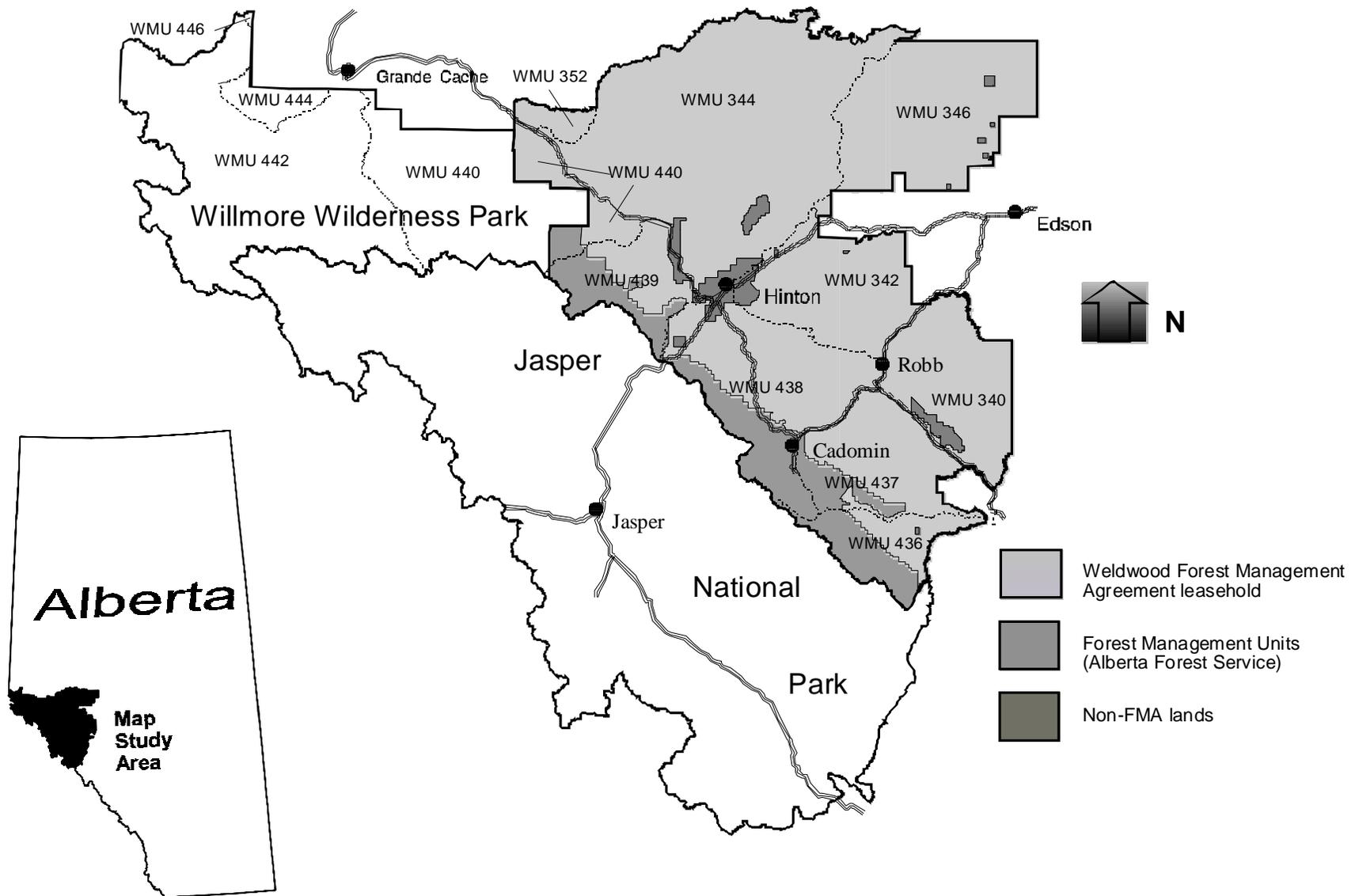
Figure 2. Foothills Model Forest Wildlife Management Units

First, the 15 values statements were factor analyzed using principal factor analysis with varimax rotation. Factors were extracted until the eigenvalue fell below 1.0. A minimum factor loading of 0.30 was used to identify items belonging to a factor. Reliability of the factors was measured using Cronbach's alpha. Second, a regression factor score was created for each of the factors for each individual. Third, to identify hunter segments a discrete cluster analysis was performed on the factor scores (FASTCLUS procedure, SAS Institute Inc. 1989). The FASTCLUS procedure uses an iterative clustering method which produces discrete clusters that are not nested or overlapping (Aldenderfer and Blashfield 1984). Initial partition is based on cluster seeds which are estimates of the cluster means. Observations are assigned to clusters by minimizing the squared Euclidean distances between the observation and the cluster means. After the initial partition, cluster means are recalculated and observations are reassigned to the nearest cluster until no new assignments occur. Specification of the number of clusters was determined using the maximum value of the cubic clustering criterion (Milligan and Cooper 1985).

Forest social value orientations were examined for each segment by calculating a bio-centred score for each individual. Human-centred statements were recoded so that higher numbers represent a bio-centred orientation and lower numbers represent a human-centred orientation. Then the responses were summed to create an indicator of bio-centred values with a possible range from 13 to 65.

RESULTS

Overnight hunting trips

Of those who held a 1996 big game license, 3.6% did not hunt big game in 1996. Of those who hunted, 75% reported at least one trip where they stayed away from home for at least one night. These hunters reported a total of 4,846 overnight hunting trips. The average number of total trips reported by those who took an overnight trip was 3.99. Hunters spent a total of 11,207 nights on overnight trips and averaged a total of 9.23 nights per hunter. On average, trips lasted 2.31 nights, respondents hunted in 1.66 Wildlife Management Units (WMUs), and had 10.4 years of experience in these WMUs.

Many trips were for multiple species e.g., deer and elk were hunted during one trip. Thus, to assess the demand for species, demand was calculated by weighting the species by the number of trips. For example, if a respondent took 10 similar trips to hunt deer and elk this was

calculated as 10 trips for deer and 10 trips for elk. Deer, moose, and elk were the most sought after species. Deer were the most common species hunted on overnight trips comprising 40% of all hunting trips (Fig. 3). The next most hunted species were moose and elk. Twenty eight percent of the trips were for these species. Bear comprised 4% of the species. Sheep and other species such as cougar, antelope, and wolves comprised less than 1%.

Day hunting trips

Of respondents who reported hunting in 1996, 75% reported at least one hunting trip where they did not stay overnight. These hunters reported a total of 15,789 day hunting trips. On average, hunters took a total of 13.77 day trips in 1996, reported hunting in 1.80 Wildlife Management Units, and had 10.2 years of experience in these WMUs.

Deer were the most common species mentioned on day hunting trips comprising 51% of all trips (Fig. 3). Elk and moose were the next most hunted species (22%). Bear comprised 4% of all species mentioned. Sheep and other species such as cougar, antelope, and wolves comprised less than 1% of the species.

Hunting expenditures

Respondents spent over $3.2 million on hunting in 1996 (Table 1). Equipment comprised the largest proportion (53%) of expenses. Of those who reported hunting expenditures, on average, they spent $1,890 on their hunting activities in 1996. These expenditures were comprised of the following variable costs: food $219.19 per person, supplies $212.30 per person, license fees $119.78 per person, travel $363.81 per person, and lodging $56.00 per person. Equipment expenditures averaged $1,001.10 per person. Excluded from the expenditures were trucks and other equipment valued at $20,000 or more. In addition to being used for hunting these items are generally used for other purposes and in this study their hunting components are impossible to assess.

