Understanding all-terrain vehicle users: The human dimensions of ATV use on the island portion of Newfoundland and Labrador

by

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ABSTRACT

This research examined the underlying factors that influence the attitudes of ATV users toward the environment, as well as the biophysical and social impacts of the activity. The recreation specialization framework was also deployed to assess how the attitudes and management preferences of ATV users change at different levels of engagement in the activity. Quantitative questionnaires were randomly distributed to ATV users across 35 communities on the Burin Peninsula on the southeast coast of the island of Newfoundland. Results showed that the attitudes of ATV users were primarily driven by beliefs about the environmental and social outcomes of the activity, type of ATV use, social involvement in ATVing, riding frequency, and whether they reside in urban or rural communities. Findings also revealed that experienced ATV users were less likely to agree with the potential impacts of the activity, while novice participants exhibited more concern for the environment, and were more supportive of resource management intervention overall.

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Chapter 1: Thesis Overview

1.1 Introduction

In the opening session of the annual convention of the National Council for Geographic Education in 1964, William Pattison outlined what he considered to be the four traditions of geography. These traditions, which included spatial studies (e.g., spatial analysis and modeling), area studies (e.g., regional geography), earth sciences (e.g., physical processes), and human-environment relationships, now regularly appear in introductory geography textbooks, and are still considered cornerstones of the field today. The latter tradition, which was initially referred to as the man-land tradition (Pattison, 1964), has become particularly relevant for resource geographers who are interested in explaining how people interact with their environment and what motivates them to engage in certain behaviours. This type of geographic inquiry not only provides a better understanding of how people feel about resource use and conservation, but also encourages public involvement in the resource management decision-making process. This research followed this tradition by examining the relationship between all-terrain vehicle (ATV) users and the outdoor recreation environment on the island portion of the province of Newfoundland and Labrador. The study examined the attitudes, values and behavior of ATV users, and assessed their preferences for ATV-related management strategies. For the purpose of this research, an ATV is defined as a 3, 4 or 6-wheeled all-terrain vehicle, quad, or side by side designed for off-road use.

As in many parts of North America, ATV use in Newfoundland and Labrador is increasing on an annual basis (Canadian Dept. of Fisheries and Oceans, 2010). It is estimated that there are currently over 40,000 ATVs on the island portion of the province alone (CPAWS, 2011). In addition to being a popular recreational pursuit, ATVs are also commonly used in support of a variety of utilitarian and subsistence activities, such as hunting, trapping, firewood collection, berry picking, and mineral prospecting (Okihiro, 1997; Cadigan, 2003). Despite the prevalence of the machines, ATV use in Newfoundland and Labrador has received very little attention from the research community. Few studies have examined the ecological impact of ATVs (Catto, 2002; Newfoundland Marten Recovery Team, 2010; Letto, 2013; Van Viessen Trip & Wiersma, in review), and no documented research exists on the attitudes, preferences and behaviour of the individuals who operate them. This knowledge gap has perpetuated negative perceptions of the ATV community among the general public, and has made it difficult for public land managers to assess the effectiveness of current provincial ATV regulations. With average winter temperatures in Canada expected to increase as a result of global climate change (McBean, 2004), ATVs could soon replace snowmobiles as the recreational vehicle of choice in Newfoundland and Labrador. If resource management policies fail to reduce irresponsible or inappropriate ATV use, fragile ecosystems that have not traditionally been exposed to year-round ATV traffic could quickly become degraded (Irland et al., 2001). Thus, the current challenge facing public land managers is to mitigate the potential impacts of the activity while also meeting the recreational and subsistence needs of an ever-growing number of ATV users.

1.2 ATV use in Newfoundland and Labrador

As in most jurisdictions in Canada, ATV riding in Newfoundland and Labrador is regulated at the provincial level by the Department of Natural Resources. In 1994, an amendment was passed by the provincial government which restricted the use of ATVs to approved areas only. Under the Motorized Snow Vehicles and All-Terrain Vehicles Act (1990), approved areas include lands that are frozen and snow-covered, forested areas that are underlain by mineral soil, forestry and mineral access roads, beaches unless prohibited by the minister, and sanctioned trails constructed under license from the Department of Environment and Conservation. ATV riding is not permitted in wetlands, bogs, or across mossy barrens. Although these restrictions remain in effect for the general ATV ridership throughout the year, a provision made in 1999 allows hunters to transport game through restricted areas during the fall hunting season. Individuals who hold a big game license are permitted up to 5 ATV trips to transport an animal from where it was felled.

Following the 1999 amendment, which was perceived by many as a reversal, concerned citizen groups, including the Canadian Parks and Wildlife Society (CPAWS) and the Nature Conservancy, formed the Newfoundland and Labrador Public Lands Coalition. The primary goals of the partnership were to reduce "ATV abuse in wilderness areas" (CPAWS, 2013, http://cpawsnl.org/campaigns/public-lands-coalition) and preserve public lands in Newfoundland and Labrador which, at over 95%, has the most publicly-owned crown land of all the Canadian provinces (Murphy et al., 2009). Despite these goals, few studies have confirmed the environmental impact of ATVs in the province (Catto, 2002; Newfoundland Marten Recovery Team, 2010). Catto (2002) found that

dunes along the southwest coast of the island of Newfoundland had been significantly eroded by ATV users accessing beaches and practicing hill-climbs, while an additional study (Newfoundland Marten Recovery Team, 2010) reported that ATV traffic was responsible for damaging the dens of Newfoundland marten (*Martes americana atrata*), an emblematic and genetically distinct member of the weasel family that is listed as threatened under both the provincial Environmental Protection Act and the federal Species at Risk Act. More recent studies have examined the impact of ATVs on small mammals and vegetation on the Avalon Peninsula in eastern Newfoundland, however results have been inconclusive. Letto (2013) found that ATV trails had no effect on the abundance of shrews and voles adjacent to trails. Van Vierssen Trip and Wiersma (in review) reported that ATVs did affect vegetation; however impacts varied by vegetation community and were not correlated with traffic volume in the study area.

In addition to environmental impacts, ATV use has also resulted in social conflict in many parts of the province. A long-standing clash between ATV users and non-users in the community of Conception Bay South on the east coast of the island of Newfoundland was well-documented by the Canadian Broadcasting Corporation (CBC), and was only resolved when the provincial government pledged CDN$140,000 for the construction of a bypass trail to prevent ATV users from accessing a multi-use trail in town (Government of Newfoundland and Labrador, 2010). Negative perceptions of ATV use are further cultivated by print and television media, as well as ATV marketing campaigns. Stories about irresponsible and dangerous ATV use, including accidents and fatalities, are regularly covered by local news outlets, while headlines such as “Anecdotes of ATV

anarchy" (Telegram, 2007a), "ATVs are ruining bogs" (Telegram, 2007b) and "ATV abusers are ruining it for everyone" (Telegram, 2007c) are commonly featured in editorial and letters to the editor columns in local newspapers. In addition, ATV- related advertising in the province generally focuses on larger, more powerful machines, and often includes images of riders racing or performing manoeuvres in remote, rugged terrain.

Despite the negative coverage it receives, ATV use remains high on the island of Newfoundland, bolstered by a growth in disposable income (Statistics Canada, 2005), as well as an aging population that relies on the machines for mobility and backcountry access. In addition to providing riders with greater independence and self-sufficiency, ATV use has also been an economic boon for small communities and outfitters, and is increasingly being considered a potential source of revenue by the provincial government. Tourism promotion aimed at attracting visitors from mainland Canada and the United States has focused on the over 5000 km of motorized trails in the province (Newfoundland and Labrador Tourism, 2012), and in particular has encouraged use of T'Railway Provincial Park, which runs across the entire length of the island of Newfoundland (approximately 883 km) and has received over CDN$3 million in funding from various levels of government (T'Railways Association, 2012).

Given the multi-faceted and often-contentious nature of ATV use in Newfoundland and Labrador, complex and innovative resource management solutions are required. Understanding ATV use from the perspective of participants represents a first

step toward balancing the protection of natural resources with the increasing demand for recreational ATV use.

1.3 Research purpose and objectives

The purpose of this study was to identify and document the attitudes and management preferences of ATV users on the island portion of the province of Newfoundland and Labrador. Specifically, research focused on how different ATV users perceive the natural environment, the biophysical and social impacts of the activity, and current provincial ATV regulations, and how these attitudes influence their riding behaviour. This project is the first to assess Canadian ATV use from the perspective of participants, and had an additional applied goal of providing public land managers with ATV policy recommendations that not only correspond to the prevailing attitudes and preferences of ATV users in Newfoundland and Labrador, but also discourage environmentally depreciative behaviour.

In order to adequately explore ATV users in Newfoundland and Labrador, the following objectives and related research questions were examined:

1. Apply a cognitive hierarchy model to identify and document the attitudes of ATV users toward the environment, and the biophysical and social impacts of the activity.
    a. What are the baseline attitudes of ATV users toward the environment?
    b. How do ATV users perceive the environmental and social impacts of ATV riding?

c. What are the underlying factors that shape environmental attitudes among ATV users?

2. Apply the recreation specialization framework to develop a typology of ATV users on the island of Newfoundland.
    a. Are there within-group differences among ATV users on the island of Newfoundland?
    b. What factors contribute to within-group differences?
    c. How do within-group differences influence attitudes toward the environment?
3. Evaluate support or opposition to current provincial ATV regulations and management policies.
    a. What are the baseline management preferences of ATV users?
    b. Do ATV users differ in their support or opposition to ATV management preferences?
    c. What factors contribute to differences in management preferences?

1.4 Organization of the Thesis

This thesis has been presented in manuscript format to facilitate the dissemination of results in academic peer-reviewed journals. The 1st chapter provides an introduction and overview of the thesis, and identifies the overarching purpose and objectives of the research.

The following 3 chapters consist of stand-alone manuscripts. Chapter 2, entitled "The human dimensions of all-terrain vehicle us: Basic concepts, existing literature and

future research" is a review article intended for publication in the *Journal of Leisure Research*. The manuscript provides an introduction to the field of human dimensions of natural resource management and reviews relevant theories used in the study of outdoor recreationists. The manuscript also amalgamates key literature on off-highway vehicle (OHV) and ATV users, and traces the chronology of this body of work by summarizing the critical points and contribution of each piece. Results of these studies are compared and contrasted, and suggestions for future research are provided. The overall intent of this chapter is to situate the thesis within the existing literature on motorized recreationists and ATV users, and to provide the reader with a more in-depth understanding of the theoretical approaches utilized in the following two chapters.

Chapter 3 is a manuscript entitled "Factors influencing attitudes among all-terrain vehicle users on the island portion of the province of Newfoundland and Labrador, Canada." This research deployed the cognitive hierarchy model of human behaviour (Fulton et al., 1996; Vaske, 2008; Fishbein & Ajzen, 2010) to examine the underlying factors that influence the attitudes of ATV users toward the environment, and the biophysical and social impacts of their activity. Multiple regression analysis was used to assess the strength and relative contribution of a number of variables to the prediction of attitudes among ATV users. Reduced models in which groups of similar items were excluded from the regression analysis were also examined in order to test the differential effect of the predictor variables on explained variance. Results provide baseline data on the environmental attitudes of ATV users in Newfoundland and Labrador, and provide

insight into the prediction of corresponding behavior. The article has been submitted for publication in the *Journal of Outdoor Recreation and Tourism*.

The research article presented in chapter 4 has been accepted for publication in the journal *Leisure Sciences*, and is entitled "Recreation specialization among ATV users and its relationship to environmental attitudes and management preferences on the island Newfoundland." The purpose of this study was to identify and document the attitudes, perceptions and resource management preferences of ATV users through the recreation specialization framework (Bryan, 1977). K-means cluster analysis was used to classify subjects into discrete groups based on their similarity across a number of behavioral, cognitive and affective measures of involvement in ATV riding. Three distinct subgroups of ATV users were identified. Differences between groups with respect to environmental attitudes and management preferences were assessed using one-way analysis of variance (ANOVA). Findings document the spectrum of attitudes and preferences among ATV users in Newfoundland and Labrador, and demonstrate how these cognitions vary at different stages of participation in the activity.

The final chapter discusses the overarching conclusions of the thesis, highlights key findings, and integrates results into the existing literature on the human dimensions of OHV and ATV use that was presented in chapter 2. This section also addresses the limitations and challenges of this project, provides recommendations for ATV-related policies in Newfoundland and Labrador, and suggests future directions for research.

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Co-authorship Statement

This dissertation includes two manuscripts that were written in collaboration with another individual. For both manuscripts, the candidate independently prepared the research proposal, and was directly responsible for all phases of the research process. The candidate collected all data in the field, performed statistical analysis on the samples, interpreted results, and was the primary and corresponding author of both manuscripts. The co-author contributed to the planning phase of the project, and assisted with interpreting data and editing the manuscripts.

The first collaborative manuscript, entitled "Factors influencing attitudes among all-terrain vehicle users on the island portion of the province of Newfoundland and Labrador, Canada" was written in conjunction with Dr. Alistair Bath. The article has been submitted for publication in the *Journal of Outdoor Recreation and Tourism*.

The second manuscript, "Recreation specialization among ATV users and its relationship to environmental attitudes and management preferences on the island of Newfoundland" was also a collaborative effort with Dr. Alistair Bath, and has been accepted for publication in the journal *Leisure Sciences*.

Chapter 2: The human dimensions of all-terrain vehicle use: Basic theories, key literature and future research

2.1 Abstract

In many parts of North America, all-terrain vehicle (ATV) riding is a contentious issue. While some individuals perceive it to be environmentally destructive, others consider it a form of outdoor recreation, and/or depend upon it for subsistence hunting and resource extraction. Human dimensions in natural resource management is both an academic and applied field of inquiry that can assist resource managers in reconciling these opposing viewpoints. By assessing more than just public opinion, human dimensions research provides insight into the underlying cognitions that guide attitudes and corresponding behavior. This information can be used to formulate ATV policies that better correspond to the fundamental beliefs of ATV users, and thus promote compliance. In addition to providing an introduction to the field of human dimensions of natural resource management, this research summary reviews theoretical approaches used in the field, assesses the current nature of ATV research studies, identifies clear knowledge gaps, and proposes suggestions for future research.

2.2 Introduction

The all-terrain vehicle (ATV) had yet to be invented when Aldo Leopold (1949) lamented the "retreat of the wilderness under the barrage of motorized tourists" (p. 166) in the late 1940s, however his sentiment is as relevant today at it was over 60 years ago. Like the automobile before it, the ATV has been much derided by environmentalists, mass media outlets, and the scientific community for conveying "mechanized man"

(Leopold, 1949, p. 43) into pristine natural areas where the very presence of motorized vehicles is considered inappropriate and potentially destructive. Critics have been increasingly outspoken since the early 1970s when use of the machines was merely regarded as a growing problem for resource managers (Dunn, 1970). Since then, ATVs have been branded as "awful" (Hope, 1970, p. 36), "destructive" (Wilkinson, 2000, p. 26), and a "damnable nuisance" (Stark, 1985, p. 84). More fervent opponents have referred to ATV-related recreation as "thrill-craft abuse" (Smith, 2000, p. 10), and have heralded it as "the end of American wilderness" (Sherwood, 1985, p. 197). Notwithstanding these persistent, and often harsh, condemnations, recreational ATV use has increased in many parts of North America and shows no signs of slowing (Cordell et al., 2005). The continued popularity of the activity, combined with the vehemence of its opponents, has made ATV use one of the most significant recreation-related issues facing resource managers today (Havlick, 2002; Holsman, 2004; Wilson, 2008).

Although the conflict surrounding ATV use is largely socio-political in nature (Havlick, 2002; Stoddart, 2011), the majority of research on the activity has focused solely on the ecological impact of the machines on wildlife, soil, air quality, water, and vegetation (Ross, 1991; Wisheu & Keddy, 1991; Melvin et al., 1994; Charman & Pollard, 1995; Rodgers & Smith, 1997; Yosef, 2000; Catto, 2002; Priskin, 2003; Durbin et al., 2004; McGowan & Simons, 2006; Zielinski et al., 2008; Naylor et al., 2009; Wilkerson & Whitman, 2009). Few studies have attempted to understand the ATV user from a social science perspective (Barker & Dawson, 1997; Mann & Leahy, 2009, 2010). The frequent emphasis on biophysical impacts, coupled with a lack of information on the human

dimensions of ATV use, has fuelled speculation among concerned citizen groups and the general public that individuals who participate in ATV riding are not concerned about the environmental effects of the activity (PAANL, 2007; Telegram, 2007a,b,c; CPAWS, 2013). Despite this view, little is known about how ATV users perceive the natural world, and whether these attitudes have an impact on how or why they ride. Incorporating social science research into ATV management can help address negative stereotypes of ATV users, and can also aid in the development of outdoor recreation policies that mitigate the potential consequences of the activity while concomitantly meeting the needs of a broad range of ATV enthusiasts.

2.2.1 Human dimensions of natural resource management

Though most often associated with human-wildlife issues, *human dimensions in natural resource management* or simply, *human dimensions*, is both an academic and applied field of inquiry that can assist managers in reconciling the growing demand for outdoor recreation with environmental protection (Manfredo, 2008). Human dimensions research is the study of human attitudes, values, preferences and behaviours as they relate to wildlife and natural resources (Gigliotti & Decker, 1992; Manfredo et al. 2009). One of the primary objectives of the field is to identify prevailing patterns of belief among individuals and interest groups who affect, and are in turn affected by, resource-related issues (Bath, 1996; Bauer et al., 2010). This information is crucial if resource managers wish to formulate outdoor recreation policies that are in line with the core beliefs and values of their constituency. Policies and regulations that are sensitive to the fundamental beliefs of citizens are more likely to meet with public approval, and are thus more

successful in reducing controversy and conflict, as well as the need for restrictive, and often costly, conservation enforcement strategies (Jakes et al., 1998; Bauer et al., 2010).

While it is rarely possible to satisfy everyone, human dimensions research can assist managers with identifying the emotional spectrum of an issue, that is the attitudes and preferences of a wide range of individuals and interest groups that are impacted by, or ascribe value to, a particular natural resource (Bath, 1989). The goal is not necessarily to reach consensus among stakeholders, but rather to encourage public input on the development of options and alternatives that represent "a range of more or less acceptable management objectives" (Decker & Chase, 1997, p. 789). Through public involvement and participatory decision-making, human dimensions research provides managers with assurance that they are implementing the best possible long-term solutions to contentious resource-related issues (Bath & Enck, 2003; Bauer, 2010).