other (0.1)
sheep (0.8)
bear (3.8)
elk (27.5)
deer (39.8)
moose (28)

other (0.1)
sheep (0.8)
bear (3.8)
elk (22.1)
deer (51.1)
moose (22.1)
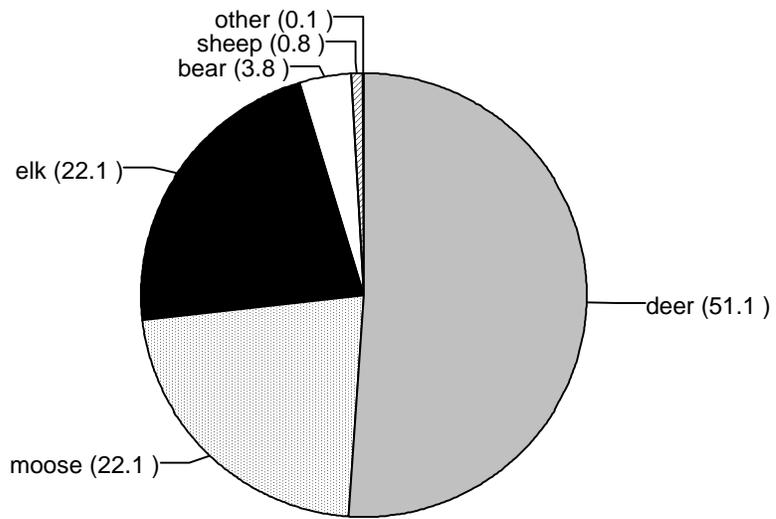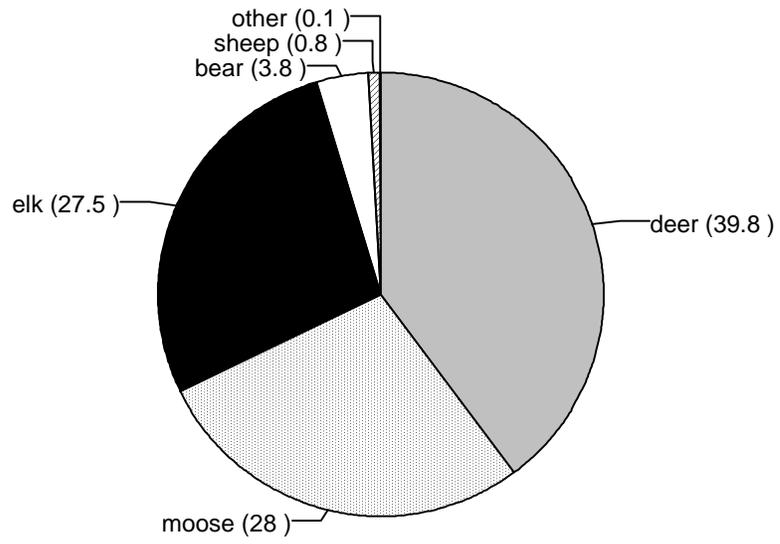
Figure 3. Distribution (%) of species hunted on overnight (top) and day (bottom) trips.

Table 1. Expenditures ($) by big game hunters during 1996

	Total	Mean	Range	Sample size
Food	343,847	219.19	0 – 3,000	1,568
Hunting supplies	337,977	212.30	0 – 5,700	1,592
License fees	193,320	119.78	14 – 1,950	1,614
Travel	590,467	363.81	0 – 10,000	1,623
Lodging	73,410	56.00	0 – 1,800	1,311
Equipment	173,2910	1,001.10	0 – 22,325	1,731
Total Expenditures	3,271,931	1,890.20	0 – 26,225	1,731

Our results showed that 3.6% of license holders did not hunt in 1996. Assuming the same proportion of all big game license holders did not hunt in 1996, we estimate the number of active big game hunters was 91,232. Aggregating the hunting costs over the population of active hunters, we estimate that over $81 million was spent on variable costs associated with big game hunting in 1996 and about $91 million was spent on hunting equipment giving a total of about $172 million spent by Alberta's big game hunters in 1996.

Forest social values

The distribution of ratings of the forest social value statements show that hunters tend to be more bio-centred than human-centred (Table 2). A majority of hunters agreed with most of the bio-centred statements. Over 98% agreed that it is important to know that forests exist and that future generations enjoy the same benefits from forests that the current generation enjoys suggesting that respondents support a concept of sustainable forest management. It is also evident that forests represent a means of spiritual renewal and that respondents feel forests have a right to exist independent of human needs. There were 2 items that received less agreement than the others: "forests have a right to exist without being managed by humans" and "forests are sacred places." While many (50% and 45%, respectively) agreed with these statements, many respondents neither agreed nor disagreed. An examination of the human-centred statements suggests that hunters are not opposed to using forests for human needs. For example, the majority agreed that forests should be managed to meet the needs of as many people as possible (75%) and that if forests are not threatened, we should use them to add to the quality of human life (65%). However, it appears that hunters do not agree that human needs should be the only goal of forest management. For example, most disagreed that forests exist mainly to serve human

Table 2. Distribution (%) of forest value scale scores

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Mean[1] (std. dev.)
Bio-centred statements:						
Whether or not I get to visit the forest as much as I like, it is important to know that forests exist in Alberta	0.1	0.2	1.3	16.3	82.1	4.80 (0.46)
Forests have a right to exist without being managed by humans	7.5	19.8	22.3	26.7	23.6	3.39 (1.25)
Forests give humans a sense of peace and well-being	0.3	0.7	4.6	34.9	59.5	4.53 (0.65)
Forests let us feel close to nature	0.1	0.2	3.0	40.1	56.5	4.53 (0.58)
Wildlife, plants, and humans have equal rights to live and develop	4.1	9.6	15.0	41.1	30.3	3.84 (1.09)
Forests are sacred places	5.9	17.8	31.6	24.7	20.0	3.35 (1.16)
It is important to maintain our forests so that future generations will enjoy the same benefits that we enjoy	0.2	0.2	1.0	21.4	77.2	4.75 (0.49)
Humans should have more respect and admiration for our forests	0.8	1.3	6.1	34.7	57.2	4.46 (0.73)
Forests rejuvenate the human spirit	0.8	2.1	18.1	46.9	32.1	4.07 (0.81)
Human-centred statements:						
Forests should be managed to meet the needs of as many people as possible	4.3	11.4	9.0	30.5	44.8	4.00 (1.17)
As many uses (for example, forestry, wildlife habitat, recreation, and oil and gas) should be made of as much forested public land as possible	14.1	27.7	21.8	25.3	11.1	2.92 (1.24)
Forests exist mainly to serve human needs	30.6	41.9	14.9	8.6	3.9	2.13 (1.07)
Forests that are not used are a waste of our natural resources	51.0	34.6	7.2	4.1	3.1	1.74 (0.98)
The primary use of forests should be for products that are useful to humans	26.3	45.4	17.7	8.8	1.8	2.14 (0.96)
If forests are not threatened, we should use them to add to the quality of human life	3.4	12	19.7	49.6	15.4	3.62 (0.99)

[1] Rated on a scale of 1 to 5, where 1 = strongly disagree and 5 = strongly agree.

needs (73%), forests that are not used are a waste of our natural resources (86%), and the primary use of forests should be for products that are useful to humans (72%).

Management preferences

To determine the social acceptability of and preferences for forest management practices we examined attitudes toward forest management. The distribution of management preference scores (Table 3) shows that a minority of hunters agreed with the statements that forests are currently being managed successfully to meet future needs (23%), forestry produces no long term adverse effects on the environment (11%), and enough harvested trees are being replaced to meet our future timber needs (16%). A minority of respondents agreed with several of the economic development and timber oriented management items: providing jobs and economic development is more important than setting aside forests from logging (9%); setting aside forests is not desirable if it means lower wages and fewer jobs (13%); forests should be managed mainly for timber and lumber products (6%); economic benefits outweigh negative consequences from forestry (12%); and economic stability of communities is more important than setting aside forests from logging (13%). A majority agreed that logging forests is acceptable if the forest is not harmed (72%) and that communities close to the forest should be given a higher priority in forest decisions than other communities (58%). However, 63% agreed that clear-cut logging should be banned on public land. The majority also agreed that legislation should be established to protect endangered species (83%) and forest management should emphasize a variety of plants and animals (89%). A minority agreed that some existing protected areas should be opened for logging (9%) and that typical examples of Alberta's forest regions should be excluded from resource development including tourism (41%).