As ATV use is one of the most popular, yet divisive recreational activities in North America (Havlick, 2002; Wilson, 2008), innovative resource management strategies are required. Integrating human dimensions research into the decision-making process is fundamental to developing policies that not only reflect the needs and wants of a wide variety of ATV enthusiasts, but also achieve conservation objectives. The purpose of the following research summary is to provide an overview of the field of human dimensions in natural resource management from both theoretical and applied perspectives. The first section introduces basic concepts and outlines a number of relevant theoretical approaches used in the field. The second section highlights the applied aspect of the discipline by summarizing key literature on the human dimensions of motorized

recreation and ATV use. Results of these studies are compared and contrasted, and recommendations for future research are provided.

2.3 Environmental attitudes and behaviour

The association between environmental attitudes and behaviour has been a primary focus of leisure and recreation researchers since the 1960s (Manning, 1999). Several theories from the fields of social psychology and human dimensions have been incorporated into outdoor recreation research in order to better understand the underlying cognitions that guide human behaviour (Fishbein, 1963; Fishbein & Ajzen, 1975; Manfredo, 1989; Fulton et al., 1996). *Cognitions* are thought processes and affective assessments that individuals use to make sense of a situation (Vaske et al., 2011). Cognitive components consist of values, beliefs, attitudes, social norms, and behavioural intentions. The *cognitive hierarchy model of human behaviour* (see Figure 2.1) describes the relationship between these constituent parts as an interdependency in which one component builds upon another in the manner of an inverted pyramid (Fulton et al., 1996). While each cognitive component can be analyzed individually, it is their interrelationship that provides the greatest insight into the prediction and possible modification of human behaviour (Bright et al., 1993).

According to the cognitive hierarchy theory, *values* are defined as "abstract cognitions that are concerned with […] desirable end-states and modes of conduct" (Fulton et al., 1996). In essence, values are the central component of personal identity; they represent an individual's most basic aspirations and desires (Vaske et al. 2011). Common values are culturally ingrained and, as such, remain largely intact throughout an

individual's lifetime. Though similar to attitudes, values are unique in four respects: (1) they are limited in number, (2) they remain constant in spite of changing situations and issues, (3) they represent a standard against which attitudes and behaviour are measured, and (4) they are at the core of an individual's belief system (Rokeach, 1973; Vaske & Donnelly, 1999). Values are the most essential component of the cognitive structure, and form the foundation for the linkage between beliefs, attitudes, norms, intentions and behaviours.

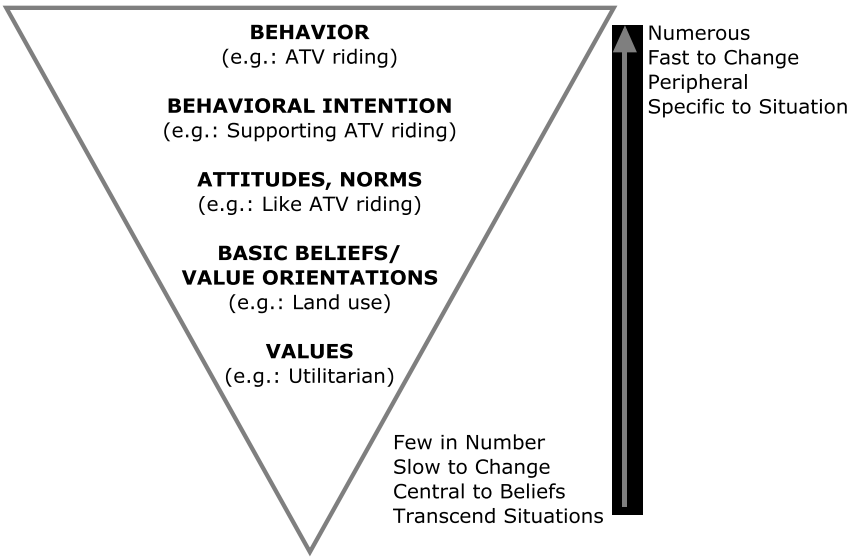

Figure 2.1. The cognitive hierarchy model of human behaviour (Adapted from Vaske & Donnelly, 1999).

While values are cultural constructions that tend not to vary among individuals belonging to the same social or ethnic group, *beliefs* are the manifestation of an individual's perception of themselves, the environment, events, objects and other people (Fishbein & Ajzen, 1975). Basic beliefs are synonymous with ideology in that they constitute a person's comprehensive vision of the world (Teel & Manfredo, 2009). In this

sense, beliefs reinforce and provide contextual meaning to fundamental values (Fulton et al., 1996). According to the *theory of reasoned action*, beliefs are central to the formation of attitudes, which, along with social norms, shape behavioural intentions and subsequent behaviour (Fishbein & Ajzen, 1975). Behavioural beliefs consist of two constituent parts: the outcome belief and the outcome evaluation (Armitage & Christian, 2004). By gathering information about a specific behaviour through observation, inference, or first-hand experience, an individual forms an outcome belief based on the probability that a particular result will occur (e.g., riding an ATV through a muddy area will cause ruts). The outcome evaluation is an affective assessment of the result (e.g., liking or disliking ruts) and ultimately determines whether the associated belief is perceived to be favorable or unfavorable. Behavioural beliefs that are closely aligned with personal values are considered salient (Armitage & Christian, 2004). While an individual can assign multiple beliefs to a particular object, only those that are the most salient contribute to the formation of attitude and corresponding behavioural intention (Ajzen & Driver, 1991). This relationship has been explored in the context of natural resource management where basic beliefs and corresponding attitudes were used to predict participation in hunting, wildlife viewing and non-wildlife related recreation (Daigle et al., 2002). Beliefs have also been used to assess support for proposed moose hunting policies (Donnelly & Vaske, 1995) and intended voting behaviour toward a controversial wolf reintroduction plan (Bright & Manfredo, 1996).

The *theory of wildlife value orientations* builds upon the theory of reasoned action by positing that basic beliefs are ultimately what underlie attitudinal differences among

individuals (Vaske et al., 2011). Networks of basic beliefs give rise to the formation of overarching *value orientations* which can be used to determine an individual's stance on human-environment relationships (Teel & Manfredo, 2009). Although individuals might share common values, they may exhibit different value orientations (Teel & Manfredo, 2009). For example, two people might highly value the ethical treatment of fur-bearing animals. The first individual might equate this value with not trapping animals at all, while the second person might interpret it to mean that fur-bearing animals should only be trapped in a humane manner. To reflect this disparity, value orientations are often depicted as a bipolar continuum with utilitarian or anthropocentric views at one end, and protectionist or biocentric views at the other (Zinn et al., 2002). Two key points of the anthropocentric value orientation are that the natural world exists for unlimited human consumption, and science and technology are capable of solving any ecological issue that may arise (Geller & Lasley, 1985). Conversely, the biocentric value orientation, which emerged out of the environmental movement of the 1970s, supports the view that humans must live in balance with the natural world. The centre of the biocentric-anthropocentric continuum represents the convergence of both viewpoints (Vaske & Donnelly, 1999). According to the cognitive hierarchy model, value orientations provide the framework for attitudes, which subsequently regulate behavioural intention and overt behaviour (Manfredo et al., 2003; Vaske, 2008). Value orientations have been used to assess environmental attitudes and support for forest management practices among campers and hunters (McFarlane & Boxall, 2000), and have also been deployed in a variety of studies that have explored the diversity of attitudes that exist toward wildlife and conservation

policies (Fulton et al., 1996; Vaske & Donnelly, 1999; Bright et al., 2000; Zinn et al., 2002; Manfredo et al., 2003; Teel & Manfredo, 2009; Vaske et al., 2011).

In order to predict, and ultimately understand, human behaviour, it is first necessary to assess *attitudes* toward the behaviour in question (Fishbein & Ajzen, 2010). Fishbein and Ajzen (2010) define attitude as a "tendency to respond with some degree of favorableness or unfavorableness to a psychological object (p. 76)." According to the cognitive hierarchy model and the theory of reasoned action, whereas values and beliefs merely guide attitudes, attitudes exert a direct influence on behaviour (Vaske, 2008; Fishbein & Ajzen, 2010). For this reason, attitudes have become one of the most frequently studied cognitive components among the social science disciplines (Vaske, 2008). Similar to beliefs, attitudes consist of two separate, but interconnected dimensions: the affective and the cognitive. While the affective dimension pertains to liking or disliking an object, person, or activity, the cognitive dimension is based on any number of beliefs about the subject matter which may or may not be factually accurate (Fishbein & Ajzen, 2010). Both dimensions are integral to the accurate prediction of behaviour. For instance, a cognitive belief that ATV riding is dangerous may generate different attitudes depending on whether the danger is negatively or positively evaluated. A negative evaluation of ATVing could be caused by a fear of being injured; however, a positive evaluation would result if an individual is excited by the potential danger of the activity. Despite sharing cognitive beliefs, the first individual would have a negative overall attitude toward ATV riding, while the second would perceive it as being generally positive.

In addition to understanding both the affective and cognitive aspects of attitudes, attitude-behaviour correspondence also increases with greater measurement specificity. Measurement specificity refers to the strength of the correlation between the variables used to measure attitude and the behaviour of interest (Fishbein & Ajzen, 1980). According to Ajzen & Fishbein (2010), the predictive validity of attitude increases when an intended behaviour is assessed according to the following four elements: *action* (e.g., ATV riding), *target* (e.g., on a particular ATV trail), *context* (e.g., in Newfoundland and Labrador), and *time* (e.g., over the past 12 months). Each of these behavioural factors can be defined in terms of either general or specific attitudes, depending on the research objective (Ajzen & Fishbein, 2010). In the context of resource management, *general attitudes* relate to broad beliefs about the environment (i.e., limitations to population growth, human dominance over nature, the intrinsic value of natural areas etc.), and might be used to predict such conservation behaviours as recycling and participating in voluntary clean-up efforts (Nord et al., 1998; Oh & Ditton, 2008). Conversely, *specific attitudes* have a direct correspondence with a particular behaviour (e.g., ATV riding through a wetland area along a specified trail). As this description implies, general attitudes are related to general behaviours, while specific attitudes correspond to specific behaviours (Tarrant et al., 1997). In addition to being more managerially relevant, specific measures of attitude also tend to be stronger and therefore more reliable predictors of behaviour than general measures (Fishbein & Manfredo, 1992; Bright & Manfredo, 1995).

Attitude accessibility, or the ability to retrieve an attitude from memory, is also postulated to increase environmental attitude-behaviour correspondence (Fazio et al., 1989; Fishbein & Ajzen, 2010). According to the *process model of attitudes*, attitudes influence perceptions, which ultimately govern behaviour (Fazio & Williams, 1986; Manfredo et al., 1992). Fazio et al. (1989) define perception as an "individual's current feelings about, or appraisal of, the object as experienced in the immediate situation" (p.280). The relationship between attitudes and perceptions is moderated by attitude accessibility, which is itself regulated by experience with and exposure to the attitude object (Fazio et al., 1989). Attitudes formed through first-hand experience are stronger and more accessible than those formed through observation or inference (Fazio et al., 1982). Repeated exposure likewise increases attitude accessibility by reinforcing the association between the object and the positive or negative attitudes expressed toward it. Attitude accessibility has been shown to improve the prediction of behaviour related to voting (Fazio & Williams, 1986) and consumer product selection (Fazio et al., 1989). In the context of recreation research, Manfredo et al. (1992) found that individuals with more accessible attitudes exhibited both stronger attitudes and greater attitude-intention consistency toward supporting prescribed burn policies.

When attitudes are either weak or inaccessible, attitude-behaviour correspondence can be increased by examining social norms, which are considered a parallel construct to attitudes (Vaske, 2008). The predictive capability of the theory of reasoned action has been shown to increase with the addition of subjective norm, which is the perception that peers or referent groups approve or disapprove of a particular behaviour (Ajzen &

Fishbein, 1969). Fundamental to the subjective norm is an individual's motivation to comply with prevailing societal beliefs. An individual's motivation to comply with the subjective norm is proportional to the social pressure put forth by referents (Armitage & Christian, 2004). Although attitude and subjective norm work in tandem to form behavioural intention, the relative significance of each construct differs among individuals, and also varies between behaviours (Ajzen, 2001). For example, attitudes were found to be significantly more important than social norms in predicting intentions to camp among males; while females were more likely to be influenced by the opinions of "important others" (Young & Kent, 1985, p.99).

As indicated by the cognitive hierarchy model and the theory of reasoned action, the direct antecedent to overt behaviour is behavioural intention (Fishbein & Ajzen, 1975). *Behavioural intention* is essentially a measure of motivation, that is, the amount of time and energy an individual is willing to expend on a given behaviour (Ajzen, 1987). The predictive validity of intention largely depends on three factors: (1) the accuracy of the correlation between intention and behaviour (2) the stability of the intention/behaviour relationship over time, and (3) the extent to which carrying out the intention is within the volition of the individual (Madden et al. 1992). Although the theory of reasoned action has proven effective in predicting social behaviours that involve a conscious choice or decision, such as supporting manatee conservation in Florida (Aipanjiguly et al., 2003) or large carnivore reintroduction in Yellowstone National Park (Bath, 1989; Bath & Buchanan, 1989), it is not a sufficient measure of more complex behaviours in which some factors are, or are perceived to be, beyond an individual's

control. The *theory of planned behaviour* was developed by Ajzen (1987) in order to account for behaviours that are non-volitional, such as camping, hunting or ATV riding. A behaviour is deemed non-volitional when external constraints or a lack of required resources impedes participation in the activity. Although the theory of planned behaviour is not concerned with actual control, it hypothesizes that an individual's perception of control over a given situation contributes to the subsequent expression of an intended behaviour (Ajzen, 1987). According to the theory of planned behaviour, perceived behavioural control is directly related to an individual's estimation of their ability to exert control over an outcome. Factors that affect perceived behavioural control include resources such as time, money, and skill level (Rossi & Armstrong, 1999). The greater an individual's perception of behavioural control, the more likely he or she is to achieve an intended behaviour (Madden et al., 1992). In the context of outdoor recreation research, the theory of planned behaviour has been used to measure hunting intentions and behaviour (Rossi & Armstrong, 1999; Hrubes et al., 2001), leisure recreation participation (Ajzen & Driver, 1991), boater speed compliance in manatee protection zones (Jett et al., 2009), and depreciative behaviour among off-highway vehicle (OHV) users (Kuehn et al., 2011).

As demonstrated through the cognitive hierarchy model of human behaviour and its associated theories, understanding the attitudes of recreationists can assist researchers in anticipating and influencing behaviour, and can also be used to identify and defuse potentially contentious situations before they occur. Perhaps most relevant to outdoor recreation research is the prediction of potentially destructive behaviours. If the beliefs

and attitudes that lead to this type of behaviour can be isolated, they can then be theoretically controlled or altered by effective resource management strategies (Aipanjiguly et al., 2003; Teel & Manfredo, 2009).

2.3.1 Environmental attitudes and outdoor recreation participation

Outdoor recreation is defined as "voluntary participation in free-time activity that occurs in the outdoors and embraces the interaction of people with the natural environment" (Plummer, 2009). In the context of environmental attitude-behaviour correspondence, outdoor recreation is a complex social phenomenon that provides the opportunity for individuals to express their moral and ethical values toward the environment in an overt manner (Jensen & Guthrie, 2006). This concept is explored in the *Dunlap-Heffernan thesis*, which represents a departure from the previously discussed theories in its use of behaviour as an indicator of values and attitude rather than the reverse. Specifically, the Dunlap-Heffernan thesis suggests that a positive correlation exists between outdoor recreation participation and an individual's level of environmental concern (Dunlap & Heffernan, 1975). Environmental concern relates to the cognitive assessment of ecological issues, and also incorporates attitudes toward management policies (Geisler et al., 1977). The thesis contends that individuals who actively participate in outdoor activities are more aware of environmental issues, and are therefore more likely to engage in pro-environmental behaviours.

The Dunlap-Heffernan thesis is based on three separate hypotheses:

1) *Participation in outdoor recreation is positively associated with environmental concern.*

2) *The level of environmental concern is higher among individuals who participate in appreciative activities, and lower among those who participate in consumptive activities.*
3) *Individuals who participate in outdoor recreation are more concerned with protecting elements of the environment that are directly associated with their activity, and are less concerned with global environmental issues.*

The first hypothesis is based on the notion that individuals who participate in outdoor activities become more attuned to the natural environment and subsequently develop greater reverence for undeveloped wilderness (Dunlap & Heffernan, 1975). Frequent and prolonged exposure to natural areas through outdoor recreation also increases the likelihood of an individual being exposed to signs of environmental destruction. According to the first hypothesis, degradation of a recreation site not only interferes with an individual's enjoyment of the activity, but also constitutes a blatant disregard for the value that he or she ascribes to the location in which it is conducted. Thus the more invested an individual is in outdoor recreation; the more opposed they are to environmental deterioration (Dunlap & Heffernan, 1975).

Hypothesis number 2 concerns the impact of outdoor recreation type on level of environmental concern. In their initial research, Dunlap and Heffernan (1975) classified outdoor pursuits according to two broad categories: *appreciative* and *consumptive*. Appreciative activities are closely associated with a biocentric perspective which emphasizes maintaining the integrity of the landscape. Individuals who engage in appreciative activities, such as hiking, wildlife-watching, nature photography, and

camping, tend not to alter the environment while participating in their activity, and are therefore presumed to have higher levels of environmental concern (Dunlap & Heffernan, 1975). In contrast, consumptive activities are associated with an anthropocentric value orientation in which resources are either modified or removed from the environment (Dunlap & Heffernan, 1975). Recreationists who participate in consumptive activities like hunting and fishing are postulated to have a lower level of environmental concern. Although not specifically measured in their study, Dunlap and Heffernan (1975) also referred to a third category, termed *abusive* or *exploitive*, to account for activities which have the potential to cause significant ecological damage, such as snowmobiling and ATV riding. Based on the results of a previous study by Knopp & Tyger (1973) in which cross-country skiers were found to have more positive environmental attitudes than snowmobilers, it was proposed that abusive activities are negatively associated with environmental concern such that participants demonstrate no regard for the environment whatsoever (Dunlap & Heffernan, 1975).

Dunlap and Heffernan's (1975) third hypothesis suggests that individuals are more concerned with protecting the environment in which they recreate, than with more general conservation issues, such as air and water pollution. For example, individuals who participate in camping or hiking have stronger attitudes toward forest protection than toward the preservation of endangered species (Dunlap & Heffernan, 1975). This finding supports hypothesis 3 by suggesting that recreationists are more affected by, and therefore more concerned with, environmental issues that have a direct bearing on their chosen activity. Thus, while the presence of endangered species might be crucial for wildlife-

watchers or nature photographers, a satisfactory camping or hiking experience is more contingent on having an intact forest than on observing wildlife (Dunlap & Heffernan, 1975).

Prior to the introduction of the Dunlap-Heffernan thesis, the majority of recreation research focused on attitudes and values as independent variables that influence human behaviour (Dunlap & Heffernan, 1975). The hypotheses outlined above suggest instead that behaviour, in this case outdoor recreation participation, determines human values and attitudes toward the environment. Dunlap and Heffernan (1975) rationalized this approach by noting that outdoor recreation preceded the concept of environmental concern, and could therefore not have been a product thereof. This notion was partially substantiated following their 1975 study in which they found considerable support for the second and third hypotheses, but only weak support for the first. Studies by Geisler et al. (1979) and Pinhey & Grimes (1979) were likewise unsuccessful in confirming a significant relationship between outdoor recreation and environmental attitude and instead found that socio-demographic indicators such as age, occupation and income were better predictors of environmental concern. Although more recent studies have corroborated Dunlap and Heffernan's initial research with respect to the second and third hypotheses, support for the first hypothesis remains weak (Van Liere & Noe, 1981; Jackson, 1986). Thus, while findings have generally shown that values and attitudes do play a role in outdoor recreation participation, it is unclear how, or if, they are related to environmental concern.

Due to the lack of correspondence between outdoor recreation participation and environmental attitudes, researchers began using the Dunlap-Heffernan thesis to measure pro-environmental behaviour, which is considered a stronger indicator of environmental concern than attitude alone (Theodori et al., 1998). This differs significantly from both the cognitive hierarchy model and the theories of reasoned action and planned behaviour in that one behaviour (e.g., outdoor recreation participation) is used to predict a subsequent behaviour (e.g., pro-environmental behaviour). Pro-environmental behaviours include a broad range of activities that support environmental protection and conservation, such as donating time or money to conservation organizations, purchasing environmentally-friendly products, reducing the application of lawn chemicals, and attending public hearings on environmental policy (Nord et al., 1998). It has been suggested that outdoor recreation results in the development of pro-environmental behaviour without necessarily contributing to an overall attitude of environmental concern (Theodori et al., 1998). Recent studies have shown renewed support for the first and second hypotheses of the Dunlap-Heffernan thesis following the substitution of environmental concern with pro-environmental behaviour (Nord et al., 1998; Theodori et al., 1998; Teisl & O'Brien, 2003).

Despite the attention it has received from recreation researchers, results of the Dunlap-Heffernan thesis have often been weak or inconsistent. This has been attributed to issues with the thesis itself which are largely methodological in nature (Geisler et al., 1977; Theodori et al., 1998; Berns & Simpson, 2009). The first challenge concerns the classification of activities into the appreciative, consumptive, and abusive categories.

Geisler et al. (1977) noted that an inherent drawback of the appreciative-consumptive-abusive trichotomy is the considerable overlap that exists between recreational activities. For example, camping is often classified as an appreciative activity despite the fact that some aspects of the practice, such as digging latrines and removing firewood from the landscape, constitute an environmental impact. Theodori et al. (1998) likewise acknowledged the inherent ecological impacts of all forms of outdoor recreation, and instead preferred to describe activities as being either *appreciative to slight resource-utilization* or *moderate-to-intensive resource-utilization*. Other researchers have elected to retain Dunlap and Heffernan's appreciative and consumptive categories, while replacing the term "abusive" with either "mechanized" or "motorized" (Jackson, 1986; Thapa & Graefe, 2009). The lack of consensus regarding the classification system has made it difficult to compare results over time and between study locations, and has called into question the theoretical rigor of the Dunlap-Heffernan thesis overall.

Another methodological challenge facing the Dunlap-Heffernan thesis is the fact that individuals seldom participate in one single outdoor activity. Most partake in several different activities, often in the same day (Geisler et al., 1977). It is also possible for one individual to be an active participant in appreciative, consumptive, and abusive activities simultaneously. For instance, Jackson (1986) found that 167 of his respondents participated in cross-country skiing (appreciative to slight-resource utilization), 67 participated in snowmobiling (abusive/mechanized or moderate to intensive resource utilization), and 24 participated in both activities. In order to accurately test the second hypothesis (i.e., *the level of environmental concern is higher among individuals who*

participate in appreciative activities, and lower among those who participate in consumptive activities), only individuals participating in cross-country skiing *or* snowmobiling need be included in the analysis. Teisl and O'Brien (2003) also recognized this issue and developed a method whereby respondents were categorized according to four levels of participation. Using the same example as above, respondents were identified as being either non-participants, cross-country skiers, snowmobilers, or participants in both activities. Despite appearing relatively straightforward, Teisl and O'Brien (2003) assessed participation in 10 separate activities, of which the majority of respondents had participated in at least 4. Thus, in order to ensure that only the most relevant respondents were included in each data set, a single individual was included as a participant in some analyses, but appeared as a non-participant in many others. Although this methodology addressed the issue of multiple-activity participation, the data analysis procedure was extremely labor-intensive, and generated results that were only moderately more significant (Teisl & O'Brien, 2003).

The mixed results of the Dunlap-Heffernan thesis reinforce the notion that outdoor recreation participation is a complex behaviour that requires a high level of analytic specificity. Despite being theoretically appealing, assessing multiple outdoor activities at once creates methodological challenges that could obscure the nature of the relationship between environmental attitudes and outdoor recreation participation. Rather than focusing on different types of recreationists, exploring the differences that exist between individuals who participate in the *same activity* has been proposed as a viable alternative to the Dunlap-Heffernan thesis (Van Liere & Noe, 1981; Thapa & Graefe, 2009).

Recreation specialization is one such approach that has received considerable attention from recreation researchers since the late 1970s (Bryan, 1977; Scott & Shafer, 2001). In addition to being conceptually straightforward, recreation specialization expands upon the attitude-behaviour relationship by examining how environmental attitudes vary at different stages of involvement in a particular activity.

2.3.2 Recreation specialization

Hobson Bryan of the University of Alabama initially proposed the recreation specialization framework in 1977 after observing attitudinal and behavioural differences among recreational trout fishermen in the northeastern United States. In particular, he noted that experienced anglers exhibited more dedication and behavioural commitment to the sport, and also displayed more reverence for undisturbed natural settings. In addition to providing a measure of current involvement in an activity, Bryan (1977) also conceptualized recreation specialization as a developmental process in which individuals progress to more advanced levels of engagement as they develop skills and gain practical experience (Scott & Shafer, 2001). The progression from beginner to expert is primarily governed by cognitive factors such as knowledge and skills. As recreationists become more specialized through education or practice, their behavioural and psychological attachment to the activity also increases (Manning, 1999). Based on this notion, Bryan (1977) defined recreation specialization as "a continuum of behaviour from the general to the particular, reflected by equipment and skills used in the sport, and activity setting preferences" (p. 175). At one end of the continuum are beginners, who participate infrequently and have no particular location or equipment preferences. Avid participants,

who spend more time engaged in the activity and have more specific setting requirements, occupy the opposite end of the spectrum (Bryan, 1977; Needham et al., 2007). The placement of individuals along the continuum not only provides insight into the stages of involvement of a particular activity, but also accounts for the variation that exists among recreationists with respect to their motivations, preferences, attitudes, and behaviour.

In order to reveal within-group variability, the recreation specialization continuum is generally applied in the form of a typology, or classification system, whereby individuals are arranged into groups on the basis of their style of participation. While Bryan's initial typology of trout fishing included 4 levels of specialization, which he referred to as *occasional fishermen*, *generalists*, *technique specialists*, and *technique setting specialists*, 3 general stages of involvement have emerged from the literature: *novice*, *establishment* and *specialization* (Bryan, 1977; Scott & Shafer, 2001). Despite not having specific site or equipment requirements, *novice* participants are primarily motivated by achieving broad goals that require neither frequent participation, nor technical expertise (Bryan, 1977; Needham et al., 2007). The activity is unlikely to be a central life interest for a beginner, and may instead be just one of many in which he or she participates. In contrast, an individual at the *establishment* stage of participation dedicates more time and effort to the activity in order to gain sufficient competence to reach important milestones (Scott & Shafer, 2001). For example, established birders might aspire to identify birds by song, while running a particular class of rapids might be a target objective for established kayakers. In the third stage of involvement, *specialization*, participants are no longer concerned with meeting specific goals, but rather consider the

activity a fundamental component of their identity (Bryan, 1977). In particular, the specialized level of involvement is characterized by focused dedication to the activity, often at the expense of other hobbies or pastimes (Scott & Shafer, 2001). Further, specialized recreationists exhibit higher levels of activity-related knowledge, technical ability, and financial investment in their chosen pursuit, and also display more attachment to the recreation setting (Bryan, 1977; Needham et al., 2007). For this reason, specialized recreationists are more likely to support conservation initiatives than novice or established participants (Virden & Schreyer, 1988; Ditton et al., 1992). As the above stages of involvement illustrate, recreation specialization entails "a general change, over time, from consumption to preservation, doing the activity for its own sake, and an accentuation on the quality of experience" (Scott & Shafer, 2001, p. 324).

The recreation specialization framework has been used to categorize and assess within-group differences among a variety of traditional recreational pursuits, including *angling* (Bryan, 1977; Chipman & Helfrich, 1988; Ditton et al., 1992; Salz et al., 2001; Salz & Loomis, 2005; Beardmore et al., 2013; Oh et al., 2013), *camping* (McIntyre & Pigram, 1992; McFarlane, 2004), *hiking and mountaineering* (Virden & Schreyer, 1988; Dyck et al., 2003), *bird watching* (McFarlane 1994; Hvenegaard, 2002; Scott & Thigpen, 2003; Lee & Scott, 2004), *hunting* (Kuentzel & Heberlein, 1992; Needham et al., 2007; Needham & Vaske, 2013; Schroeder et al., 2013), *SCUBA diving* (Thapa et al., 2005; Thapa et al., 2006) and *boating* (Wellman et al., 1982; Kuentzel & McDonald, 1992; Bricker & Kerstetter, 2000). The concept has also been applied in leisure and tourism research to measure recreation specialization among nature tourists (Scott & Thigpen,

2003), heritage tourists (Kerstetter et al., 2001), bridge players (Scott & Godbey, 1994) and online gamers (Wu et al., 2013). Relatively few researchers have examined the diversity that exists between individuals who participate in motorized forms of outdoor recreation (Donnelly et al., 1986; Jett et al., 2009), and only one study has attempted to segment OHV users specifically (Smith et al., 2010).

Despite being a widely-applied theoretical approach, there has been a general lack of consensus among researchers about how best to assess recreation specialization (Scott & Shafer, 2001). Although single-item approaches have been utilized (Ditton et al., 1992), the specialization construct is most often treated as a multi-dimensional index comprised of behavioural, cognitive and affective components (Scott & Shafer, 2001; McFarlane, 2004; Needham et al., 2007). The *behavioural dimension* measures past experience and economic investment in an activity (Chipman & Helfrich, 1988), while the *cognitive dimension* evaluates knowledge of the activity, as well as self-assessed skill level (Donnelly et al., 1986; Thapa et al., 2006). Lastly, the *affective dimension* focuses on the personal importance of the activity, as well as the centrality of the activity to an individual's lifestyle (Virden & Schreyer, 1988; Ditton et al., 1992; McIntyre & Pigram, 1992). Various combinations of the above dimensions have appeared either a single additive index or as several multi-item indexes to empirically assess differences among recreationists.

In addition to inconsistency in the number of dimensions used to conceptualize the construct, there has also been a lack of agreement on whether one combined or several separate indexes are more appropriate for analyzing recreation specialization (McFarlane,

2004). Use of a single additive index involves situating individuals along the specialization continuum by summing their standardized scores for each of the dimensions outlined above. Low scores correspond to novice participants, while high scores are associated with specialists. The index is subsequently used as a continuous variable (Wellman et al., 1982; Virden & Schreyer, 1988) or is divided into discrete groups (i.e., halves, thirds, or quartiles) to represent the various levels of low, medium, or high specialization (Salz et al., 2001; Dyck et al., 2003; Scott et al., 2005; Smith et al., 2010). Although methodologically straightforward, the additive approach introduces researcher bias into the classification process through the use of subjective cut-points, and has also been criticized for obscuring the relative contribution of each dimension to the overall index (Lee & Scott, 2004; Needham et al., 2007). According to Scott & Shafer (2001), the assumption that all 3 dimensions positively covary oversimplifies the progression of a recreationist from beginner to expert. Although the focused, expert behaviour of a specialist might be considered a model for novice participants, relatively few individuals will achieve this level of proficiency (Bryan, 1977; Wellman et al., 1982). External constraints such as career and family commitments, as well as a lack of time or financial resources often prevent participants from advancing in the linear "lock-step fashion" initially proposed by Bryan (Scott & Shafer, 2001). Further, some individuals may be frequent participants in an activity, but demonstrate relatively little knowledge or skill development, while others might participate sporadically, but display high levels of knowledge and skill (Lee & Scott, 2004). By analyzing each dimension separately, the multi-item index takes into consideration this variability and prevents the specialization construct from being weighted too heavily by any one dimension (Kuentzel & McDonald,

1992; Lee & Scott, 2004). Although the multiple index method does provide insight into the differential effects of each dimension, this overall approach represents a fundamental shift away from the recreation specialization framework, which was initially conceptualized by Bryan (1977) as a composite measure of behavioural, cognitive, and affective involvement in a particular activity.

Cluster analysis, a multivariate statistical technique, has been proposed as an alternative means of classifying subjects into discrete groups based on their similarity across all 3 specialization dimensions (McFarlane, 1994; Lee & Scott, 2004). The procedure uses algorithms to assign individuals to coherent subgroups in which members are more similar to each other than to those belonging to other clusters (Lorr, 1983). In addition to being well-suited to large sample sizes (Lee & Scott, 2004), cluster analysis takes into account the multi-dimensionality of the specialization construct, does not assume that dimensions covary, and introduces less researcher bias into the assignment of recreationists to specialization groups (Scott & Thigpen, 2003; Scott et al., 2005). Cluster analysis has been used to segment anglers (Chipman & Helfrich, 1988), campers (McIntyre and Pigram, 1992), hunters (Needham et al., 2007) and bird watchers (McFarlane, 1994; Hvenegaard, 2002; Scott & Thigpen, 2003; Lee & Scott, 2004; Scott et al., 2005), but has yet to be applied to motorized recreationists.

Following the classification of recreationists into discrete groups, the recreation specialization index is most often applied as an independent variable against which any number of dependent variables is assessed (Scott & Shafer, 2001). Recreationists at different stages of involvement have been shown to vary across a number of correlates,

including motivations for participation (Smith et al., 2010), perceptions of crowding (Kuentzel & McDonald, 1992), recreation setting preferences (Schreyer & Beaulieu, 1986; Virden & Schreyer, 1988; Scott & Thigpen, 2003), place attachment (Bricker & Kerstetter, 2000), activity substitutability (Needham & Vaske, 2013), and identity (Schroeder et al, 2013). The specialization framework has also been used to detect differences in *environmental attitudes* (Wellman et al., 1982; Ditton et al., 1992; Mowen et al., 1996; Dyck et al., 2003; Salz & Loomis, 2005; Thapa et al., 2006; Oh & Ditton, 2008; Jett et al., 2009; Smith et al., 2010) and *preference for management action* (Chipman & Helfrich, 1988; Kuentzel & McDonald, 1992; Salz et al., 2001).

2.3.3 Recreation specialization and environmental attitudes

Based on his initial observation that more specialized anglers exhibited greater resource-dependency, Bryan (1977) proposed that a positive relationship exists between an individual's level of specialization and his or her concern for the recreation environment. Although the framework has been used to explore how environmental attitudes vary at different stages of participation, there has been a lack of agreement on whether general or specific measures of attitude are more appropriate for the construct (Oh & Ditton, 2008). As previously discussed, *general attitudes* relate to broad beliefs about the environment, while *specific attitudes* pertain to activity-related impacts on the recreation setting itself. Dyck et al. (2003) found that there was no association between specialization and general environmental concern among mountaineers; although more experienced participants did exhibit more positive activity-specific attitudes toward low-impact practices. Similarly, more specialized recreationists who had participated in

hiking, camping, nature study or auto touring at Mt. Rogers National Park in Virginia were more concerned with the local natural setting than with global environmental issues (Mowen et al., 1996). A positive correlation between specialization and activity-specific attitudes was also found to exist among SCUBA divers (Thapa et al., 2006) and anglers (Chipman & Helfrich, 1982; Fisher, 1997). These findings are consistent with the third hypothesis of the Dunlap-Heffernan thesis which proposes that individuals tend to be more invested in protecting the recreation setting than with general resource conservation (Dunlap & Heffernan, 1977; Theodori et al., 1998). Despite these results, separate researchers have found equal support for activity-specific and general measures of attitude among freshwater anglers (Ditton et al., 1992; Oh & Ditton, 2008), while other studies failed to demonstrate an association between specialization and activity-specific attitudes among both canoeists (Wellman et al., 1982) and saltwater anglers (Salz & Loomis, 2005).

Research on motorized recreationists has used either general or specific measures of environmental attitude. Using an additive index which consisted of behavioural, cognitive and affective measures of involvement, Smith et al. (2010) compared 3 subgroups of OHV users across 15 general environmental attitude statements taken from the New Ecological Paradigm (NEP) scale. The NEP scale is a Likert-type rating system that is intended to measure attitudes and opinions about three broad belief domains pertaining to (1) the balance of nature, (2) limitations to growth, and (3) human dominance over nature (Dunlap & Van Liere, 1978). Despite achieving adequate reliability on both the recreation specialization and NEP scales, Smith et al. (2010) failed

to find a significant difference in general environmental attitudes across OHV specialization levels.