Overall, these results suggest that hunters do not view current forest management as sustainable and they are not in favor of some management goals that emphasize timber production and economic development. However, they are not opposed to logging *per se*. A management approach with a holistic orientation that considers non-timber users, manages for a variety of species (biodiversity), employs alternative harvesting methods,

Table 3. Distribution (%) of forest management preference scores

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Mean[1] (std. dev.)
Sustainability statements:						
Our forests are being managed successfully to meet our present and future needs	14.0	35.5	27.5	19.8	3.1	2.62 (1.05)
Forestry practices generally produce no long term adverse effects on the environment	28.2	46.3	14.7	9.2	1.6	2.10 (0.97)
Enough harvested trees are being replaced by planting new ones or by natural seeding to meet our future timber needs	21.4	36.0	27.1	13.7	1.8	2.39 (1.02)
Protection statements:						
Typical examples of Alberta's forest regions (for example boreal and aspen parkland) should be excluded from development such as forestry, oil and gas, and tourism	4.8	26.7	27.5	26.6	14.4	3.19 (1.13)
Legislation should be established to protect endangered species of plants and wildlife in our forests	1.6	3.8	11.2	44.5	38.8	4.15 (0.88)
Forest management should emphasized a variety of plants and animals	0.5	1.2	9.1	63.3	25.9	4.13 (0.65)
Some existing protected areas such as parks should be opened for logging	54.3	28.4	8.5	6.1	2.7	1.74 (1.03)

Table 3. Continued

Statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Mean[1] (std. dev.)
Economic development/timber management statements:						
Providing jobs and economic development is more important than setting aside forests from logging	27.1	46.8	17.2	7.4	1.6	2.10 (0.93)
Setting aside forests from logging is not desirable if it means lower wages or fewer jobs	17.5	44.0	25.1	10.8	2.5	2.37 (0.97)
Forests should be managed mainly for timber and lumber products	32.5	52.9	8.5	5.4	0.7	1.89 (0.82)
The economic benefits from forestry practices usually outweigh any negative consequences	25.0	41.7	21.6	10.1	1.5	2.21 (0.98)
Logging forests is acceptable if the forest is not harmed	3.9	9.8	14.8	61.0	10.8	3.65 (0.93)
When making forest decisions, the concerns of communities close to the forest should be given a higher priority than other communities	5.1	19.3	17.7	44.0	13.8	3.42 (1.10)
Clear-cut logging should be banned on public land	5.2	11.8	19.7	27.3	35.9	3.77 (1.20)
Economic stability of communities is more important than setting aside forests from logging	16.7	42.1	28.5	11.1	1.7	2.39 (0.95)

[1] Rated on a scale of 1 to 5, where 1 = strongly disagree and 5 = strongly agree.

involves communities in management decisions, and provides some protection, especially for endangered species, may be acceptable to these forest users.

Knowledge of forest-related facts

Scores on the forest-related knowledge items indicate that most respondents seemed to have basic knowledge of some forest-related issues (Table 4). For example, 54% knew that chemicals are not commonly used to control weeds in Alberta's forests, 90% knew that forest companies must follow government guidelines when harvesting timber, 66% knew that there is a natural replacement of the kinds of trees in a forest, 84% knew that insects can cause severe damage to forests, and 73% knew that the number of bull trout have declined. However, only 50% knew that areas do not have to be replanted after harvesting in order for the forest to return . There were also two items that had a high proportion of respondents who were "Not sure" of the correct response. About 45% were not sure that woodland caribou need old growth forest and 28% were not sure that Alberta had more softwoods than hardwoods.

Socioeconomic characteristics

The socioeconomic information indicates that the sample was similar in education to the Alberta population (Table 5). Household incomes were high with 34% earning $70,000 or more in 1996 (Table 6). In 1991, only 19% of Alberta households earned this amount (Statistics Canada 1991). Over 42% of respondents households had 4 or more people compared with only 30% of Alberta households (Table 7). Over half (54%) of respondents did not have anyone under 17 years old living in their household. This household structure reflects the age of the sample: the mean age was 43 years and 77% were 35 or older (Table 8). In 1991, only 51% of the Alberta population was 35 or older (Statistics Canada 1991). Over 37% of respondents lived on a farm or in a rural area, 15% lived in a community of less than 5,000 people, 25% lived in a community with a population of 5,000 to 99,999 people, and 23% lived in areas with populations of 100,000 or more. Interest group affiliation was measured by membership in a hunting or fishing organization and other conservation-related organizations and by the economic dependence of a household member on the forest sector. Thirty percent belonged to a hunting or fishing organization and 11% belonged to other conservation-related organizations. Eleven percent had a

household member dependent on the forest sector for their economic livelihood. Only 4% of the respondents were women.

Table 4. Distribution of knowledge scores

Knowledge item	% Correct	% Not sure
Chemicals are commonly used to control weeds in Alberta's forests	54.0	27.9
There are no old-growth forests in Alberta	83.5	11.2
Lodgepole pine depends on forest fire to open its cones and shed its seeds	76.3	16.2
The number of bull trout have decreased in Alberta	73.1	22.1
Clear cutting is the most common method of harvesting trees in Alberta	66.7	17.9
Most of Alberta's forested land is owned by the provincial government	76.8	14.6
Forest companies are required to follow government guidelines when harvesting timber	89.8	6.5
Over time, there is a natural replacement of the kinds of trees in a forest	66.4	12.0
Alberta has more softwoods than hardwoods	67.4	22.8
The woodland caribou prefers old growth forest but can survive in areas that have been cleared by logging	33.2	43.6
All areas where trees are harvested must be replanted in order for the forest to return	50.4	8.6
The seedlings planted after harvesting are usually hardwoods	64.3	24.5
Insects such as caterpillars can cause severe damage to forests	83.5	8.6

Table 5. Distribution of education levels

Education level	% Hunters n = 1696	% Alberta population[1] n = 1,918,290
High school or less	48.0	48.7
Technical, trade or other non-university	33.1	29.4
Some University	18.9	22.0

[1] Alberta population ≥15 years old (Statistics Canada 1991).

Table 6. Distribution of total household income

Household income ($)	% Hunters n = 1496	% Alberta households[1] n = 910,390
less than 10,000	1.6	6.6
10,000 – 19,999	3.3	15.6
20,000 – 29,999	7.2	13.6
30,000 – 39,999	12.1	13.4
40,000 – 49,999	14.4	12.4
50,000 – 59,999	14.2	10.9
60,000 – 69,999	13.4	8.2
70,000 or more	33.9	19.3

[1] Household income in 1991 (Statistics Canada 1991).

Table 7. Distribution of people living in the household

| Number of people | % Hunters | | % Alberta households[1] |
	Total people in household n = 1665	People under 17 years old n = 1665	Total people in household n = 910,390
0	-	54.4	-
1	12.1	14.5	21.9
2	27.3	19.7	31.2
3	18.1	8.1	17.0
4 or 5	36.9	3.1	26.0
6 or more	5.6	0.3	3.9

[1] Statistics Canada 1991

Table 8. Age distribution

Age category (years)	% Hunters[1] n = 1713	% Alberta population[2] n = 2,131,018
10 – 24	5.7	26.2
25 – 34	17.7	23.0
35 – 44	34.0	19.4
45 – 54	24.4	11.7
55 – 64	11.4	8.9
65 and over	6.9	10.8

[1] Hunters must be at least 14 years old.
[2] Excludes children < 10 years old (Statistics Canada 1991).

Segmentation analyses

Foothills Model Forest hunters

One hundred and fifty two respondents (8.8%) took at least one hunting trip to the FMF in 1996. Overall, 7.1% of all hunting trips were to the FMF area. A total of 1,171 day trips and 302 overnight trips were to this area. Eighty percent of all trips to the FMF were day trips. The distribution of hunting trips among the 13 Wildlife Management Units (WMUs) shows that none of the respondents hunted in WMU 436 (Table 9). This WMU, located southeast of Cadomin, is more remote than other WMUs in the FMF (Fig. 2). WMU 346 was the most popular hunting area receiving 44% of the total FMF trips. The next most popular WMUs were 344, 340, and 342 each receiving 14%, 11%, and 10% of the FMF trips, respectively. The remaining WMUs each received less than 5% of the trips.