Jett et al. (2009) explored the relationship between specialization and specific attitudes toward manatee conservation among motor-boaters. The initial composite index lacked reliability as a result of data skewness in the behavioural dimension; therefore specialization was operationalized using only the affective and cognitive dimensions of involvement. Specific attitudes were operationalized using 3 researcher-derived statements regarding marine conservation. Jett et al. (2009) confirmed that specialization was negatively associated with manatee protection among motor-boaters. These findings run contrary to what has generally been reported in the specialization literature by demonstrating that less experienced motor-boaters had more positive attitudes toward marine conservation than specialized participants (Jett et al., 2009).

2.4 Key Research on OHV/ATV users

Although not specifically focused on ATV users, past research has explored the relationship between environmental attitudes and behaviour among individuals who operate 4-wheel drive jeeps, off-road motorcycles, dirt bikes, dune buggies, and ATVs, which are collectively referred to as off-highway vehicles (OHVs). While early studies compared the environmental attitudes of OHV users to non-motorized recreationists (Van Liere & Noe, 1981; Nord et al., 1998; Theodori et al. 1998; Tarrant & Green, 1999; Teisl & O'Brien, 2003; Thapa & Graefe, 2003), later research has gone on to explore attitude-behaviour correspondence among OHV users as a distinct group of recreationists (Barker & Dawson; 2010; Smith et al., 2010; Kuehn et al., 2011). More recently, desired benefits

(Smith & Burr, 2011) and meanings-based approaches (Mann & Leahy, 2009; 2010) have been applied in order to understand how OHV and ATV riding experiences shape environmental attitudes and behaviour.

2.4.1 Comparative studies on OHV/ATV users

Among the first studies to examine OHV recreation from a social science perspective was a comparative assessment of appreciative, consumptive and motorized recreationists at Cape Hatteras National Seashore, North Carolina. Using the Dunlap-Heffernan thesis as a theoretical framework, researchers Van Liere and Noe (1981) hypothesized that the level of environmental concern would be higher among individuals who participated in appreciative activities than among those who participated in consumptive or motorized activities. Three motorized activities, 4-wheel driving, dune buggying and motorcycling, were included in the analysis, along with 3 appreciative (i.e., birdwatching, walking, photography) and 2 consumptive activities (i.e., surf fishing and pier fishing). General environmental attitudes were measured using a 12-item NEP scale. Overall, results showed only weak support for the hypothesis. Van Liere and Noe attributed these results to a lack of specificity in the NEP statements, and concluded that general environmental attitudes were not significantly associated with any of the 3 categories of outdoor recreation activities.

Based on the results reported by Van Liere and Noe, Nord et al. (1998) hypothesized that the differences between appreciative, consumptive and motorized recreationists would be more pronounced by assessing how outdoor recreation influences pro-environmental behaviour, rather than environmental attitudes. Pro-environmental

behaviour, which included such activities as reducing the application of lawn and garden chemicals, contributing money to environmental organizations, and reading a conservation magazine, was operationalized through a series of 8 yes/no questions. Eight appreciative, consumptive and motorized forest activities were assessed using multiple regression analysis, which revealed modest negative associations between pro-environmental behaviour and camping, sightseeing by car, hunting and OHV riding. Although the regression coefficients for camping and hunting were significant at the $p \leq 0.05$ level, results for sightseeing by car and OHV riding indicated that neither activity was significantly related to pro-environmental behaviour. Nord et al. (1998) also assessed the relationship between activity type and environmental concern. Although it explained only 0.08% of the total variance, results of the reduced regression model in which environmental concern was the dependent variable and recreational activities were the independent variables revealed that OHV riding was the only activity that was significantly ($p \leq 0.10$) associated with concern for the environment. Nevertheless, by demonstrating that both appreciative and consumptive activities were negatively associated with pro-environmental behaviour, the findings of Nord et al. (1998) called into question the appropriateness of classifying recreation activities according to the appreciative-consumptive-motorized categories that were initially proposed by Dunlap and Heffernan.

In their study of recreationists in Pennsylvania, Theodori et al. (1998) likewise explored the relationship between pro-environmental behaviour and outdoor recreation, however, rather than applying the appreciative-consumptive-motorized trichotomy,

activities were described as either *appreciative to slight resource-utilization* or *moderate-to-intensive resource-utilization*. Riding OHVs was included in the latter category along with hunting and fishing. Pro-environmental behaviours were measured using 7 of the 8 items introduced by Nord et al. (1998). Although all activities were positively correlated with pro-environmental behaviour, moderate-to-intensive resource utilization activities were less so. OHV riding exhibited the weakest bivariate relationship among all 9 activities included in the study. In addition to confirming a positive relationship between outdoor recreation participation and pro-environmental behaviour, this study was the first to corroborate Dunlap and Heffernan's second hypothesis (i.e., *environmental concern is higher among individuals who participate in appreciative activities, and lower among those who participate in consumptive activities*) by analyzing OHV users.

Teisl and O'Brien (2003) reexamined the second hypothesis of the Dunlap-Heffernan thesis by exploring the association between environmental concern, pro-environmental behaviour and outdoor recreation participation among a nationally-representative sample of US residents. A researcher-derived matrix was used to assess the attitudes and behaviours of participants and non-participants in 10 appreciative, consumptive and motorized activities, including ATV riding. Attitudes toward forest management, intentions to purchase environmentally-labeled wood products, and participation in environmental organizations were assessed using regression analysis. Although all activities exhibited positive regression coefficients, appreciative activities, such as photography and wildlife watching, generated consistently higher levels of environmental concern and pro-environmental behaviour. Despite these results, it should

be noted that there was no significant difference in the opinions of ATV users and all 5 groups of appreciative recreationists regarding the percentage of US forests that are managed in an environmentally-friendly manner. Further, the attitudes of ATV users toward forest management resembled those of hikers, campers and cross-country skiers, and were only found to be significantly different from those of wildlife watchers and nature photographers. These results substantiate the concerns of Nord et al. (1998) with respect to the appreciative-consumptive-motorized typology, and suggest that aggregating recreationists by activity type fails to recognize the particular nuances of each pursuit.

In a related study of forest recreationists at Bald Eagle State Forest in Pennsylvania, Thapa and Graefe (2003) explored the connection between appreciative, consumptive and motorized recreation activities and environmental concern. It was hypothesized that appreciative recreationists would exhibit stronger environmental attitudes and behaviours, and would also demonstrate more support for forest protection than both consumptive and motorized recreationists. Environmental attitudes were assessed using the NEP scale, while behaviours were operationalized through 15 items derived from the Environmentally Responsible Behaviour Index. Data from the 3 groups were compared using one-way analysis of variance (ANOVA). Results showed considerable support for the hypotheses. Motorized recreationists, which included ATV users, were found to have lower levels of environmental concern across all items, and were significantly less likely to engage in green consumerism, political activism, and educational development pertaining to environmental issues. Motorized recreationists were also more likely to prioritize the provision of recreational opportunities over habitat

protection. Although they too advocated examining activities separately in order to generate more in-depth results, Thapa and Graefe (2003) concluded that motorized recreation is closely associated with a technocentric worldview in which forest protection is less important than achieving personal goals.

Diverging from previous research, Tarrant and Green (1999) explored whether participation in appreciative, consumptive and motorized forms of outdoor recreation had a mediating or moderating effect on attitude-behaviour correspondence. Whereas a mediating effect implies that the relationship between environmental attitudes and pro-environmental behaviour is caused by outdoor recreation participation, a moderating effect occurs if the relationship varies, either positively or negatively, as a result of participation (Tarrant & Green, 1999). The environmental attitudes of respondents, which included 4-wheel drive enthusiasts, were measured using 5 well-recognized attitude scales. Pro-environmental behaviour was assessed using an 11-item scale similar to those used by Nord et al. (1998) and Theodori et al. (1998). Moderation was analyzed using bivariate correlations, while mediation was tested using a series of regression equations. Recreation participation was found to have no moderating effect on the attitude-behaviour relationship across all activities, however a significant mediating effect was observed for appreciative activities such as bird watching, hiking and backpacking. Tarrant and Green interpreted these findings to mean that environmental attitudes, whether ecocentric or anthropocentric, exert an influence on preferred recreation type, which subsequently governs pro-environmental behaviour. Thus, because OHV riding entails inherent ecological impacts, participation in the activity is less likely to engender pro-

environmental behaviours. Despite these conclusions, the study failed to establish a link between environmental attitudes and behaviour among motorized recreationists, suggesting again that a multiple-activity approach is too broad to identify the underlying factors that govern attitude-behaviour correspondence among OHV and ATV users.

Although the Dunlap-Heffernan thesis has proven useful for collecting baseline data on the environmental attitudes of different types of recreationists, the above studies have done little to resolve the conflict that often exists between motorized and non-motorized user groups. Recreationists, as well as the general public, have been particularly divided in regards to ATV use, which has been criticized by detractors for denigrating the beauty and serenity of parks and wilderness areas (Smith, 2000; Havlick, 2002). Rather than addressing this apparent conflict, the Dunlap-Heffernan thesis pits one activity against another, with little regard for individual attitudes or preferences. In addition to highlighting the differences between recreationists, the thesis also fails to provide practical solutions, and is therefore merely descriptive in nature. A more in-depth approach which examines the attitudes, values and corresponding behavior of OHV/ATV users as a distinct group is not only less conflict-driven, but also allows for the prediction, and possible prevention of outdoor recreation conflict between incompatible user groups.

2.4.2 Within-activity studies on OHV/ATV users

In order to overcome some of the methodological challenges associated with comparative studies, several researchers have explored attitude-behaviour correspondence among OHV and ATV users specifically. Barker and Dawson (2006) evaluated the association between environmental attitudes and outdoor recreation participation among

OHV and ATV users in Adirondack Park, New York. The study examined both general and specific attitudes toward the environment; general attitudes were operationalized using the NEP scale, while activity-specific attitudes were assessed through 17 researcher-derived variables intended to measure the cognitive and affective dimensions of ATV riding. Summed scores for both attitude types were used to create two separate indexes which were subsequently segmented into three groups comprised of low, medium, and high attitude scores. A chi-square analytic framework was implemented to assess whether groups differed across general environmental and activity-specific attitudes toward the recreation setting. Barker and Dawson found that more frequent participation in OHV and ATV riding lead to more positive attitudes toward the recreation setting, but had no effect on general environmental attitudes. Results lend further support to the notion that activity-specific attitudes, in addition to being more strongly related to outdoor recreation behaviour, are more consistent measures of attitude-behaviour correspondence among ATV users.

In their study of OHV users in Utah, Smith et al. (2010) likewise explored the relationship between OHV riding and general environmental attitudes. The purpose of their study was to develop a typology of OHV users based on level of expertise, attitude toward the environment, and motivations for participation. Using the recreation specialization framework, 3 subgroups of OHV users – low, medium and high – were identified based on behavioural, cognitive and affective measures of involvement. Environmental attitudes were assessed using the NEP scale, while motivations were operationalized through the Recreation Experience Preference (REP) Scale which

consists of 21 items that measure agreement with such leisure goals as personal achievement, stress relief, and teaching others. One-way ANOVAs were calculated to assess whether specialization groups differed across environmental attitude and motivation dimensions. Results confirmed the existence of within-group differences among OHV users, but found no relationship between level of expertise and general environmental attitudes. However, highly specialized recreationists were found to be significantly different from the other groups across 3 of the 7 motivation dimensions, namely *achievement stimulation*, *independence*, and *meeting new people*. Thus, while the REP scale was successful in assessing within-group differences among OHV users, the NEP scale was found to be an insufficient measure of environmental attitude-behaviour correspondence due to an overall lack of specificity.

In addition to applying a different approach to the study of motorized recreationists, a recent study by Kuehn et al. (2011) was also the first to assess OHV riding through the theory of planned behaviour. It was hypothesized that intentions to participate in two depreciative behaviours, namely the illegal use of non-OHV trails and the creation of unauthorized trails, was a function of the relationship between recreation participation, riding experience, management preferences, and attitudes toward the depreciative behaviours. Attitudes and intentions were operationalized using 6 variables which asked respondents how they felt about the depreciative behaviours, and whether they planned to engage in illegal trail use or unauthorized trail creation during their next ride. Management preferences were evaluated by assessing agreement with 2 indirect and 2 direct resource management options. A stepwise regression analysis for each behaviour

was calculated using intentions as the dependent variable, and attitudes, management preferences, age, riding experience, and frequency of participation as the independent variables. The strongest predictors of intention for both behaviours were attitudes. Individuals who had negative attitudes toward depreciative behaviors were less intent on engaging in these types of activities. The first behaviour, illegal trail use, was also significantly related to direct management options and age. Older respondents who supported direct management were also less likely to ride on non-OHV trails. Conversely, indirect management options were a stronger predictor of the second behaviour. Respondents who favored indirect management strategies such as educating riders about the potential negative impacts of OHV use were less likely to create trails during their next ride. In addition to revealing that the majority of OHV users had a negative attitude toward depreciative behaviours, the results of this study also suggest that attitudes and intentions are influenced by both direct and indirect resource management strategies. These findings have important theoretical and managerial implications, and demonstrate that the attitude-behaviour framework is not only well-suited to the study of ATV users, but is also sufficiently robust to predict depreciative behaviour.

2.4.3 Desired benefits and meanings of OHV/ATV use

Rather than focusing solely on the relationship between attitudes and outdoor recreation participation, a limited number of studies have explored OHV and ATV users from a social-psychological perspective by examining desired benefits and meanings associated with the activity. Smith and Burr (2011) postulated that a positive relationship exists between years of OHV riding experience, the desired social-psychological benefits

of the activity, and environmental attitudes. Riding experience was assessed using two open-ended questions which asked respondents to indicate how many years they have been riding OHVs, as well as their frequency of participation over the last year. A cluster analysis of responses resulted in 4 groups which were referred to as *casual newcomers*, *casual veterans*, *frequent riders*, and *occasional riders*. Desired benefits were operationalized using the REP scale, while environmental attitudes were assessed through the NEP scale. Differences between groups were compared using ANOVA tests. Although frequent riders were more motivated by personal achievement, all groups indicated that experiencing beautiful landscapes and natural settings was a primary benefit of OHV use. Benefits associated with stress release and personal freedom were likewise ascribed high importance among all 4 groups. Despite having a differential effect on desired benefits, OHV riding experience was not related to general environmental attitudes in any way. Notwithstanding these findings, Smith and Burr (2011) draw attention to the fact that the primary desired benefits of OHV users resemble those of non-motorized recreationists, and are not related to environmental dominance or thrill-seeking, as is often perceived by the public.

In addition to providing social-psychological benefits, recent studies have focused on the meaning of ATV riding to participants. In order to understand how ATV users interpret their riding experiences, and how these experiences come to be meaningful, Mann and Leahy (2009, 2010) conducted 19 semi-structured interviews with members of 3 established ATV clubs in Maine. A qualitative analysis of the interview transcripts revealed that the meanings derived from ATV use center on individual connections with

nature, others and self. Being immersed in nature was considered meaningful to respondents, as were the social connections made with family and friends. A major finding of Mann and Leahy's research was that relationships between husbands and wives, as well as those between parents and children, were made stronger and more meaningful by participating in ATV riding. The activity was also found to be especially meaningful to respondents with health conditions such as arthritis and heart disease as it was one of the few remaining activities in which they could still participate. By demonstrating that participants not only value ATVing, but find it meaningful to their lives, Mann and Leahy (2009, 2010) revealed a more nuanced range of attitudes than has been uncovered in past research on ATV users. Further, the findings of these 2 studies reaffirm those of Smith and Burr (2010) by establishing that the desire to connect with nature, others and self may be more important to ATV users than experiencing excitement and thrills.

2.5 Discussion

As the above summaries demonstrate, results of human dimensions research on OHV/ATV users over the past 30 years have been decidedly mixed. Early research which compared the environmental attitudes of OHV/ATV users to those of non-motorized recreationists using the Dunlap-Heffernan thesis found no significant differences (Van Liere & Noe, 1981; Nord et al., 1998; Tarrant & Green, 1999; Teisl & O'Brien, 2003), with the exception of two studies (Theodori et al. 1998; Thapa & Graefe, 2003) which reported that OHV/ATV users exhibited lower levels of environmental concern than their non-motorized counterparts. Despite these results, the methodological challenges

associated with the Dunlap-Heffernan thesis have prevented the comparison of studies across time and space, and have thus diminished the theoretical rigour of the thesis overall.

More recent research has examined OHV users as a distinct group of recreationists; however results have likewise been inconsistent. While some studies failed to establish a significant relationship between OHV riding and general environmental attitudes (Smith et al., 2010; Smith & Burr, 2011), others found that participation in OHV riding was associated with positive attitudes toward the recreation setting (Barker & Dawson, 2010), as well as negative attitudes toward environmentally depreciative riding behavior (Kuehn et al., 2011). These results, in conjunction with the findings of 2 qualitative studies which revealed a more nuanced range of attitudes among a small sample of ATV club members (Mann & Leahy, 2009; 2010), underscore the need for further research on ATV use from a human dimensions perspective.

Despite the mixed findings, the collective results of the existing literature offer a blueprint for future research. Whereas studies that have utilized the Dunlap-Heffernan thesis have generally produced weak or inconsistent results (Van Liere & Noe, 1981; Nord et al., 1998; Tarrant & Green, 1999; Teisl & O'Brien, 2003), research that has deployed a variation of the cognitive hierarchy model of human behaviour (Barker & Dawson, 2010; Kuehn et al., 2011) has been more successful in explaining the nature of the relationship between OHV/ATV recreation and environmental attitudes. In addition to being more methodologically straightforward, the cognitive hierarchy model appears well-suited to ATV users who are hypothesized to have high attitude accessibility as a

result of direct riding experience and repeated exposure to the activity. Future studies could focus on uncovering the underlying factors that influence attitudes and corresponding behavior among ATV users. If attitudes that lead to ecologically harmful behavior can be isolated, they can then be theoretically modified or replaced by implementing appropriate resource management strategies (Aipanjiguly et al., 2003).

An additional finding of past research concerns the effectiveness of general and specific measures of attitude. While attempts to segment OHV/ATV users on the basis of general environmental attitudes have been unsuccessful (Smith et al., 2010; Smith & Burr, 2011), researchers that have examined activity-specific attitudes among the OHV community have revealed a significant connection between frequent participation in the activity and positive attitudes toward the recreation environment (Barker & Dawson, 2010). These results support the cognitive hierarchy model by demonstrating that greater measurement specificity generates more well-defined attitudes among OHV/ATV users. In addition to being more managerially relevant, specific attitudes toward the recreation setting are also better predictors of specific behavior (Fishbein & Ajzen, 1975; Vaske, 2008). Subsequent studies might now explore how specific attitudes toward the recreation environment vary at different stages of involvement in ATV riding. Assessing ATV users through the recreation specialization framework would not only provide insight into within-group differences among ATV users, but would also allow resource managers to develop policies that meet the needs of a broader spectrum of ATV riders.

Despite the opposition it has received from conservation groups, the media and the general public, recreational ATV use has increased exponentially in many parts of the

world and shows no signs of slowing (Cordell et al., 2005). The on-going challenge for resource managers will be to reconcile the popularity of the activity with ecological protection. A logical first step in addressing the controversy surrounding recreational ATV use is to examine the activity from a human dimensions perspective. This approach not only offers significant predictive and preventive capabilities, but also fosters broader support for conservation initiatives overall.

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Chapter 3: Factors influencing attitudes among ATV users on the island portion of the province of Newfoundland and Labrador, Canada

3.1 Abstract

This study examined the underlying factors that influence the attitudes of ATV users toward both the environment, and the biophysical and social effects of the activity. Data were collected through a quantitative survey of 600 residents of the Burin Peninsula on the island of Newfoundland. Multiple regression analysis was used to assess how the attitudes of ATV users are affected by specific beliefs about the environmental and social impacts of the activity, social influences, length and frequency of participation, socio-demographic circumstances, and whether ATV use is motivated by recreational or subsistence goals. Seven variables explained 41% of the total variance in attitudes. Results showed that the attitudes of ATV users were primarily driven by beliefs about the environmental and social outcomes of the activity, type of ATV use, social involvement in the ATV-related activities, frequency of participation, and whether they reside in a rural or urban area. Findings support the belief-attitude relationship and suggest that efforts to predict ATV behaviour must focus on cognitions, social influences, and type and frequency of participation rather than on external factors such as socio-demographic indicators and length of participation.

3.2 Introduction

Over the last 20 years, all-terrain vehicle (ATV) riding has become one of the most popular, yet divisive recreational pastimes in North America (Havlick, 2002; Holsman, 2004; Wilson, 2008). While proponents of ATVing believe that there are

significant social, psychological, and economic benefits to be derived from the activity (Havlick, 2002; Mann & Leahy, 2009), critics contend that the machines are not only environmentally destructive, but also incompatible with non-motorized forms of recreation in multi-use areas (Moore, 2004; Davenport & Switalski, 2006). The continued growth of the activity, combined with the popular image of ATV enthusiasts as "thrill-seekers" who have little regard for the environment and other recreationists, has made ATV use one of the most controversial recreation-related issues facing resource managers today (Smith, 2000; Havlick, 2002).

There are over 40,000 ATVs in Newfoundland and Labrador, Canada, and it is estimated that the majority are being operated on the island portion of the province (CPAWS, 2011). ATV use has a long utilitarian history on the island of Newfoundland and is intrinsically linked to a variety of subsistence activities, including hunting, fishing, foraging, and firewood collection (Okihiro, 1997; Cadigan, 2003). Recreational riders can likewise be found on trails, beaches, logging roads, secondary highways, and abandoned rail beds throughout the island. Although ATVs are a common sight, their use remains a contentious issue among many Newfoundlanders. Concerned citizen groups suggest that a provincial regulation allowing hunters to use ATVs in ecologically sensitive habitats has given riders unrestricted access to pristine wilderness areas, and has increased the potential for irresponsible ATV use island-wide (PAANL, 2007; CPAWS, 2013). Natural features that are characteristic of the island of Newfoundland, such as coastal dunes, sphagnum bogs and limestone barrens, as well as endemic wildlife species, such as the Newfoundland marten (*Martes americana atrata*), have been identified as being

particularly affected by ATV traffic (Catto, 2002; Newfoundland Marten Recovery Team, 2010). This has led to speculation among environmental organizations, local media outlets, and the general public that ATV users are not concerned about the ecological impact of ATVing, and are thus more likely to engage in environmentally depreciative behaviour (PAANL, 2007; Telegram, 2007a,b,c; CBC News, 2011; CPAWS, 2013). Despite this perception, no documented information exists on the characteristics and behaviour of ATV users on the island of Newfoundland. As a result, little is known about how participants perceive the environmental and social effects of their activity, and how these attitudes, in turn, influence behaviour.

The progression from human thought to action has been described as a hierarchy of cognitions in which attitudes, defined as positive or negative evaluations of an object, ultimately influence behaviour (Fulton et al., 1996; Vaske, 2008; Fishbein & Ajzen, 2010). Understanding the attitudes of ATV users, therefore, can assist researchers and public land managers in predicting outdoor recreation behaviour, and can also be used to evaluate support or opposition to proposed resource management strategies. This research sought to identify and document the attitudes of ATV users toward both the natural environment and the biophysical and social impacts of the activity within the context of this theoretical framework. In pursuing this objective, underlying factors that have been shown to contribute to attitude formation among recreationists, namely specific beliefs about the activity (Bourke & Luloff, 1994; Donnelly & Vaske, 1995; McFarlane & Boxall, 2000), social involvement (Steel et al., 1994), prior experience (Roggenbuck & Berrier, 1982), type of participation (Donnelly & Vaske, 1995), and socio-demographic

characteristics (Bourke & Luloff, 1994; Reading et al., 1994; Donnelly & Vaske, 1995; McFarlane & Boxall, 2000), were assessed in order to determine whether these variables can be used to predict attitudes and corresponding behaviour among the ATV constituency. Findings are intended to assist public land managers in understanding ATV use from the perspective of participants, with an ultimate goal of providing recommendations for policies that minimize the impacts of the activity without significantly impeding those who not only enjoy ATV riding, but perhaps depend upon it for food security or mobility.

3.3 Factors Affecting Attitudes

A number of theories from the field of social psychology have been incorporated into outdoor recreation research in an effort to understand the underlying factors that influence attitudes and subsequent behaviour (Fishbein & Ajzen, 1975; Manfredo, 1989; Fulton et al., 1996). The cognitive hierarchy model of human behaviour describes this relationship as an interdependency in which layers of cognitions, specifically values, beliefs, attitudes, social norms and behavioural intentions, build upon one another in the manner of an inverted pyramid (Fulton et al., 1996). At the base of the model are a finite number of *values*, which are culturally-ingrained modes of conduct that tend to remain constant throughout an individual's lifetime (Rokeach, 1973). Broad values provide the foundation upon which *beliefs* are formed through observation, inference, or first-hand experience. Beliefs, which can be either favorable or unfavorable, represent an individual's assessment of themselves, the environment, events, objects and other people (Fishbein & Ajzen, 2010). Sets of salient beliefs give rise to overarching *value*

orientations, which regulate the direction and intensity of an individual's stance on a particular object or issue (Fulton et al., 1996; Vaske, 2008). In the context of outdoor recreation research, value orientations are often depicted as a bipolar continuum with biocentric beliefs at one end, and anthropocentric views at the other (Steel et al., 1994; Vaske, 2008). The biocentric value orientation supports the view that humans must live in balance with the natural world, while the anthropocentric perspective encourages the use of natural resources for the benefit of humankind. Placement along the continuum is what contributes to attitudinal differences among individuals (Vaske & Donnelly, 1999). As demonstrated through the cognitive hierarchy model, attitudes are ultimately derived from value orientations which consist of networks of salient beliefs. Thus, examining the beliefs of recreationists can help determine whether corresponding attitudes are positive or negative, and can provide insight into the manner in which these views are likely to influence behaviour (Bourke & Luloff, 1994; Donnelly & Vaske, 1995; McFarlane & Boxall, 2000).

In addition to beliefs, the attitudes of recreationists may also be affected by social involvement in organized clubs and sporting associations. By facilitating interaction between like-minded individuals with common goals, clubs help establish social norms, which are customary standards of behaviour shared by a group or society (Vaske, 2008; Fishbein & Ajzen, 2010). Social pressure put forth by the collective membership influences attitudes by discouraging and, if necessary, threatening sanctions against members who violate group norms (Mann & Leahy, 2010; Kuehn et al., 2011). Individuals who consider club membership fundamental to their identity, or who have a

sense of obligation to their peers, are more affected by the possibility of sanctions, and are thus more likely to conform to the attitudinal and behavioural expectations of the group (Vaske, 2008). No studies have examined how membership in a recreation-related club or association affects attitudes toward the environment; however several researchers have assessed the impact of belonging to a general conservation organization (Steel et al., 1994; McFarlane & Boxall, 2000). Although McFarlane and Boxall (2000) found that membership in an environmental organization was not a significant determinant of attitudes among outdoor recreationists, Steel et al. (1994) reported that members of conservation groups were more likely to display biocentric attitudes toward forests than non-members.

Prior experience, defined here as the length and frequency of participation in a particular activity, has also been identified as a possible correlate of attitudes among recreationists (Roggenbuck & Berrier, 1982; Hammit et al., 1994; Reading et al., 1994; Donnelly & Vaske, 1995). Length of participation refers to the total number of years of involvement in an activity, while frequency pertains to the number of days of participation over a specified period (e.g., 12 months). Activities that are performed more frequently generate stronger, more accessible attitudes by reinforcing the association between an attitude object and an individual's positive or negative evaluation thereof (Fazio et al, 1989; Manfredo et al., 1992). Various researchers have proposed that active participation in outdoor activities increases an individual's aesthetic appreciation of the natural world, and, in so doing, fosters more positive attitudes toward the environment and resource management policies (Dunlap & Heffernan, 1975; Geisler et al., 1977).

While a number of studies have shown that prior recreation experience has little influence on the formation of environmental attitudes (Hammit et al., 1994; Donnelly & Vaske, 1995), Reading et al. (1994) demonstrated that individuals who had participated in hunting within the previous 2 years exhibited more anthropocentric attitudes than those who had not (Reading et al., 1994). An additional study by Roggenbuck & Berrier (1982) also revealed that less experienced wilderness campers were more likely to display positive attitudes toward forest protection regulations than those with more experience.

Type of recreation participation may also be an underlying factor that influences attitudes. While some individuals engage in outdoor recreation for pleasure, others are motivated by accomplishing tasks related to subsistence or utilitarian practices. Three broad types of recreation activities have been identified in the literature: *appreciative*, *consumptive* and *motorized* (Dunlap & Heffernan, 1975; Thapa & Graefe, 2003). Appreciative activities, such as hiking, wildlife-watching, and camping, do not intentionally harm or remove components from the environment, and are thus associated with biocentric attitudes (Dunlap & Heffernan, 1975). In contrast, consumptive and motorized activities, such as hunting, fishing and ATV riding, either modify or remove resources from the environment, and are therefore associated with anthropocentric attitudes (Dunlap & Heffernan, 1975). Although no research has examined how attitudes are affected by different types of participation in the same activity (e.g., recreational ATV use vs. utilitarian ATV use), studies have assessed how involvement in either appreciative or consumptive/motorized activities shapes attitudes. Both Bourke and Luloff (1994) and McFarlane and Boxall (2000) examined whether participation in appreciative and

consumptive/motorized activities underlies attitudinal differences among woodland recreationists, however neither study established a link between participation type and attitudes toward forest protection. In contrast, Donnelly and Vaske (1995) found that participation in hunting was a significant predictor of attitudes toward a proposed moose hunt, while involvement in wildlife viewing and photography was not.

A number of socio-demographic indicators have also been identified as factors that affect attitudes. Age and gender are among the most frequently examined characteristics in attitudinal studies of recreationists (Bourke & Luloff, 1994; Reading et al., 1994; Donnelly & Vaske, 1995; McFarlane & Boxall, 2000). Results have generally shown that younger females are more likely to exhibit biocentric attitudes than older males (Bourke & Luloff, 1994; Reading et al., 1994; Steel et al., 1994; McFarlane & Boxall, 2000). Younger females are also more supportive of resource management initiatives than the latter group (Reading et al., 1994). The effects of urban or rural residency (Bourke & Luloff, 1994; Donnelly & Vaske, 1995), as well as the length of residency in a particular community (Reading et al., 1994), have also been assessed. Although not always significantly correlated (Bourke & Luloff, 1994; Donnelly & Vaske, 1995), individuals who live in rural environments for longer periods have been shown to exhibit stronger anthropocentric attitudes, as well as less approval for resource management intervention (Reading et al., 1994).

Given the mixed findings reported above, further research is needed to identify which factors underlie the attitudes and corresponding behaviour of outdoor recreationists. In responding to the calls for empirical data on the attitudes of motorized

recreationists toward both the environment and the biophysical and social effects of their activity (Thapa & Graefe, 2003; Smith et al., 2010), this study contributes to the literature by examining how various factors contribute to attitude formation among an often controversial, yet under-researched group of motorized recreationists, ATV users. We hypothesize that beliefs about the potential outcomes of the activity, social influences, prior experience, type of participation, and socio-demographic indicators will be significant explanatory variables for predicting the attitudes of ATV users.

3.4 Study Area

Data were collected on the Burin Peninsula, which is located on the south coast of the island portion of the province of Newfoundland and Labrador (see Figure 3.1). Locally referred to as "The Boot" due to its distinctive shape, the Burin Peninsula extends approximately 6,000 km^2 into the North Atlantic Ocean, and is flanked by Placentia Bay to the east and Fortune Bay to the west. The peninsula lies in the Maritime Barrens eco-region which is characterized by rolling heath-lands, bedrock outcrops, and intermittent stands of pure balsam fir (Damman, 1983). The eco-region is also marked by extensive networks of bogs and fens interspersed with areas of dense, low-growing vegetation that is sufficiently hearty to withstand the peninsula's cool, foggy summers and persistent off-shore winds. Characteristic wildlife of the region includes black bears (*Ursus americanus*), moose (*Alces alces*), fox (*Vulpes fulva*), ptarmigan (*Lagopus lagopus*), and the endemic Newfoundland marten (*Martes americana atrata*). The Burin Peninsula is also an important stop-over point for migratory bird species, and provides valuable

calving and overwintering grounds for several of the province's caribou herds which have been listed as a species of concern by the provincial government (PAANL, 2008).

Separated as it is from the rest of the island by a narrow 30-km long isthmus, the Burin Peninsula is a geographically contained area that is home to over 21,000 residents (Statistics Canada, 2011). The only urban centre, Marystown (pop. 5,506), is the economic hub of the peninsula, and is located approximately 306 km from the provincial capital, St. John's. According to the most recent census data, the median age of the population is 46.9 years, and 50.4% of residents are female (Statistics Canada, 2011). In 2007, personal income per capita was CDN$22,700 per year with 57% of jobs coming from the retail, manufacturing, fishing, and health and social services sectors (Human Resources, Labour and Employment, 2007).

The population distribution of communities on the Burin Peninsula is listed in Table 3.1. Of the 35 communities scattered across the peninsula, only one, Winterland (pop. 363), is not located directly along the coast (Rural Secretariat, 2012). The settlement pattern of the Burin Peninsula is typical of many parts of the province where small villages, known as "outports", were established in the early 19th century to serve the commercial cod fishery. The physical and social isolation of outport life, coupled with extreme financial uncertainty, led to the development of a unique culture based around subsistence resource extraction (Okihiro, 1997). Faced with financial hardship, either as a result of poor fishing or the questionable business practices of the merchant class, outport families turned to hunting and gathering as a means of supplementing winter food stores (Kennedy, 1997). In addition to providing economic stability, these practices established

a long tradition of common-property rights in Newfoundland and Labrador which, even today, has the highest percentage (95.6%) of publicly-owned crown land of any Canadian province (Murphy et al., 2009). Though no longer necessary for survival, subsistence activities such as hunting, trapping, fishing, fuel wood collection, and berry picking remain "cherished Newfoundlander rights" (Roach et al., 2006, p. 57).

In addition to having cultural significance among residents, natural resource extraction is also the primary economic driver of the Burin Peninsula. Both the provincial and federal governments rely on commercial fishing, mining, and off-shore oil and gas production to boost both the regional and provincial economies. Despite government support for industrial development, subsistence resource extraction has become increasingly regulated since the late 1980s (McGrath, 1993). This has led to an apparent paradox in the province in which residents are expected to abide by increasingly-strict environmental legislation, while large-scale commercial resource exploitation, along with its associated ecological and social impacts, continues relatively unabated (Omohundro & Roy, 2003).