Table 9. Hunting trips to the Foothills Model Forest

Wildlife Management Unit	Number of day trips (%)	Number of overnight trips (%)	Total trips (%)
340	127 (10.8)	33 (10.9)	160 (10.9)
342	118 (10.0)	24 (7.9)	142 (9.6)
344	177 (15.1)	34 (11.3)	211 (14.3)
346	521 (44.5)	126 (41.7)	647 (43.9)
352	3 (0.3)	16 (5.3)	19 (1.3)
436	0 (0.0)	0 (0.0)	0 (0.0)
437	17 (1.5)	18 (6.0)	35 (2.4)
438	34 (2.9)	30 (9.9)	64 (4.3)
439	33 (2.8)	5 (1.7)	38 (2.6)
440	10 (0.9)	3 (1.0)	13 (0.9)
442	16 (1.4)	3 (1.0)	19 (1.3)
444	55 (4.7)	4 (1.3)	59 (4.0)
446	60 (5.1)	6 (2.0)	66 (4.5)
Total	1,171 (100.0)	302 (100.0)	1,473 (100.0)

Deer, moose, and elk were the most sought after species. The species hunted varied among the WMUs (Fig. 4). For example, about 42% of trips to WMUs 439 and 342 were for deer while WMU 442 had no deer hunting trips. Although WMU 442 received only 20 trips most (90%) of these were for sheep. WMUs 438, 437 and 440 were also popular sheep hunting areas with 58%, 35%, and 33% of the trips being for sheep, respectively. WMU 340 was a popular moose hunting area with 40% of the trips being for moose. However, moose was not a popular

WMU 340

bear (0.9)

deer (27)

elk (31.9)

moose (40.2)

WMU 342

elk (39.9)

deer (42.7)

moose (17.4)
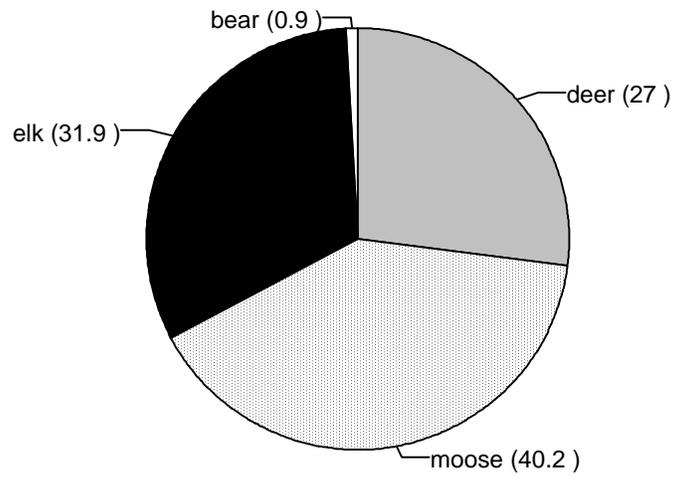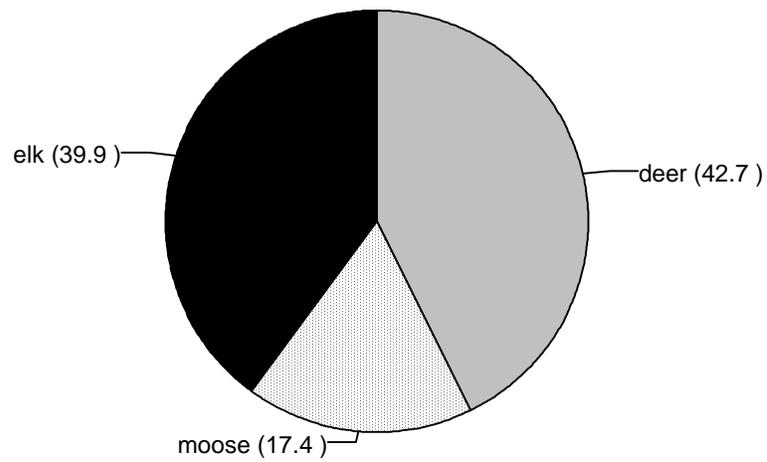
Figure 4. Distribution (%) of species hunted in the Foothills Model Forest by Wildlife
Management Unit (WMU).

WMU 344
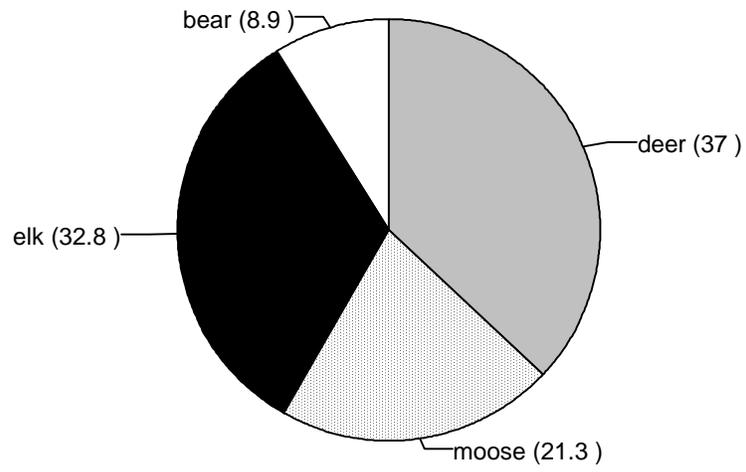
WMU 346
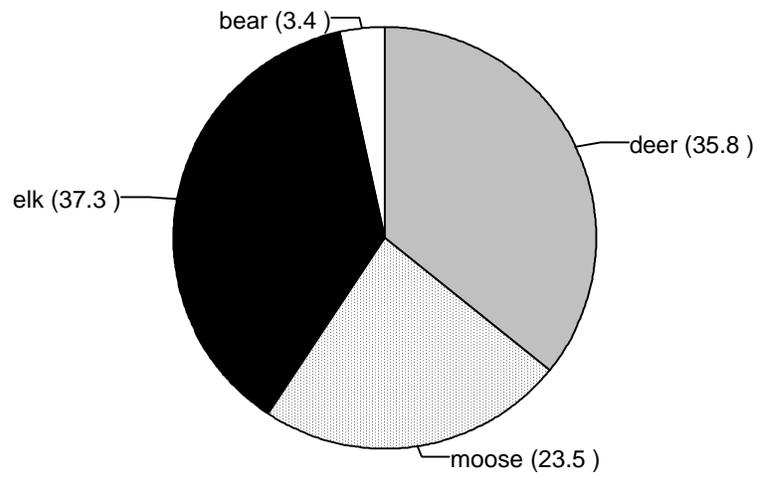
Figure 4. (Continued)

WMU 352
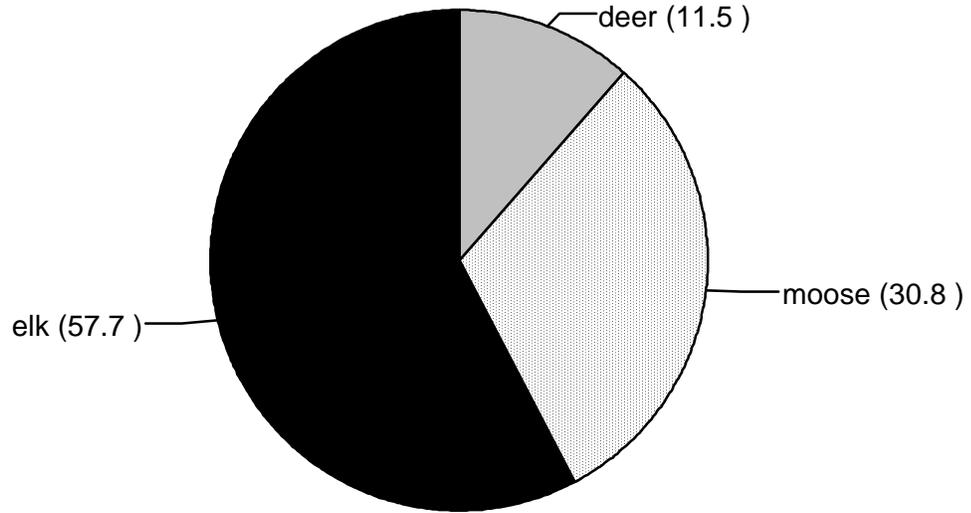
WMU 437

Figure 4. (Continued)