Table 3.1. Sampling frame and sample size on the Burin Peninsula

Town	Population	% of Pop. of Burin Peninsula	Sample Size
Marystown	5,506	26.50	159
Burin	2,424	11.67	70
Grand Bank	2,415	11.62	70
Fortune	1,442	6.94	42
St. Lawrence	1,244	5.99	36
Lawn	672	3.23	19
Lewin's Cove	555	2.67	16
Garnish	545	2.62	16
Terrenceville	530	2.55	15
St. Bernard's-Jacques Fontaine	470	2.26	14
Winterland	363	1.75	10
Fox Cove - Mortier	333	1.60	10
Parker's Cove	301	1.45	9
Rushoon	288	1.39	8
Lamaline	286	1.38	8
Bay L'Argent	285	1.37	8
Boat Harbour - Brookside	275	1.32	8
Grand Le Pierre	260	1.25	8
Point May	233	1.12	7
North Harbour	210	1.01	6
Swift Current	208	1.00	6
Red Harbour	191	0.92	6
Lord's Cove	175	0.84	5
Jean de Baie	173	0.83	5
Frenchman's Cove	172	0.83	5
English Harbour East	147	0.71	4
Baine Harbour	137	0.66	4
Harbour Mille-Little Harbour East	136	0.65	4
Spanish Room	134	0.64	4
Little Bay East	130	0.63	4
Little St. Lawrence	125	0.60	4
Little Bay	108	0.52	3
Point au Gaul	97	0.47	3
Garden Cove	86	0.41	2
Rock Harbour	66	0.32	2
Beau Bois	55	0.26	2
TOTAL	**20,777**	**100**	**600**

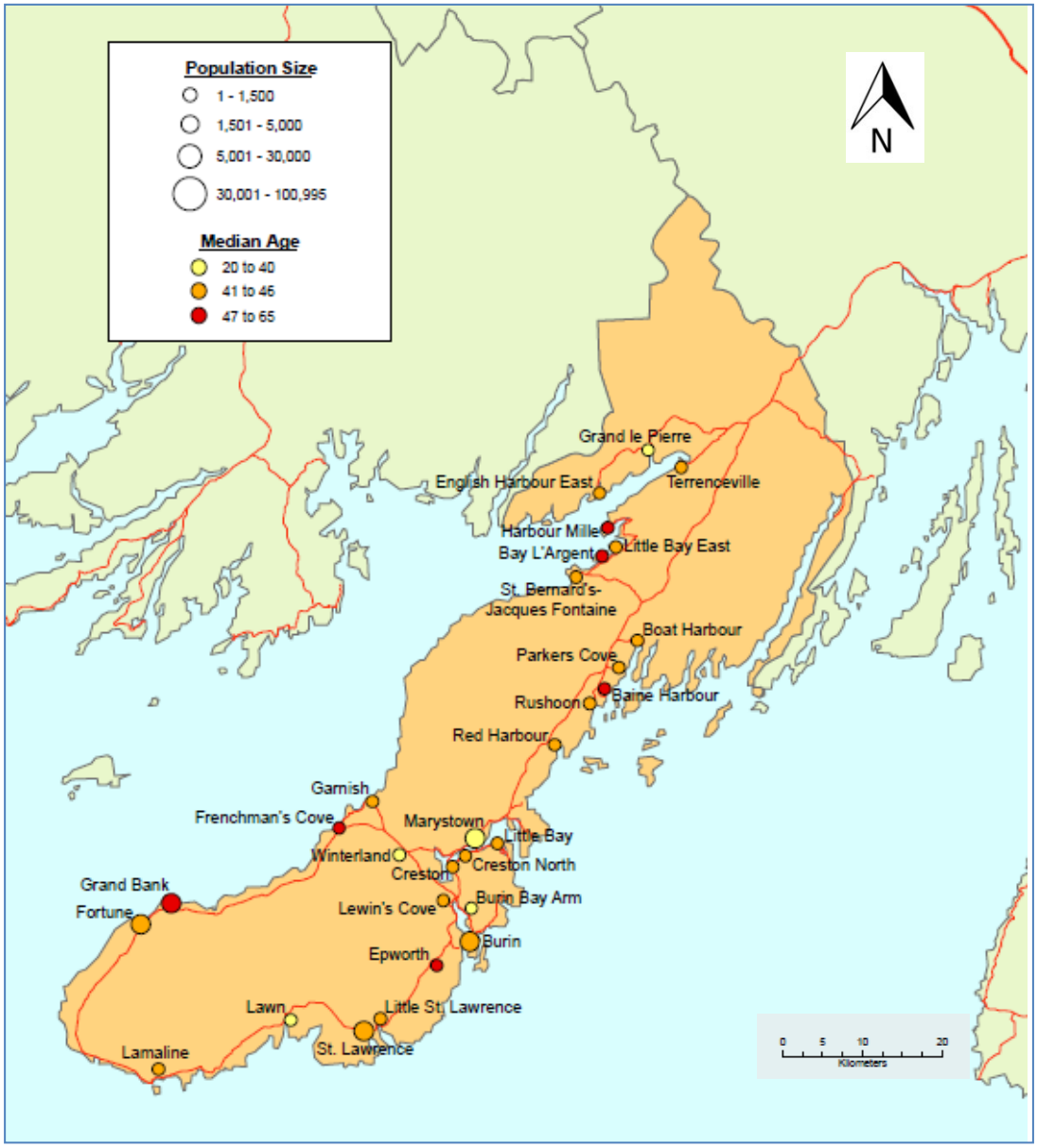

Figure 3.1. Study area (adapted from Newfoundland and Labrador Statistics Agency, 2008)

3.4.1 ATV Use on the Burin Peninsula

Although no data exists on ATV ownership on the Burin Peninsula, anecdotal evidence collected from government officials and local residents suggests that there is

approximately one machine per household. Estimates are even higher in some communities, such as the town of Garnish (pop. 545) on the west coast of the peninsula, where ATV ownership is thought to be on par with automobile ownership at 1.4 per household (Natural Resources Canada, 2011). Garnish also has the distinction of being the only municipality in the province of Newfoundland and Labrador where ATV use is legally permitted on town-administered roadways. In addition to having high ridership, ATV associations on the Burin Peninsula tend to be stronger and more organized than in other parts of the province. There are no fewer than 12 associations across the peninsula, several of which have been active for over 15 years. ATV associations are primarily responsible for trail construction and maintenance, which is funded by annual membership fees, fundraising, and financial assistance from the federal government National Trails Coalition and the Newfoundland and Labrador Department of Innovation, Trade and Rural Development. Currently, there are approximately 190 kilometers of approved trail peninsula-wide.

Despite being economically important and culturally accepted, ATV use is highly restricted by law; users must remain on either mineral soil or government-approved trails, and are not permitted to travel on the expansive bogs and wetlands that dominate the peninsula. The only exception occurs during the fall hunting season when holders of a big-game license are permitted up to 5 trips in a restricted area to transport a felled animal. In order to increase riding opportunities for both residents and tourists alike, a number of local trail associations have been collaborating on the Burin Peninsula Trailway project with the goal of constructing a continuous ATV trail around the

peninsula. When completed, the final trail system will be approximately 300 km long and will take one week to circumnavigate. The Trailway initiative has thus far been successful in connecting small communities, and has also reinvigorated abandoned outport villages that were once only accessible by sea.

3.5 Methods

This project utilized both quantitative and qualitative methods of data collection. A self-administered questionnaire (Appendix A) was designed in order to gather data on the beliefs, attitudes, preferences, behaviour and socio-demographic characteristics of ATV users in the study area. The questionnaire was modeled after similar instruments used to assess OHV and ATV users in the United States (Smail, 2007; D'Luhosch, 2008; Smith, 2008), and was presented as an 8-page booklet consisting of 73 closed-ended, 4 open-ended questions, and a blank space for additional comments. The cover of the booklet identified the project as a Memorial University-led initiative and explained the purpose of the study. Instructions for completing the questionnaire, as well as contact information for the primary researcher were also provided.

Although quantitative research methods are often preferred by policy makers (Johnston et al., 2003; Willis, 2007), overreliance on one method exposes data to the biases of that particular technique and could weaken results (Mitchell, 1989; Denscombe, 2010). In order to offset the limitations of quantitative surveys, qualitative focus groups were used to augment the breadth of findings and improve overall accuracy (Mitchell, 1989). Upon receiving ethics clearance from Memorial University's Interdisciplinary Committee on Ethics in Human Research (ICEHR Reference No. 20130136-AR) in May

2012, a series of preliminary focus group sessions was conducted in the study area. In addition to encouraging public involvement in the project, the primary purpose of the focus group sessions was to gather baseline data for use in hypothesis formulation and quantitative survey design (Stewart & Shamdasani, 1990). Eligible participants were recruited from local ATV associations using snowball sampling (Krueger & Casey, 2010). A total of 20 individuals, including 6 females and 8 non-members of an ATV association, participated in 3 separate focus group sessions. Participants were asked to discuss how and why they became involved in ATV riding, how long they have been involved, and whether they typically ride for recreational or utilitarian purposes. The benefits, challenges and misconceptions of ATV use were also discussed, as were issues pertaining to current provincial ATV regulations. The discussion provided a clearer understanding of concerns on the Burin Peninsula, and also provided insight into the language and terminology of ATVing, which is often highly technical. At the end of the focus group session, the quantitative questionnaire was pilot tested in order to ensure that questions were logical and unambiguous. As no concerns were raised, the questionnaire was subsequently finalized and approved by faculty members at Memorial University, staff at the Institute of Biodiversity and Ecosystem Science (IBES), and the university ethics committee.

Quantitative data collection occurred in July and August of 2012. The most recent census data from Statistics Canada (2011) was used to determine the current populations of 35 established communities across the Burin Peninsula. Stratified random sampling proportional to community size was used in order to ensure that ATV users were sampled

in each town (Sheskin, 1985; Vaske, 2008). Consistent with the accepted standard in social science research, the target response rate for completed questionnaires was 400 in order to produce results that were accurate 19 times out of 20, plus or minus 5% (Vaske, 2008).

A significant challenge of the data collection process was the identification and selection of subjects. Yearly registration of ATVs is not a legal requirement in Newfoundland and Labrador; therefore no reliable sampling frame was available. Hand-delivery of questionnaires through the drop-off/pick-up (DOPU) method has been proposed as a suitable technique in areas where mailing addresses and telephone numbers are unavailable (Clark & Finley, 2007). The DOPU method is generally quicker than traditional mail surveys, and has also been shown to increase response rates through face-to-face contact with subjects (Steele et al., 2001; Allred & Ross-Davis, 2010). An additional benefit of the DOPU method is that individuals who do not meet the eligibility requirements of the study can immediately be eliminated and replaced with suitable participants (Allred & Ross-Davis, 2010).

The distribution pattern of questionnaires is presented in Table 3.1. In order to achieve the target response rate of 400, a total of 600 questionnaires were randomly distributed among 35 communities following the DOPU protocol outlined by Riley and Kiger (2002). Researchers made initial contact with subjects by going door-to-door at every nth house at various times throughout the week. Potential subjects were identified by inquiring whether anyone in the household over 19 years of age had ever participated in ATV riding either as an operator or passenger. If an eligible household was identified,

the researcher explained the purpose of the project and asked for permission to leave a questionnaire that would be collected no more than three days later. If the individual agreed, a clear plastic doorknob bag containing a questionnaire, a blank envelope and a cover sheet (Appendix B) was left at the house. The cover sheet provided additional information about the study and was used to notify subjects of the anticipated pick-up date and time. If there were several ATV users in the household, the adult having the next birthday was asked to complete the questionnaire. Subjects were instructed to seal the completed survey in the envelope and hang it in the plastic doorknob bag for retrieval. If an individual indicated that no one in the household had ever participated in ATV use, or refused to participate in the survey, the nearest neighbor was contacted (Clark & Finley, 2007). If no one was home for the initial contact, the doorknob bag was left in a prominent location on the front of the house. Addresses, pick-up dates and times, and type of contact made at the household (i.e. personal contact with respondent, personal contact with other individual at the residence, no personal contact) were recorded on specially-designed tracking sheets for each community.

At the arranged time, researchers returned to collect the completed surveys. If the doorknob bag was not located, the researchers attempted to make contact with the household to inquire about the status of the questionnaire. Whether contact was made or not, a postcard reminder (Appendix C) with a new pick-up date and time was left. This procedure was performed a third time; however if the doorknob bag was not located, a stamped envelope addressed to the primary researcher was left with a final notice with

instructions (Appendix D) to mail the completed questionnaire within the following two days.

3.5.1 Operationalization of Variables

Dependent Variable

Environmental attitudes were measured using 8 activity-specific variables adapted from both the literature (Thapa et al., 2006; Smail, 2007; D'Luhosch, 2008, Jett et al., 2009) and the focus group sessions (see Table 3.3). Statements were developed to measure perceptions of the environmental impact and cultural significance of ATV use in Newfoundland and Labrador. Respondents rated their agreement with the statements along a 5-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree".

Independent Variables

The first set of independent variables assessed specific beliefs about the potential positive and negative impacts of ATV use (see Table 3.2). Respondents rated a series of 10 statements relating to the environmental, social and economic outcomes of ATV riding along a 5-point Likert scale as above.

Social involvement was measured using two dichotomous variables which asked participants whether they belong to any ATV clubs or associations, and if they have ever volunteered to do trail maintenance or clean-up. A "no" answer was coded as 0, while "yes" was coded as 1 (McFarlane & Boxall, 2000).

Prior experience was assessed using two open-ended questions which asked respondents to indicate how many years they have been riding ATVs, as well as the number of days they rode over the last 12 months.

Type of participation in ATV use was evaluated through 7 statements which asked respondents how often they use their ATVs for the following purposes: hunting, fishing, wood cutting, berry picking, exploring trails, to experience excitement and thrills, and for transportation to and from the cabin. Responses were rated along a 5-point scale where 1 = "never", 2 = "rarely", 3 = "sometimes", 4 = "mostly", and 5 = "all the time".

The last set of independent variables measured 4 socio-demographic characteristics including gender, age, place of residence (i.e., rural or urban), and length of residency in a particular community. After indicating whether they were male or female, respondents were asked to situate themselves within one of 12 age categories between "20-24 years" and "over 75 years". Urban or rural residency was assessed by coding questionnaires according to the location where they were collected (i.e., urban = 0 and rural = 1). Following the definition provided by Municipalities of Newfoundland and Labrador (2010), only one community within the study area was considered urban with a population greater than 4,000. Finally, number of years of residency in a community was measured using a categorical variable with 6 options ranging from "less than 1 year" to "over 20 years".

3.5.2 Analysis

Quantitative data were organized, coded, and entered into IBM SPSS Statistical software (version 17.0) for analysis. Appropriate checking procedures during coding, data

entry and data preparation were utilized in order to ensure quality control. Using descriptive statistical techniques, improperly coded data and outliers were identified and removed (Tabachnick & Fidell, 2001). Descriptive statistics were also used to describe and summarize the characteristics of the sample (Tabachnick & Fidell, 2001; Rogerson, 2010).

In order to reduce the *beliefs* and *type of ATV use* items into a smaller number of coherent subsets, variables were factor analyzed using two separate principal component analyses (PCA) with varimax rotation. Varimax rotation was used to increase the interpretability of results by augmenting factor loadings that were high prior to rotation, and decreasing those that were low (Tabachnick & Fidell, 2001). The PCAs were considered appropriate if Bartlett's test of sphericity was significant (i.e., $p \leq 0.05$) and the Kaiser-Meyer-Olkin (KMO) measure was greater than 0.6 (Tabachnick & Fidell, 2001). Components with eigenvalues greater than 1 were extracted, and factor loadings of 0.40 or more were used to identify which variables were associated with a particular component. Scale reliability coefficients were calculated for each component using Cronbach's alpha (α). Scales were considered reliable if the Cronbach's α values were 0.60 or higher (Tabachnick & Fidell, 2001, Vaske, 2008). Factor scores were generated for each observation on each factor extracted in the PCAs, and were subsequently used as independent variables in the regression analyses.

To create the dependent variable – environmental attitudes – responses to the 8 attitude items were summed for each individual (McFarlane & Boxall, 2000). Two biocentric attitude statements were reverse coded to remain consistent with the other

items, which were anthropocentric in nature. A Cronbach's α reliability coefficient was also computed for the dependent variable.

A multiple regression model using ordinary least squares (OLS) was subsequently developed to assess the strength of the relationship between the dependent and independent variables, as well as the relative contribution of each independent variable to the prediction of attitudes among ATV users (Tabachnick & Fidell, 2001). Correlation coefficients among the independent variables were assessed prior to conducting the regression analysis; none exceeded +/- 0.5, indicating that multicollinearity was not a concern (Tabachnick & Fidell, 2001; Vaske, 2008).

3.6 Results

3.6.1 Univariate Results

A total of 434 completed questionnaires were either collected in the field (413) or received in the mail (21), resulting in an overall response rate of 72.3%. Eighty-two non-ATV users were identified and replaced through the DOPU method and 7 individuals refused to participate when face to face contact was made by a researcher. Fourteen surveys completed by non-ATV users were subsequently removed from the analysis, which resulted in a total of 420 usable questionnaires (70.0%).

Findings revealed that the vast majority of respondents were men (80.4%) who had resided in their respective communities for over 20 years (84.0%). The age variable was normally-distributed, with 51% of the sample lying between the ages of 45 and 69. Over 77% of participants were residents of rural communities. ATV users reported an average 19 years (S.D., 9.7) of ATV riding experience, while the mean number of days

spent riding during the past 12 months was 44 (S.D., 64.9) Only 18.7% of respondents were members of an ATV club or association, however almost half (49.9%) had volunteered to assist with trail maintenance or clean-up efforts.

With regard to type of ATV use, machines are primarily used for transportation to and from the cabin, as well as for wood cutting and hunting (see Table 3.2). Over 42% of respondents reported using ATVs to access their cabin "mostly" or "all the time", while 32.2% of participants use ATVs for hunting at the same rate. An additional 29.6% use ATVs for wood cutting "mostly" or "all the time". The activities in which ATV users were least likely to engage were thrill-seeking and berry-picking. Almost 60% of respondents indicated that they "rarely" or "never" use ATVs for excitement or thrills, with an additional 57.1% equally unlikely to use the machines to pick berries. The most frequent responses for the remaining 2 uses, fishing, and exploring trails and public lands, were for the "sometimes" option. Approximately 30% of respondents indicated that they sometimes use ATVs for wood cutting and exploring, while 34.4% sometimes use them in support of fishing.

Mean scores for the majority of the 10 belief statements were either neutral or positive (see Table 3.2). On average, scores for the belief statements which asked participants to rate the environmental and social consequences of ATV use were neutral ($\bar{x}$=3.03 to 3.27), with the exception of the variable "ATVs interfere with the enjoyment of other recreationists," which met with disagreement ($\bar{x}$=2.19). Mean scores were higher for the items which assessed beliefs about the economic, physical and social benefits of ATV use. Responses to the economic and social variables ranged from neutral to

agreement ($\bar{x}$=3.55 to 3.57), but were neutral for the variable "ATVing is physically demanding and has significant health benefits" ($\bar{x}$=3.05). Responses to the final variable, "ATVs help people who have difficulty walking get out into the backcountry" were both stronger and more positive ($\bar{x}$=4.21) than any other belief item.