WMU 438

bear (5.3) ──
deer (18.1)

moose (1.1)

elk (18.1)

sheep (57.4) ──

WMU 439

elk (30.2) ──
deer (41.9)
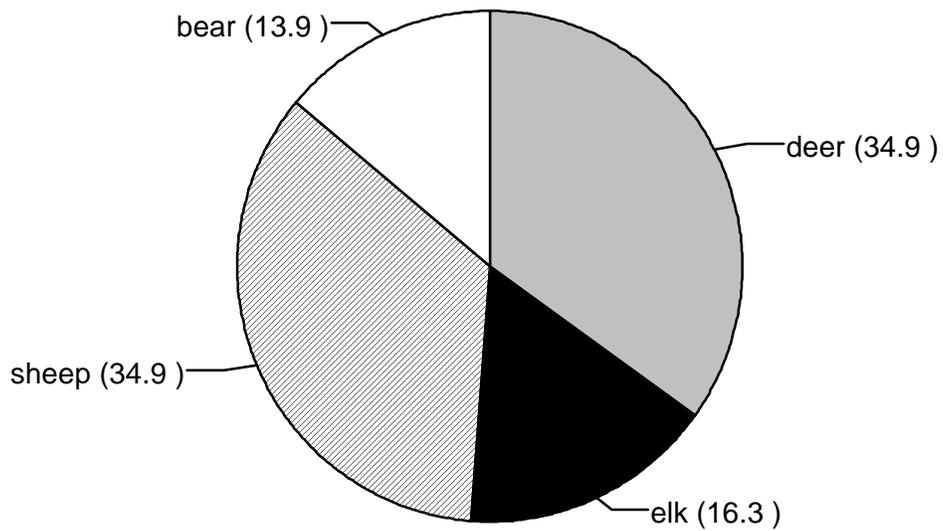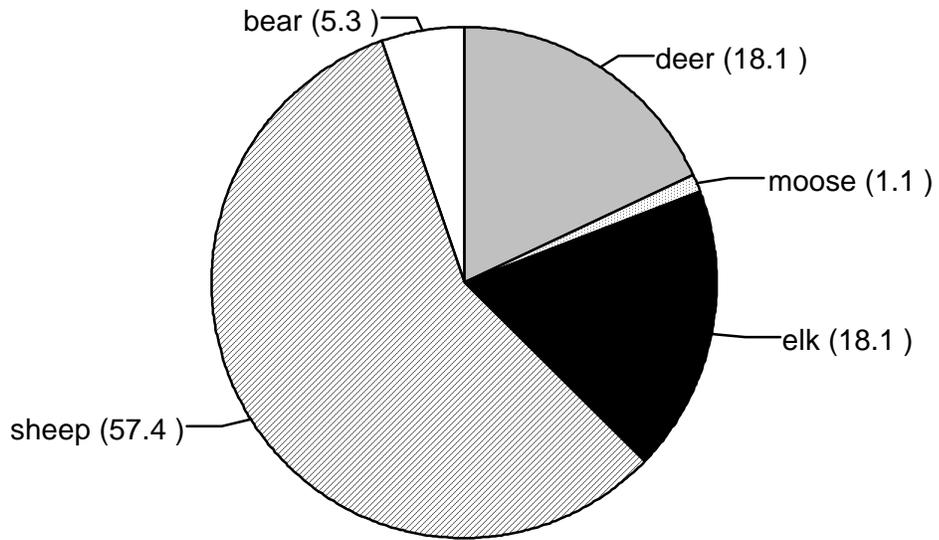
moose (27.9) ──

Figure 4. (Continued)

25
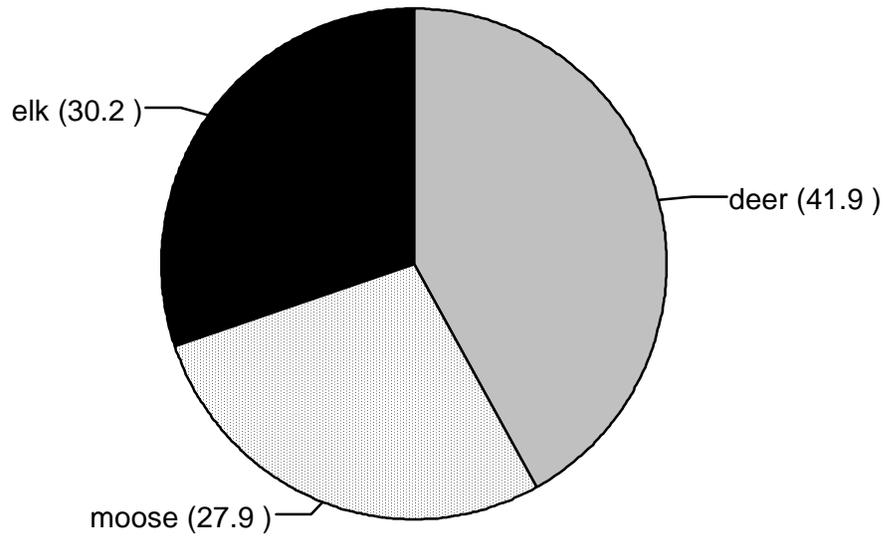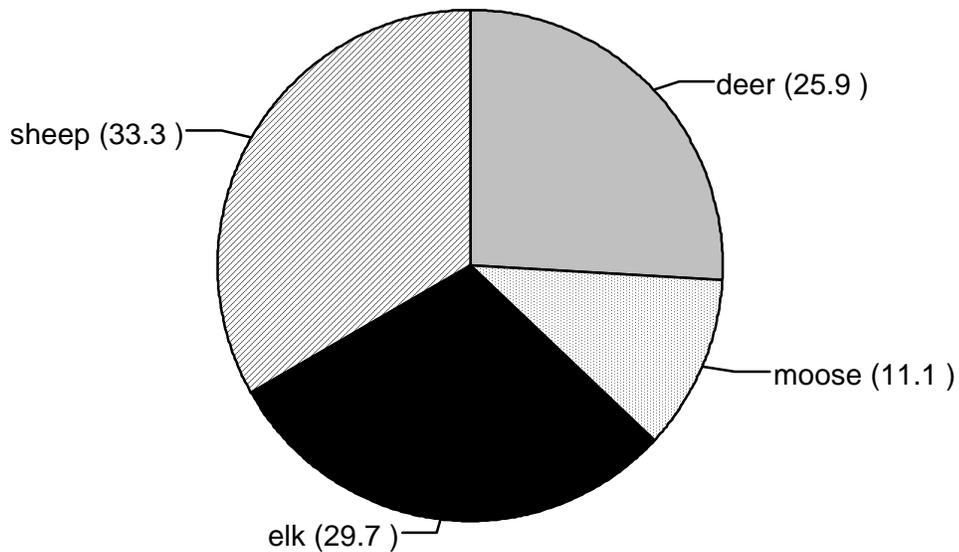
WMU 440

WMU 442

Figure 4. (Continued)

WMU 444

bear (5.9)
sheep (1.2)
deer (30.6)
elk (62.3)

WMU 446

sheep (1.6)
elk (33.9)
deer (47.2)
moose (17.3)
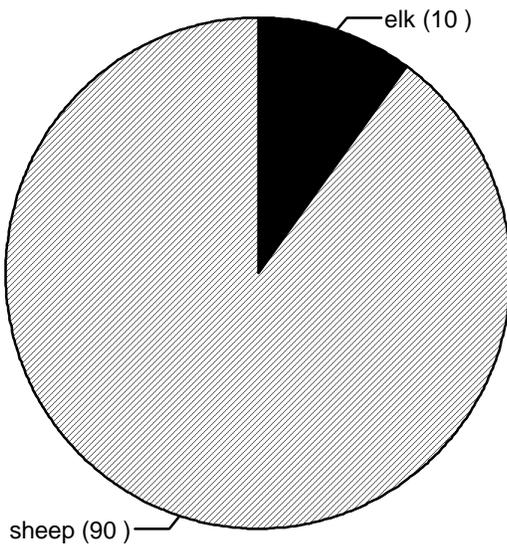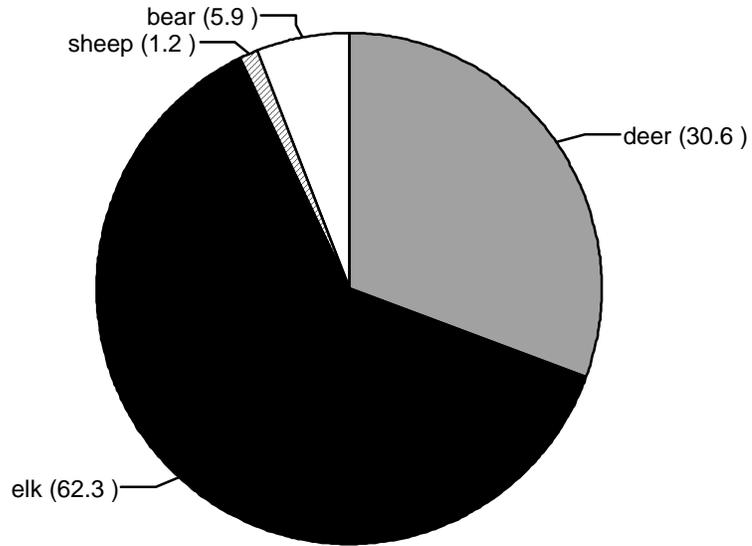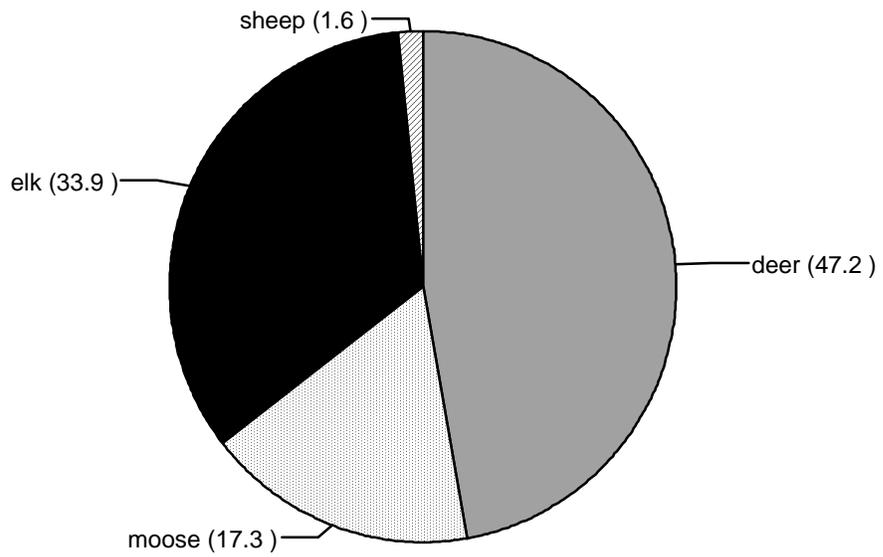
Figure 4. (Continued)

species in several WMUs. No respondents hunted moose in WMU 437, WMU 442, and WMU 444. Only 1% of the trips to WMU 438 and 11% of the trips to 440 were for moose. The most popular bear hunting area was WMU 437 with 14% of the trips to this area being for bear.

A comparison of FMF hunters with other hunters in the sample shows that FMF hunters are more involved in hunting (Fig. 5). Although, on average, FMF hunters did not take significantly more overnight trips they spent more nights on trips, took more day trips, and spent more money on hunting than non-FMF hunters (Table 10).
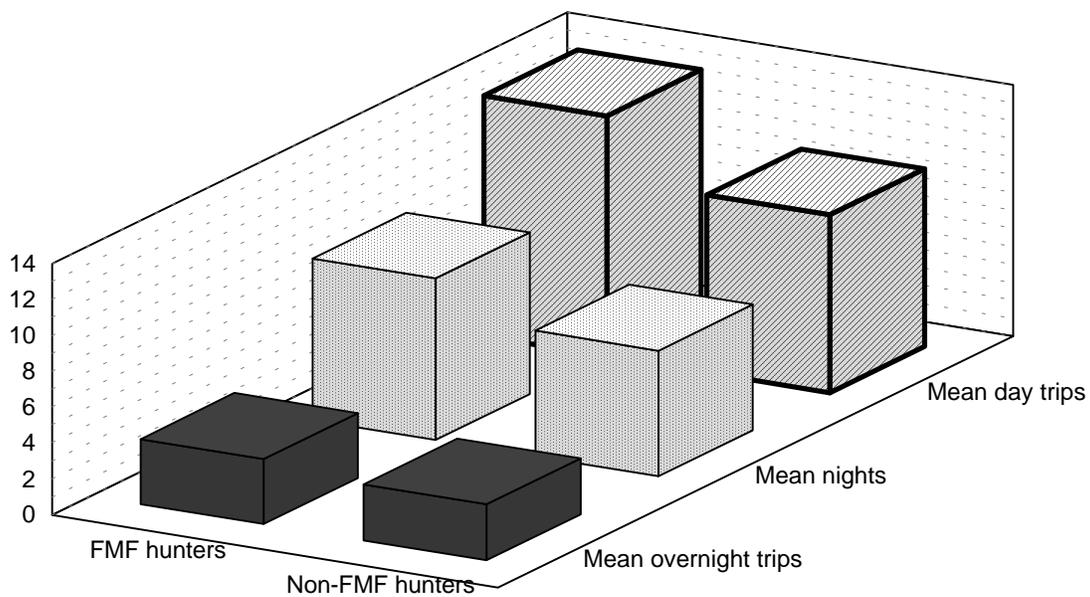
Figure 5. Hunting involvement by Foothills Model Forest (FMF) and non-FMF hunters.

More of the FMF hunters (16%) had a household member who was dependent on the forest sector for their economic livelihood and they had higher household incomes (38% had household incomes of $70,000 or more) than other hunters (Fig. 6 & Table 10). More FMF hunters were residents of Edmonton and surrounding area (St. Albert, Sherwood Park, Stony Plain, or Spruce Grove) and local FMF communities (Hinton, Edson, Grand Cache, Jasper, Brule, or Cadomin) than those who hunted in other areas. Residents of the local FMF communities comprised 3.4% of the hunting sample but made up 26% of those who took a

hunting trip to the FMF. Edmonton and area residents comprised 17% of the sample but made up 32% of those who took a hunting trip to the FMF.

Table 10. Comparison of Foothills Model Forest (FMF) hunters and other hunters

Variables	FMF hunters	Non-FMF hunters	T value/χ^2	p
Mean overnight trips	3.52	3.10	–0.99	.4345
Mean nights	8.84	6.99	–2.69	.0072
Mean day trips	14.13	9.74	–3.61	.0003
Mean variable costs ($)	1172.10	926.71	–3.15	.0016
% Edmonton residents	32.24	15.21	28.11	.000
% Local residents	25.66	0.67	273.93	.000
% Dependent on forest sector	15.89	10.06	4.85	.028
% University education	9.21	11.93	4.30	.116
% Household income ≥$70,000	37.50	29.01	4.70	.030
Mean knowledge score	9.28	8.78	–2.86	.0048
Mean bio-centred score	50.96	49.91	–2.39	.0177
Management preferences[1]:				
Legislation should be established to protect endangered species of plants and wildlife in our forests	4.32	4.12	–2.52	.0118
Some existing protected areas such as parks should be opened for logging	1.42	1.78	4.09	.0000
Logging forests is acceptable if the forest is not harmed	3.49	3.66	2.05	.0419

[1] Rated on a scale of 1 to 5, where 1 = strongly disagree and 5 = strongly agree.

Comparing the composite knowledge score of forest-related facts shows that FMF hunters had more correct responses (mean = 9.28) than other hunters (mean = 8.78) (Table 10). FMF hunters had a higher biocentric orientation score (mean = 50.96) than non-FMF hunters (mean = 49.91) and they differed on 3 of the forest management preference statements (Table 10). FMF hunters were more supportive of protecting endangered species and excluding logging activities from existing protected areas, and were less accepting of logging the forest if the forest is not harmed. These results suggest that FMF hunters are more biocentred in their forest values and more supportive of protection oriented forest management strategies. However, these results do not take into consideration differences that might be attributed to socioeconomic characteristics of FMF and non-FMF hunters.
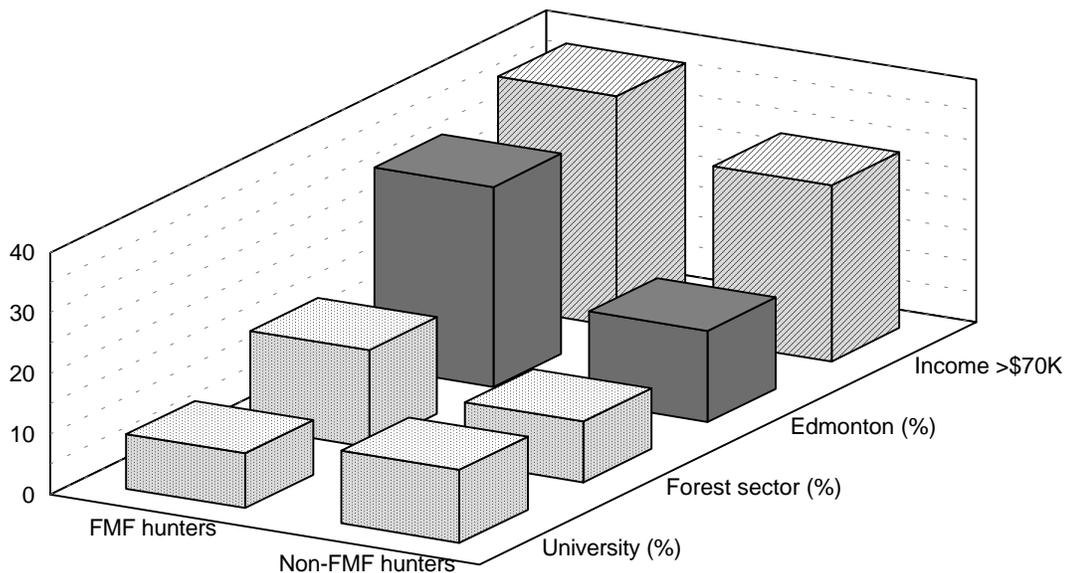
Figure 6. Socioeconomic characteristics of Foothills Model Forest (FMF) hunters and non-FMF hunters.