Table 3.2. Means and standard deviations for belief and type of ATV use variables

Type of ATV use items	$\bar{x}$	**SD**
As a vehicle to help with wood cutting.[1]	2.76	1.41
As a vehicle to help with hunting.[1]	2.75	1.41
As a vehicle to help with fishing.[1]	2.64	1.25
As a vehicle to help with berry picking.[1]	2.25	1.12
As a transportation vehicle to get to and from the cabin.[1]	3.09	1.46
As a vehicle for exploring trails and public lands.[1]	2.54	1.25
As a vehicle for excitement and thrills.[1]	2.29	1.36
Belief Items	$\bar{x}$	**SD**
Environmental and Social Consequences		
ATVs disturb wildlife.[2]	3.27	1.21
ATVs significantly erode trails.[2]	3.14	1.21
ATVs increase illegal hunting.[2]	3.02	1.39
ATVs trample vegetation.[2]	3.26	1.24
ATVs interfere with the enjoyment of other recreationists.[2]	2.20	1.20
Economic and Social Benefits		
ATVing generates tourism revenue for the province.[2]	3.54	1.22
ATV riding strengthens the bonds between family and friends.[2]	3.68	1.17
ATVing provides economic benefits to small communities.[2]	3.58	1.15
ATVing is physically demanding and has significant health benefits.[2]	3.03	1.22
ATVs help people who have difficulty walking get out into the backcountry.[2]	4.21	0.99

[1]Scale: 1 = never, 2 = rarely, 3 = sometimes, 4 = mostly, 5 = all the time

[2]Scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree

Overall, responses to the 8 attitude items were mixed (see Table 3.3). Statements that assessed attitudes toward the cultural and functional importance of ATV use in

Newfoundland and Labrador were positive; respondents generally agreed that "ATV use is an important part of Newfoundland and Labrador's culture" ($\bar{x}$=4.01), but also felt that it is "a privilege, not a right" ($\bar{x}$=3.93). Results were similarly positive for the variable which asked about using ATVs to complete non-recreational tasks ($\bar{x}$=3.98), as well as for the statement "The benefits I get from ATVing outweigh the potential impact of the activity" ($\bar{x}$=3.50). Conversely, respondents disagreed with the statements "It is my right to ride where I want on public land" ($\bar{x}$=2.35) and "Protecting the environment causes too many inconveniences for ATV users" ($\bar{x}$=2.28). Lastly, participants expressed a neutral opinion about the environmental impact of ATVs given the amount of untouched wilderness on the island of Newfoundland ($\bar{x}$=3.12), but agreed with the statement "It is important to protect the environment even though it prevents ATV use in some areas". This variable garnered the highest level of agreement ($\bar{x}$=4.28) across all 8 attitude items.

Table 3.3. Items used to form attitude score

Environmental Attitude Statements	$\bar{x}$	**SD**
ATV riding is an important part of Newfoundland and Labrador's culture.	4.01	1.02
ATV riding in Newfoundland and Labrador is a priviledge, not a right.[a]	3.93	1.12
The benefits I get from ATV riding outweigh the potential impact of the activity.	3.50	1.12
I need my ATV to accomplish other important tasks.	3.98	1.22
It is important to protect the environment even though it prevents ATV use in some areas.[a]	4.28	0.89
It is my right to ride where I want on public land.	2.35	1.20
Protecting the environment causes too many inconveniences for ATV riders.	2.28	1.21
Given the amount of untouched wilderness on the island of Newfoundland, ATVs are having very little impact on the environment.	3.12	1.25
Cronbach's α = 0.65		

Scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree

[a] Items reverse-coded prior to analysis.

3.6.2 Multivariate Analysis

The PCA of the 10 belief statements produced two 5-item factors with eigenvalues greater than 1 which accounted for 55.0% of the total variance (see Table 3.4). Bartlett's test of sphericity was significant ($p \leq 0.001$), and the KMO measure was 0.83. Loadings for both factors were greater than 0.50. The 2 factors represented distinct dimensions of the belief items and were labelled as *biocentric beliefs* and *anthropocentric beliefs*. The biocentric beliefs factor consisted of variables that measured perceptions of the environmental and social impact of ATV use on wildlife, vegetation, and other recreationists, while the anthropocentric beliefs factor was comprised of items related to the social and economic benefits of ATV riding. Cronbach's α was good for the biocentric beliefs factor at $\alpha = 0.81$, and adequate for the anthropocentric beliefs factor at $\alpha = 0.76$ (Vaske, 2008).

Table 3.4. Principal component analysis results for belief items

Environmental Attitude Factor Items	Factor 1: Biocentric Beliefs	Factor 2: Anthropocentric Beliefs	α
Biocentric Beliefs			0.81
ATVs disturb wildlife.	**.77**	-.12	
ATVs significantly erode trails.	**.76**	-.06	
ATVs increase illegal hunting.	**.76**	-.09	
ATVs trample vegetation.	**.84**	.00	
ATVs interfere with the enjoyment of other recreationists.	**.55**	-.27	
Anthropocentric Beliefs			0.76
ATVing generates tourism revenue for the province.	-.18	**.75**	
ATV riding strengthens the bonds between family and friends.	-.17	**.77**	
ATVing provides economic benefits to small communities.	-.19	**.79**	
ATVing is physically demanding and has significant health benefits.	.11	**.56**	
ATVs help people who have difficulty walking get out into the backcountry.	-.11	**.64**	
Eigenvalues	3.54	1.95	
Percentage of total variance explained	35.49	19.52	
Cumulative variance explained	35.49	55.00	

The PCA of the 7 items relating to type of ATV use resulted in 2 clear factors with all factor loadings greater than 0.5 and eigenvalues greater than 1 (Table 3.5). Bartlett's test of sphericity was significant ($p \leq 0.001$), and the KMO measure was 0.62. Total explained variance was 55.3%. The first factor was labeled *utilitarian use* and included hunting, fishing, wood cutting, berry picking, and transportation to and from the cabin. Exploring trails, and experiencing excitement and thrills comprised the second factor, which was labelled *recreational use*. Scale reliability for both items was adequate at $\alpha = 0.70$ for utilitarian use and $\alpha = 0.64$ for recreational use.

Table 3.5. Principal component analysis results for primary ATV use items

Factor Items for Primay Use of ATV	Factor 1: Utilitarian Use	Factor 2: Recreational Use	α
Subsistence/Utilitarian Use			0.70
As a vehicle to help with wood cutting.	**0.67**	-0.27	
As a vehicle to help with hunting.	**0.79**	-0.18	
As a vehicle to help with fishing.	**0.77**	0.21	
As a vehicle to help with berry picking.	**0.58**	0.20	
As a transportation vehicle to get to and from the cabin.	**0.54**	0.07	
Recreational Use			0.64
As a vehicle for exploring trails and public lands.	0.03	**0.85**	
As a vehicle for excitement and thrills.	0.03	**0.81**	
Eigenvalues	2.31	1.56	
Percentage of total variance explained	32.93	22.32	
Cumulative variance explained	32.93	55.49	

The Cronbach's α coefficient was also computed for the dependent variable, environmental attitudes. Scale reliability of the 8 attitude items was satisfactory at $\alpha = 0.65$.

3.6.3 Regression Analysis

Results of the multiple regression showed that 7 independent variables explained 41% of the total variance in the attitudes of ATV users toward the environment, and the biophysical and social impacts of the activity (see Table 3.6). Significant explanatory variables ($p \leq 0.01$) included biocentric beliefs, anthropocentric beliefs, and participation in both recreational and utilitarian ATV use. The number of days of ATV riding over the past 12 months, participation in voluntary clean-up efforts, and residency type were also significant ($p \leq 0.05$), though less so. Beta values across all significant variables were positive with the exception of the biocentric beliefs variable. The negative beta value ($\beta = -0.430$) for this item indicates that individuals with more positive attitudes toward ATV use (i.e. more anthropocentric attitudes) were less likely to agree with the belief statements concerning the environmental and social impacts of ATV riding. The beta value for anthropocentric beliefs was positive ($\beta = 0.207$); agreement with these statements was associated with less concern for the environment. Beta values were likewise positive for participation in both recreational ($\beta = 0.192$) and utilitarian ($\beta = 0.203$) ATV use, as well as for the variables pertaining to voluntary trail maintenance and clean-up ($\beta = 0.109$) and the number of days of ATV riding over the past 12 months ($\beta = 0.099$). This suggests that respondents who actively participate in all types of ATV riding and ATV-related activities are more likely to exhibit anthropocentric attitudes toward the environment. Of the socio-demographic variables, only residency type was significant ($p \leq 0.05$). Rural residents were more likely to generate attitude scores consistent with anthropocentric attitudes. Membership in an ATV club or association, age, gender and years of participation were not significant predictors of attitudes.

Table 3.6. Regression analysis of possible predictors of environmental attitudes among ATV users

Independent Variables	Standardized Regression Coefficient (β)
Beliefs	
Biocentric	-.430**
Anthropocentric	.207**
Social Involvement	
Club Membership	.058
Participation in voluntary clean-up and trail maintenance	.109*
Prior Experience	
Years of riding experience	.045
Number of days of participation over the last 12 months	.099*
Type of Use	
Recreational	.192**
Utilitarian	.203**
Socio-Demographic	
Age	.019
Gender	.048
Residency type	.106*
Length of residency in the community	.086
Adjusted R^2	.408
F Value	18.084
Model *p* Value	< 0.001

*Significant at $p < .05$ level

**Significant at $p < .01$ level

3.7 Discussion

The results of this study reveal partial support for our hypothesis which proposed that beliefs about the potential outcomes of the activity, social influences, prior experience, type of participation, and socio-demographic indicators would be significant explanatory variables for predicting the attitudes of ATV users. Of the independent variables, only beliefs, participation type, volunteer participation, number of days of

riding over the past 12 months and residency type were significant explanatory variables for predicting the attitudes of ATV users toward both the environment and the biophysical and social outcomes of the activity. Years of experience, ATV club membership, length of residency in a community, age and gender were not significantly related to attitudes.

The findings of this research highlight the importance of examining outdoor recreation issues not just from a biophysical standpoint, but also from the perspective of participants. Understanding the attitudes of ATV users can help dispel public misconceptions about these recreationists, and can also assist resource managers in developing policies that more effectively balance environmental protection with the provision of motorized recreation opportunities. This research proceeded by identifying and documenting the attitudes of ATV users toward both the environment, and the biophysical and social effects of the activity, and then utilized multiple regression analysis to assess the influence of several multi-item variables on these attitudes. This approach is effective in providing baseline data on the environmental attitudes of ATV users, and can also be used to predict and, if necessary, modify attitudes and corresponding behaviour among the ATV constituency.

Overall, the results of this study challenge the notion that individuals who participate in ATV riding are not concerned with the potential impacts of the activity. Attitudes toward environmental protection were generally positive; the majority of respondents agreed that protecting the environment is important even though it prevents ATV use in some areas, and disagreed that it is their right to ride where they want on

public land. Respondents also felt that ATV use is a privilege rather than a right, and did not feel inconvenienced by environmental protection measures. Notwithstanding these results, the data also indicate that a large proportion of respondents rely on ATVs to accomplish non-recreational tasks. Although previous studies have demonstrated that resource dependency is a significant contributor to anthropocentric attitudes among recreationists (Reading et al., 1994; McFarlane & Boxall, 2000), the findings presented here indicate that biocentric attitudes and utilitarian/subsistence practices are not mutually exclusive concepts. Rather, results suggest awareness among respondents that the success of utilitarian pursuits is contingent upon protecting the recreation environment. A possible explanation for this finding stems from the historic settlement pattern of the Burin Peninsula where physical isolation and financial hardship led to the development of a unique culture based around subsistence resource extraction (Okihiro, 1997). Support for this notion is evident in the strong, positive attitudes expressed toward the cultural significance of ATV use in Newfoundland and Labrador. While no longer necessary for survival, subsistence activities such as hunting, trapping, fishing, fuel wood collection, berry picking, and, by extension, ATV use remain strong cultural traditions (Roach et al., 2006), and are not perceived to be environmentally depreciative.

The results of the multiple regression revealed 7 significant determinants of attitude that accounted for 41% of the total variance. These findings were similar to the results of previous studies of outdoor recreationists that explained between 17% and 42% of the total variance in attitudes (Bourke & Luloff, 1994; McFarlane & Boxall, 2000). Consistent with past research (Bourke & Luloff, 1994; Donnelly & Vaske, 1995;

McFarlane & Boxall, 2000), this analysis revealed that beliefs, in particular biocentric beliefs about the negative effects of ATV riding on wildlife, vegetation and other recreationists, were a significant predictor of attitudes among ATV users. These results support the cognitive hierarchy model of human behaviour by demonstrating that the attitudes of ATV users are governed by salient beliefs about the environmental impact of the activity. While an individual can assign multiple beliefs to a particular object, only those that are the most salient contribute to the formation of attitudes and corresponding behaviour (Fishbein & Ajzen, 2010). Although attitudes toward the environment were generally positive, the negative beta value for biocentric beliefs suggest that individuals who agreed with the economic, social and physical health benefits of ATV use were less concerned with the environmental impact of the machines. Thus, while the attitude statements about environmental protection were met with agreement among the majority of respondents, the regression analysis revealed that multiple perspectives exist on the biophysical effects of ATV riding. This discrepancy can largely be attributed to the broad nature of the environmental attitude statements, and underscores the need for a more in-depth examination of complex issues. This study demonstrates that while attitude statements are effective in measuring general support or opposition to a particular topic, analyzing multiple factors at the same time through regression analysis reveals a more nuanced range of opinions and beliefs.

Other findings of this study also revealed similarities with past research on the attitudes of outdoor recreationists. Participation in both recreational and utilitarian ATV use was also a significant predictor of attitudes among ATV users; individuals who

participated in these activities were less likely to exhibit positive attitudes toward the environment. These findings coincide with those of Reading et al. (1994) and Donnelly & Vaske (1995) who likewise found a positive association between participation in consumptive activities and anthropocentric attitudes. Although the socio-demographic variables as a whole were among the poorest predictors of attitudes, results were consistent with Reading et al. (1994) by revealing that rural-dwelling ATV users who were long-time residents of their community were more likely to demonstrate anthropocentric attitudes. As has also been previously reported, age (Bourke & Luloff, 1994; Donnelly & Vaske, 1995) and gender (Donnelly & Vaske, 1995; McFarlane & Boxall, 2000) were not significant determinants of attitude in this study. This result could be attributed to the fact that the majority of respondents were males between the ages of 45 and 69. ATV riding, as well as hunting, fishing and domestic wood cutting, are largely male-dominated activities in Newfoundland and Labrador, and this is reflected in the high proportion of male respondents.

Results which diverged from those of previous research pertain to the social involvement and frequency of participation variables. Although membership in an ATV club or association was not a significant predictor of attitudes, individuals who volunteered to maintain and clean trails were more likely to exhibit anthropocentric attitudes toward the environment. This result differs from that of Steel et al. (1994) who reported that social involvement in a conservation organization contributed to positive attitudes toward the environment. As was previously noted above, active participation in recreational ATV use was also significantly associated with anthropocentric attitudes

among ATV users. This finding suggests that there is a perceived trade-off between the benefits of ATV riding and ecological considerations for active riders. Although they exhibited pro-environmental sentiments, active participants were more likely to feel that the overall impact of ATV riding was positive, rather than negative.

We conclude by noting the limitations of this study. Although this research was successful in explaining a significant portion of the variance in attitudes, the independent variables assessed were both limited in number and site-specific. Constraints related to time and survey length prevented additional variables from being measured. Therefore the possibility exists that underlying factors that had an influence on attitudes in other studies, such as education (Donnelly & Vaske, 1995; McFarlane & Boxall, 2000), income (Donnelly & Vaske, 1995) and basic values (McFarlane & Boxall, 2000), could also affect the attitudes of ATV users. A second limitation relates to the ability of the findings to be generalized to other locations. Some of the independent variables tested were selected on the basis of local culture and practices (i.e., using ATVs in support of firewood collection), and may not be relevant in other areas. Resource managers can draw on the results presented here by noting that, in general, ATV users on the Burin Peninsula have a positive attitude toward the environment; application of these findings to management strategies may not be appropriate outside of the province of Newfoundland and Labrador or possibly even beyond the Burin Peninsula region.

Despite these limitations, this research extends the literature by providing insight into the environmental attitudes of ATV users, and by identifying variables that can be used to predict attitudes and corresponding behaviour among this group of recreationists.

Given the exploratory nature of this research, further studies are needed to examine the underlying factors that shape attitudes among ATV users across samples and over time. By applying this approach to future studies of ATVing, managers will not only have a better understanding of the attitudes of ATV users toward the natural environment, but will also be able to implement the best and most appropriate long-term solutions to ATV-related issues.

3.8 References

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Chapter 4: Recreation specialization among ATV users and its relationship to environmental attitudes and management preferences on the island Newfoundland

4.1 Abstract

The purpose of this study was to identify and document the attitudes, perceptions and resource management preferences of all-terrain vehicle (ATV) users through the recreation specialization framework. Data were collected on the Burin Peninsula on the south coast of the island portion of the province of Newfoundland and Labrador. Variables were operationalized using a quantitative survey which generated an 8-item specialization index based on behavioural, cognitive and affective measures of involvement in ATV riding. Three distinct subgroups of ATV users were identified through K-means cluster analysis. One-way ANOVA tests revealed significant differences across specialization groups. Results document the spectrum of attitudes and management preferences, and provide recommendations for outdoor recreation policies that reflect the needs of a wide variety of ATV users.

4.2 Introduction

The popularity of all-terrain vehicle (ATV) riding, combined with the vehemence of its detractors, has made ATV use on public lands one of the most contentious issues facing resource managers today (Havlick, 2002; Wilson, 2008). Since use of the machines became widespread in the 1980s, critics have become increasingly outspoken about the impact of ATVs on the environment and other non-motorized recreationists (Smith, 2000;

Havlick, 2002). Despite the opposition it has received, ATV use has increased exponentially in many parts of the world, bolstered by the social, psychological, and physical health benefits participants have been shown to derive (Mann & Leahy, 2009, 2010; Burr et al., 2011; Smith & Burr, 2011). Given the complex and controversial nature of ATVing, the on-going challenge for resource managers is to minimize the impacts of ATV use without significantly compromising the recreational experience of those who not only enjoy the activity, but perhaps also depend upon it for transportation or subsistence applications.

Recognizing the diversity that exists between ATV users can assist public land managers in implementing more appropriate policies that reflect the needs of a wide variety of ATV enthusiasts. Policies and regulations that are consistent with the fundamental beliefs of the broader ATV constituency are more likely to meet with public approval, and are therefore more successful in achieving resource management objectives (Bath, 1996; Jakes et al., 1998; Bauer et al., 2010). Recreation specialization is a theoretically robust construct that can assist managers in identifying within-group differences among ATV users across behavioural, cognitive and affective measures of involvement in an activity (Bryan, 1977; Smith et al., 2010). While a large body of knowledge has been compiled on within-group differences among traditional outdoor recreation activities such as hiking, canoeing, fishing, and wildlife watching (see Scott et al. [2005] for a summary), very little is known about the diversity that exists between individuals who participate in motorized forms of outdoor recreation (Donnelly et al., 1986; Jett et al., 2009), and few studies have attempted to segment ATV users specifically

(Smith et al., 2010). This research adds to the existing literature on recreation specialization by developing a typology of ATV users based on behavioural and psychological measures of involvement.