Future analyses will include multivariate analysis that examines the association between forest values, management preferences, demographics, and FMF hunters. The number of FMF hunters captured in the survey is small (n = 152). The differences identified in the current study might warrant a future investigation of forest values and management preferences using a larger sample. Models are being developed that link biophysical and GIS data with hunting trip information to examine the relationship between industrial forestry activities and hunting including a preliminary analysis of the impact of various forest management scenarios on the economic value of hunting.

Forest social values

The factor analysis on the forest social values scale identified two factors that correspond to the bio-centred and human-centred dimensions proposed by Steel et al. (1994). Two items did not load on any factors and were dropped from the analysis (Table 11). Both of these items related to the rights of forests and non-human species: "Forests have a right to exist without being managed by humans" and "Wildlife, plants, and humans have equal rights to live and develop."

Table 11. Factor analysis of forest social values scale

Statement	Factor 1 (Bio-centred)	Factor 2 (Human-centred)
Forests let us feel close to nature	0.71	0.09
Forests rejuvenate the human spirit	0.67	0.07
Forests give humans a sense of peace and well-being	0.66	0.06
It is important to maintain our forests so that future generations will enjoy the same benefits that we enjoy	0.58	–0.08
Humans should have more respect and admiration for our forests	0.56	–0.19
Forests are sacred places	0.46	–0.13
Whether or not I get to visit the forest as much as I like, it is important to know that forests exist in Alberta	0.37	–0.12
The primary use of forests should be for products that are useful to humans	–0.27	0.51
Forests exist mainly to serve human needs	–0.18	0.51
As many uses (for example, forestry, wildlife habitat, recreation, and oil and gas) should be made of as much forested public land as possible	–0.04	0.45
Forests that are not used are a waste of our natural resources	–0.26	0.43
Forests should be managed to meet the needs of as many people as possible	0.13	0.37
If forests are not threatened, we should use them to add to the quality of human life	0.1	0.36
Eigenvalue	2.7	1.17
Percent variance	80.9	35.1
Cronbach's alpha	0.76	0.60

The cluster analysis identified three discrete segments. The value orientations of the segments indicate that cluster 1 respondents had the highest bio-centred score, cluster 3 had the lowest score, and cluster 2 was between these two extremes (Table 12). This suggests that the clusters can be arranged on a continuum with cluster 1 respondents being the most bio-centred and cluster 3 the least. Thus, for ease of presentation, the segments were named Bio-centred (cluster 1), Moderates (cluster 2), and Human-centred (cluster 3). The Bio-centred group comprised 38% of respondents, Moderates 35%, and Human-centred 27%.

Table 12. Comparison of forest social values segments[1]

Variable	Bio-centred n = 595	Moderates n = 552	Human-centred n = 435	F/χ^2	p
	Segment			Statistics	
Age (years)	40.7[a]	44.3[b]	44.8[b]	21.16	0.000
Mean overnight trips	3.3[a]	2.7[a,b]	2.3[b]	4.24	0.015
Mean day trips	10.6[a]	8.8[a,b]	8.2[b]	4.32	0.014
Women (%)	6.3	3.1	2.1	12.97	0.000
Household income ≥$70,000 (%)	26.4	33.0	31.5	6.47	0.039
Some university education (%)	17.1	19.9	20.0	1.92	0.382
Residence ≤5,000 people (%)	55.0	47.1	53.0	7.58	0.023
Edmonton or Calgary residents (%)	22.5	28.2	21.2	7.92	0.019
Foothills Model Forest residents (%)	3.5	2.9	3.0	0.41	0.814
Dependent on forest sector (%)	9.8	11.6	14.0	4.32	0.115
Member of a hunting organization (%)	29.3	29.8	30.9	0.30	0.859
Member of a conservation organization (%)	11.3	12.2	10.2	0.89	0.640
Mean bio-centred score	54.3[a]	49.8[b]	44.3[c]	1017.93	0.000
Mean knowledge score	8.7[a,b]	8.9[a]	8.6[b]	3.01	0.049

[1] Any two means that do not share a superscript are significantly different at $p \leq .05$ using Tukey's HSD test.

An examination of the socioeconomic data indicates that the Bio-centred respondents are younger, have the highest proportion of women, and lower household incomes than the other segments (Table 12 & Fig. 7). Bio-centred respondents are more involved in hunting, on average, taking more overnight and day hunting trips than hunters in the other segments. The Moderate group had the highest proportion of hunters living in Edmonton or Calgary and fewer individuals living in an area with a population of 5,000 or less. The Human-centred group had the lowest proportion of women. There were no differences among the segments on education or the proportion who live in the Foothills Model Forest area (ie., Hinton, Edson, Grande Cache, Jasper, Brule, or Cadomin). There were no differences on membership in a hunting or conservation related organization or the proportion who had a household member dependent on the forest sector for their economic livelihood. These results suggest that hunters are not

homogeneous in their value orientations and that segments based on values also differ on some socioeconomic factors and hunting involvement.
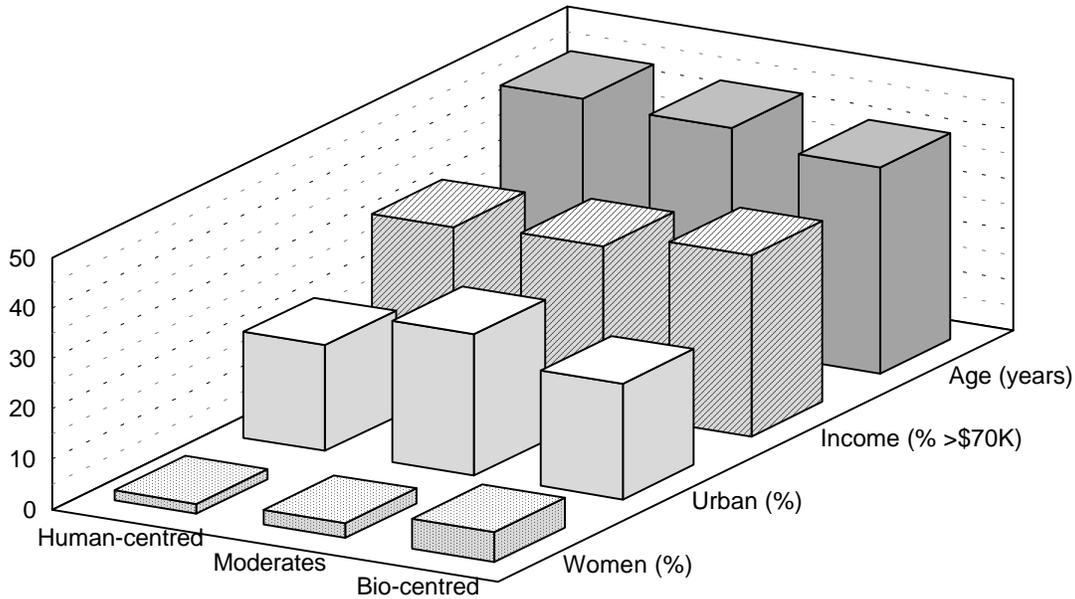
Figure 7. Socioeconomic characteristics of forest social values segments.

Differences occurred among the segments on most forest management preferences (Table 13). The Bio-centred group rated statements related to protection oriented management strategies higher than the Human-centred or Moderate groups and statements related to economic development and timber oriented management and sustainability of current management lower than these segments. The Human-centred respondents generally had the lowest scores on statements relating to protection of forests and highest scores on economic development and timber oriented management and sustainability statements. The Moderate groups' management preferences were generally between the two extremes of the Bio-centred and Human-centred groups. These results suggest that management preferences appear to be consistent with forest social values. Respondents who are the most bio-centred are the most supportive of protection oriented management strategies, are least supportive of economic development and timber oriented management strategies, and viewed current forest management as less

Table 13. Comparison of forest management preference scores[1] among social value segments

Statement	Segment			ANOVA Statistics	
Sustainability statements:	Bio-centred	Moderates	Human-centred	F value	*p*
Our forests are being managed successfully to meet our present and future needs	2.30[a]	2.72[b]	2.94[c]	54.54	0.000
Forestry practices generally produce no long term adverse effects on the environment	1.82[a]	2.11[b]	2.48[c]	64.64	0.000
Enough harvested trees are being replaced by planting new ones or by natural seeding to meet our future timber needs	2.12[a]	2.37[b]	2.76[c]	51.34	0.000
Protection statements:					
Typical examples of Alberta's forest regions (for example boreal and aspen parkland) should be excluded from development such as forestry, oil and gas, and tourism	3.51[a]	3.15[b]	2.81[c]	51.84	0.000
Legislation should be established to protect endangered species of plants and wildlife in our forests	4.38[a]	4.27[b]	3.69[c]	93.05	0.000
Forest management should emphasize a variety of plants and animals	4.26[a]	4.28[a]	3.83[b]	82.25	0.000
Some existing protected areas such as parks should be opened for logging	1.43[a]	1.82[b]	2.10[c]	59.35	0.000

Table 13. Continued.

Statement	Segment			ANOVA Statistics	
Economic development/timber management statements:	Bio-centred	Moderates	Human-centred	F value	*p*
Providing jobs and economic development is more important than setting aside forests from logging	1.73[a]	2.17[b]	2.47[c]	92.41	0.000
Setting aside forests from logging is not desirable if it means lower wages or fewer jobs	2.08[a]	2.47[b]	2.62[b]	45.88	0.000
Forests should be managed mainly for timber and lumber products	1.59[a]	1.92[b]	2.25[c]	92.83	0.000
The economic benefits from forestry practices usually outweigh any negative consequences	1.94[a]	2.23[b]	2.57[c]	54.07	0.000
Logging forests is acceptable if the forest is not harmed	3.45[a]	3.80[b]	3.73[b]	22.55	0.000
When making forest decisions, the concerns of communities close to the forest should be given a higher priority than other communities	3.34	3.46	3.48	2.79	0.062
Clear-cut logging should be banned on public land	4.03[a]	3.80[b]	3.38[c]	37.32	0.000
Economic stability of communities is more important than setting aside forests from logging	2.14[a]	2.37[b]	2.72[c]	49.50	0.000

[1] Rated on a scale of 1 to 5, where 1 = strongly disagree and 5 = strongly agree. Any two means that do not share a superscript are significantly different at $p \leq .05$ using Tukey's HSD test.

sustainable than the other groups. Thus, forest social values may be good explanators of preferred management strategies.

Comparing the composite knowledge score among the segments shows that the Human-centred group had the lowest and the Moderate group had the highest score (Table 12). The Bio-centred group did not differ significantly from the other 2 groups.

DISCUSSION

Although the percentage of the Alberta population participating in hunting has declined since the 1980s[1] (Boxall et al. 1991) it appears that hunting is still an important activity for many Albertans. Hunters in this study were very active taking several hunting trips in 1996 and contributing about $172 million to the provincial economy. Because a lot of big game hunting occurs on public land in the boreal forest where the occurrence of other non-timber activities are minimal, hunters constitute important non-timber users of the boreal forest who should be considered in forest management decisions.

Based on the forest social values used in our study it appears that although hunters do not seem to be opposed to using forests to benefit humans, they do not think that humans should be the only focus of forest management. Hunters were primarily bio-centred, agreeing with spiritual and existence values and the rights of forests and other species to exist for their own sake. Although respondents agreed with some of the statements related to human use of the forest, they do not agree that human needs should be paramount in management. This is reflected further in hunters' forest management preferences where respondents disagreed with managing primarily for timber and economic development and agreed with managing for a variety of species and protecting species and existing protected areas. However, a minority (41%) of hunters agreed with protecting typical examples of forest regions from industry and tourism. This may reflect hunter's concerns that hunting and off highway vehicle use could be excluded from protected areas. Respondents might not be opposed to all development but may view some types as more acceptable than others. For example, hunters might support tourism development but be opposed to more industrial development. The acceptability of various

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[1] This decline seems more evident among urban residents while the percentage of rural residents participating seems to be remaining relatively stable (Boxall and Smith 1986).

types of development on public land was not explored. These results suggest that the establishment of new protected areas in the boreal forest may not be supported by hunters if their concerns are not met.

Our results suggest that a holistic management approach to resource management that considers non-timber uses, manages for a variety of species (biodiversity), employs alternative harvest methods to clear-cutting, involves communities in decision making, and provides some protection especially for endangered species, may be acceptable to hunters in Alberta. These are often cited as elements in sustainable forest management (Bengston 1994). Thus, hunters seem to support the philosophy of sustainable forestry. However, although forest management in the province purports such an approach, it appears that hunters do not believe that forests are being managed sustainably. This could be a result of hunters not being aware of sustainable management strategies or believing that sustainable management is not being implemented successfully. The belief that forests are not being managed sustainably occurred despite the fact that virtually all respondents knew that the forest industry must follow government guidelines when harvesting. This suggests that hunters either think the guidelines are not adequate to provide for future needs or that they are not being followed or enforced.

While most hunters (72%) were not opposed to logging the forest if it was not harmed, the majority (64%) thought that clear-cutting should be banned on public land. How hunters define clear-cuts or why they feel clear-cutting should be banned was not explored in this study. However, it could be that while clear-cuts improve the amount of game they might have a negative impact on the hunting experience. For example, improving access to an area may result in more hunters and more off-highway vehicles visiting the area which in turn could lead to a sense of congestion and crowding among hunters. Forest management that takes into consideration hunters concerns may have to manage for more than the supply of species. Considerations of the type of hunting experiences sought and the attributes of the forest that are necessary to achieve satisfactory hunting experiences may be necessary to address hunters concerns. This means expanding research such as wildlife habitat supply modeling to include human dimensions such as examining the types of species desired, motivations for hunting, and the forest attributes that are desired by hunters. A second implication of the negative

assessment of clear-cut logging is that hunters associate clear-cuts with large, regular shaped cut-blocks, and poor reforestation. It could be that hunters are not aware of new harvest strategies that are based on wildlife habitat supply, smaller cut block design, and irregular shapes. This lack of awareness could also be a contributor to the negative assessment of the sustainability of current forest management. New strategies that are designed to include wildlife conservation and other values need to be communicated effectively to the hunting population. The forest industry needs to ensure that those in close proximity to forestry activities are aware of conservation initiatives and innovative management strategies. One means of communicating with the hunter population is through hunter magazines and fish and game organizations. However, because this study indicates that only 30% of hunters belong to hunting organizations, in-the-field communication may also be necessary. In order to communicate new forest management strategies and the efforts to achieve sustainable management it may be necessary to demonstrate research activities and innovative management techniques (e.g., the use of wildlife habitat supply models, smaller cut block sizes, and varying cut block shape) in areas accessible to hunters. Communication messages that emphasize the importance of industrial development based primarily on jobs and economic development may not be very successful with hunters. Forestry initiatives will have to demonstrate incorporation of ecosystem functions and enhance a variety of benefits, not just economic, to be acceptable to these stakeholders.

The forest social values scale utilized in this study seems to be a promising tool for examining forest social values. Three subtypes of hunters were identified using the scale and the subtypes differed on their management preferences and socioeconomic characteristics. This suggests that the scale is a useful tool in helping managers develop goals and strategies that are socially acceptable, be able to predict how certain segments of society will react to management practices, and determine what groups will be positively or negatively impacted by management activities.

Future analysis of the data in this study will include a comparison of the forest social values of hunters with other stakeholder groups such as campers and the general Alberta population. To understand and be able to predict how segments of society or forest users will react to management actions a multivariate analysis that examines

variables influencing values and management preferences will be necessary. For example, are there certain socioeconomic variables, subtypes of users, or membership in certain stakeholder groups that are associated with value orientations or management preferences? Answers to these types of question will provide managers with information on the forest social values stakeholders regard as important and what management actions might be socially acceptable to particular segments of society.

While the analysis presented in this report provides information on what hunters think and feel about certain aspects of forests and forest management it does not include an examination of the link between industrial forestry activities and hunting activities. For example, if hunters do not support clear-cut logging do they avoid clear-cut areas when hunting? What effect does cut-block size or shape have on where people hunt? Future analysis will link the GIS data available through the Foothills Model Forest with the hunter data base in the current study to examine these types of questions.

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