Balancing the growing demand for ATV use with resource conservation can also be facilitated by exploring the attitudes of ATV users toward the recreation setting itself. Various studies have shown support for the notion that individuals who participate in outdoor recreation activities exhibit greater levels of environmental concern (Dunlap & Heffernan, 1975; Jackson, 1986; Teisl & O'Brien, 2003). Environmental concern refers to the cognitive and affective assessment of ecological issues, and also incorporates public attitudes toward resource management policies (Geisler et al., 1977). Understanding the attitudes and perceptions of ATV users can assist resource managers in predicting and influencing behaviour, and can also be used to gauge possible acceptance of new management strategies (Bath & Enck, 2003; Vaske, 2008). With this objective in mind, this study assessed the attitudes and perceptions of different types of ATV users toward the environmental and social impact of ATVing, and evaluated support or opposition to current provincial ATV management policies across specialization groups. Results are intended to assist policy-makers in formulating ATV management strategies that not only correspond to the environmental beliefs and values of ATV users, but also contribute to conservation goals.

4.3 Recreation Specialization

The recreation specialization framework was first proposed by Bryan (1977) to account for attitudinal and behavioural differences among recreational trout fishermen in

Wyoming, Montana and Idaho. In particular, it was noted that experienced anglers exhibited more dedication and behavioural commitment to the sport, and also displayed more environmental concern. The correlation between experience level and environmental attitude is primarily related to cognitive factors such as knowledge and skills. As cognition becomes increasingly specialized through education or practice, behavioural and psychological development necessarily follows (Manning, 1999). Based on this notion, recreation specialization was defined by Bryan (1977) as "a continuum of behaviour from the general to the particular, reflected by equipment and skills used in the sport, and activity setting preferences" (p. 175). Individuals progress along the continuum as they develop skills and gain practical experience. Those who are highly specialized purchase more expensive equipment, spend more time engaged in the activity, and have more specific setting requirements. Specialized participants also display more resource-dependency than novice participants, and are thus more likely to support resource management intervention as a means of protecting the recreation resource (Virden & Schreyer, 1988; Ditton et al., 1992).

Although no formal measurement protocol exists, recreation specialization is most often treated as a multi-dimensional index comprised of behavioural, cognitive and affective components (Scott & Shafer, 2001; McFarlane, 2004). The behavioural dimension measures past experience and current participation in an activity, and consists of such variables as years of experience, and number of days of participation within a prescribed time period (Chipman & Helfrich, 1988; Smith et al., 2010). The cognitive dimension evaluates knowledge of the activity, self-assessed skill level, and equipment

investment (Wellman et al., 1982; Donnelly et al., 1986; Thapa et al., 2006). The affective dimension focuses on personal commitment and enduring dedication (Virden & Schreyer, 1988; Ditton et al., 1992). Variables used to quantify the affective component include frequency of participation, centrality of the activity to an individual's lifestyle, and attitudes toward the activity (McIntyre & Pigram, 1992). Various combinations of the above dimensions have been used as either a single additive index or as several multi-item indices to examine the relationship between recreation specialization and such correlates as motives for participation (Smith et al., 2010), perceptions of crowding (Kuentzel & McDonald, 1992), recreation setting preferences (Schreyer & Beaulieu, 1986; Virden & Schreyer, 1988; Scott & Thigpen, 2003), environmental attitudes and behaviours (Wellman et al., 1982; Dyck et al., 2003; Jett et al., 2009; Smith et al., 2010), and preference for management action (Chipman & Helfrich, 1988; Kuentzel & McDonald, 1992; Salz et al., 2001).

Recreation specialization has generally been successful in assessing within-group differences among self-propelled outdoor recreationists including *anglers* (Bryan, 1977; Chipman & Helfrich, 1988; Ditton et al., 1992; Fisher, 1997; Salz et al., 2001; Salz & Loomis, 2005; Beardmore et al., 2013; Oh et al., 2013), *hunters* (Kuentzel & Heberlein, 1992; Needham et al., 2007; Needham & Vaske, 2013; Schroeder et al., 2013), *hikers and mountaineers* (Virden & Schreyer, 1988; Dyck et al., 2003), *campers* (McIntyre & Pigram, 1992; McFarlane, 2004), *canoeists* (Wellman et al., 1982; Donnelly et al., 1986; Kuentzel & McDonald, 1992; Bricker & Kerstetter, 2000), *bird watchers* (McFarlane 1994; Hvenegaard, 2002; Scott & Thigpen, 2003; Lee & Scott, 2004), and *SCUBA divers*

(Thapa et al., 2006); however application of the framework to motorized forms of recreation is less common and has met with mixed results. Donnelly et al. (1986) compared three subgroups of motor-boaters (dayboaters, cruisers, and racers) using an additive index, and found that only two of the three subgroups varied along the specialization continuum in the expected manner. Jett et al. (2009) also assessed within-group differences between motor-boaters and found that the behavioural dimension of the specialization index failed to perform adequately, and thus resulted in only weak support for the construct. In contrast, a study of off-highway vehicle (OHV) users which used an additive index to segment participants produced 3 distinct subgroups of OHV users based on their behaviour, skill and commitment to the activity (Smith et al., 2011). Given the utility of the construct at assessing within-group differences among OHV users, the specialization framework used for this research will likewise be conceptualized as a composite measure of behavioural, cognitive, and affective involvement in ATV riding.

4.3.1 Environmental Attitude-Behaviour Correspondence

Several theories from the field of social psychology have been applied in outdoor recreation research in order to understand the nature of the relationship between environmental attitudes and behaviour (Manfredo, 1989; Fulton et al., 1996). This association is often described as a hierarchy of cognitions in which attitudes, defined as positive or negative evaluations of an object, exert a direct influence on overt behaviour (Fulton et al., 1996; Vaske, 2008; Fishbein & Ajzen, 2010). Essentially, if a recreationist exhibits either positive or negative attitudes toward the recreation setting, his or her corresponding behaviour in that environment will likewise be positive or negative. This

information is not only useful for anticipating outdoor recreation behavior, but can also be used to develop specific setting attributes or resource management initiatives that enhance the overall recreation experience. Moreover, if attitudes that lead to depreciative recreation behavior can be identified, they can then be replaced or altered through targeted public education programs or policy strategies (Aipanjiguly et al., 2003).

Past research has explored environmental attitude-behavior correspondence among motorized recreationists, including ATV users, however results have been mixed. While a number of studies have failed to establish a significant link between environmental attitudes and behaviour among off-highway vehicle (OHV) users (Van Liere & Noe, 1981; Nord et al., 1998; Tarrant & Green, 1999; Teisl & O'Brien, 2003), others have reported that OHV users exhibited lower levels of environmental concern and were less likely to engage in positive environmental behavior than non-motorized recreationists (Theodori et al. 1998; Thapa & Graefe, 2003). Further, it was noted that OHV users were more likely to prioritize personal goal achievement over forest protection (Thapa & Graefe, 2003). Tarrant and Green (1999) postulated that environmental attitudes, whether positive or negative, exert an influence on preferred recreation type, which subsequently governs pro-environmental behaviour. As OHV and ATV riding entail inherent ecological impacts, participation in these activities is presumed to engender less positive environmental behaviour (Tarrant & Green, 1999). Despite this hypothesis, more recent studies have concluded that participation in OHV riding is associated with positive attitudes toward the recreation setting (Barker & Dawson, 2010), as well as negative attitudes toward environmentally depreciative riding

behavior (Kuehn et al., 2011). These findings call into question the results of previous research and highlight the need for further examination of environmental attitude-behavior correspondence among motorized recreationists. Within the context of this theoretical framework, this research seeks to identify and document the environmental attitudes of ATV users in order to provide insight into the manner in which these attitudes are likely to influence behavior.

4.3.2 Recreation Specialization and Environmental Attitudes

Exploring the environmental attitude-behavior relationship through the recreation specialization framework can reveal how environmental concern and corresponding behavior vary at different stages of participation. Bryan (1977) initially proposed that a positive relationship exists between level of specialization and environmental attitudes; however there has been a lack of consensus on whether general or specific measures of attitude are more appropriate for the construct (Oh & Ditton, 2008). *General attitudes* relate to broad beliefs about the environment (i.e., limitations to population growth, human dominance over nature, the intrinsic value of natural areas etc.), and also refer to non-recreation-related conservation behaviours such as recycling and participating in voluntary clean-up efforts (Nord et al., 1998; Oh & Ditton, 2008). Conversely, *specific attitudes* pertain to activity-related impacts on the recreation setting itself. For example, Thapa et al. (2006) asked scuba divers to report how often they came into contact with coral, and Dyck et al. (2003) assessed the attitudes of mountaineers toward low-impact camping practices such as travelling cross-country and tenting only in unvegetated areas.

Although much of the recreation specialization literature has focused on both general and specific attitudes toward the environment (Mowen et al., 1996; Oh & Ditton, 2008; Smith et al., 2010), individuals tend to be more invested in protecting the recreation setting than with general resource conservation (Dunlap & Heffernan, 1975; Theodori et al., 1998). Dyck et al. (2003) found that specialization was not related to general environmental concern among mountaineers, but was related to activity-specific attitudes, with more specialized mountaineers exhibiting greater support for low-impact practices. Similarly, more specialized recreationists who had participated in hiking, camping, nature study or auto touring at Mt. Rogers National Park in Virginia were more concerned with the local environment than with global environmental issues (Mowen et al., 1996). Differences in activity-specific attitudes have also been shown to exist among scuba divers (Thapa et al., 2006) and anglers (Chipman & Helfrich, 1982; Fisher, 1997). Despite these findings, no significant difference was reported in the activity-specific attitudes of saltwater anglers toward marine protected areas (Salz & Loomis, 2005), nor was there any variation in the attitudes of canoeists toward depreciative river behaviours across specialization groups (Wellman et al., 1982). Further, two studies (Ditton et al., 1992; Oh & Ditton, 2008) found equal support for activity-specific and general measures of attitude; both were positively correlated with specialization among anglers.

Studies on motorized recreation have used both specific and general measures of environmental attitude. Smith et al. (2010) confirmed the existence of within-group differences among OHV users, but found no relationship between level of expertise and general environmental concern. Conversely, a significant difference was found between

motor-boating specialization groups across specific attitudes related to manatee protection (Jett et al., 2009). Contrary to what has generally been reported in the specialization literature, more experienced motor-boaters were found to be less supportive of manatee conservation initiatives (Jett et al., 2009). Given the inconsistency of results, further application of the specialization framework is required to confirm whether a significant relationship exists between specialization and environmental concern among ATV users, another example of a motorized recreation activity. This research will focus on activity-specific attitudes which are not only more managerially relevant, but also better predictors of specific behaviour (Fishbein & Ajzen, 1975; Vaske, 2008). Based on the findings reported by Jett et al. (2009), it is hypothesized that attitudes and perceptions of the environmental impact of ATVing will differ across specialization levels; however, given the exploratory nature of this study, no speculation on the strength and direction of the relationship between specialization level and environmental attitudes is proposed.

4.3.3 Recreation Specialization and Management Preferences

Preference for resource management action is another dependent variable that is often assessed through the recreation specialization framework. In the broadest sense, resource management involves the regulation, distribution and development of natural resources through measured decision-making and policy implementation (Mitchell, 1989). Though not a resource in the traditional sense, outdoor recreation is no different than any other land use insofar as it has the capacity to "satisfy human wants" (Mitchell, 1989, p. 2). Physical attributes such as topography, water, vegetation, climate, and space itself are fundamental to outdoor recreation, as are intangible features such as scenic

vistas and a feeling of solitude (Clawson & Knetsch, 1966; Pigram & Jenkins, 2006). In order to minimize the impact of outdoor recreation on the very attributes that make it appealing, resource managers employ both indirect and direct management strategies. Whereas indirect management strategies rely on education and information to influence attitudes, direct strategies utilize regulations and law enforcement to modify behaviour (Manning et al., 1996). Understanding how preferences for indirect and direct management differ across specialization levels can assist managers in satisfying the needs and wants of a greater cross-section of recreationists.

Although Bryan (1977) first proposed that more experienced recreationists prefer undeveloped wilderness settings, and hence less direct managerial intervention, subsequent research has been mixed on whether a positive or negative relationship exists between specialization and preferences for resource management action. Despite preferring rugged terrain and an absence of signage, experienced hikers were found to be more supportive of direct management strategies such as enforced trail quotas and limits on party size (Virden & Schreyer, 1988). Similarly, specialized anglers were more likely to favour creel and size limits (Chipman & Helfrich) and mandatory catch-and-release programs (Fisher, 1997). Despite these findings, negative correlations between specialization and support for management action have also been reported. Kuentzel and McDonald (1992) assessed canoeists and found limited support across all specialization levels for a series of 9 proposed direct management strategies. Specialized saltwater anglers were also found to be less supportive of access restrictions to marine protected areas than less experienced anglers (Salz & Loomis, 2005), and more seasoned vehicle-

based campers were more critical of managerial intervention than those who had less experience (McIntyre & Pigram, 1992). As no studies on motorized recreation have attempted to quantify indirect and direct management preferences through the specialization framework, a non-directional hypothesis is proposed for the current research which posits that the management preferences of ATV users will differ across specialization levels.

4.4 Methods

4.4.1 Study Area

Data for this research were collected on the Burin Peninsula, which is located on the south coast of the island of Newfoundland. Known locally as "The Boot" due to its shape and relative position in the North Atlantic Ocean, the peninsula is home to approximately 21,000 residents (Statistics Canada, 2011) who live in 35 communities. The Burin Peninsula lies in the Maritime Barrens ecoregion which is characterized by large expanses of heathland and fen which, in addition to being important for migratory bird species, are valuable calving and overwintering grounds for several of the province's endangered caribou herds (PAANL, 2008).

Although no data exists on ownership rates, ATVs, which are here defined as three, four or six-wheeled vehicles, quads, or side by sides designed for off-road use, are a common sight throughout the peninsula. Anecdotal evidence collected from government officials and local residents suggests that there is approximately one machine per household. Despite their prevalence, ATV use is highly restricted on the Burin Peninsula; users must remain on mineral soils or government-sanctioned trails and are not permitted

to travel on the expansive bogs that dominate the landscape. In order to increase riding opportunities, a number of local trail associations have been collaborating on the Burin Peninsula Trailway project with the goal of constructing a continuous ATV trail around the peninsula. Currently, there are approximately 190 kilometers of approved trail peninsula-wide.

4.4.2 Data Collection

This project utilized both qualitative and quantitative methods to achieve the research objectives. Following ethics clearance from Memorial University's Interdisciplinary Committee on Ethics in Human Research (ICEHR Reference No. 20130136-AR), a series of 3 preliminary focus group sessions was conducted in the study area in May 2012. Participants were recruited from local ATV associations using snowball sampling. In addition to encouraging public involvement in the project, the primary purpose of the focus group sessions was to gather exploratory data for use in hypothesis formulation and quantitative survey design (Stewart & Shamdasani, 1990). Participants were encouraged to discuss key issues that are pertinent to ATV users on the Burin Peninsula. This provided a clearer understanding of priorities, and also provided insight into the language and terminology of ATVing, which is often highly technical.

Quantitative data collection was conducted in July and August of 2012. The most recent census data from Statistics Canada (2011) was used to determine the current populations of 35 established communities across the Burin Peninsula. Stratified random sampling proportional to community size was used in order to ensure that ATV users in each town were sampled (Sheskin, 1985; Vaske, 2008). A total of 600 questionnaires

were randomly hand-delivered using a drop-off/pick-up (DOPU) technique which consisted of an initial drop-off, a follow-up visit to either collect the completed questionnaire or deposit a reminder post-card, and if necessary, a final collection attempt (Riley & Kiger, 2002). If the questionnaire was not completed by the 3rd visit, a stamped envelope addressed to the primary researcher was left with instructions to mail the survey within the following two days. Eligible respondents were individuals over 19 years of age who had participated in ATV riding either as an operator or passenger. If there were several ATV users in the household, the adult having the next birthday was asked to complete the questionnaire. If no one in the household had ever participated in ATV use, or if participation in the survey was refused, the nearest neighbor was contacted (Clark & Finley, 2007).

4.4.3 Operationalization of Variables

Variables were operationalized through an 8-page quantitative questionnaire which consisted of both closed and open-ended questions. The questionnaire was modeled after similar instruments used to assess OHV and ATV users in the United States (Smail, 2007; D'Luhosch, 2008; Smith, 2008) and was pilot tested with ATV users at the focus group sessions prior to implementation. Eight variables relating to behavioural, cognitive, and affective involvement in ATV riding were used to develop a multi-dimensional specialization index. The behavioural dimension was modeled after similar motorized recreation studies (Jett et al., 2009; Smith et al., 2010), and consisted of two open-ended questions which asked respondents to indicate how many years they have been riding ATVs, as well as their frequency of participation over the last year. The

cognitive dimension was comprised of two variables which measured skill and economic investment. ATV users in Newfoundland and Labrador are not required to complete certification or training courses, therefore subjects were asked to self-assess their skill level as either 1 = beginner, 2 = intermediate, 3= advanced or 4 = expert. Economic investment was measured through an open-ended question regarding the total number of ATVs and/or Side by Sides owned. Although equipment ownership variables are often removed from specialization indices in order to minimize the confounding effect of higher discretionary income (Jett et al., 2009; Smith et al., 2010), Ditton et al. (1992) suggest that committed recreationists keep up with technology in order to improve skills and develop new modes of participation. Thus, for the purposes of this study, higher scores on this question were used to indicate more advanced skill. Lastly, the 4 variables used to assess the affective dimension were adapted from McIntyre and Pigram's (1992) measures of enduring involvement. Four statements pertaining to the importance and centrality of ATVing to the respondent's lifestyle were rated on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Environmental attitudes were measured using 18 activity-specific variables adapted from both the literature (Thapa et al., 2006; Smail, 2007; D'Luhosch, 2008, Jett et al., 2009) and the focus group sessions. Subjects were asked to rate their agreement with 8 attitude statements about ATV use in Newfoundland and Labrador along a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Ten statements relating to potential positive, negative and neutral impacts of ATV use were also rated on

a 5-point Likert scale as above. Impacts were environmental, social and economic in nature.

Preferences for ATV management in Newfoundland and Labrador were measured using 14 researcher-derived variables drawn from the focus-group sessions. Statements included both indirect and direct management strategies. Indirect management options included more visible regulations and a more extensive trail network, while direct management options consisted of mandatory environmental education and safety courses, restricted access in designated areas, increased ATV-related fines, and more enforcement officers in the field. All preferences were rated on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

4.4.4 Data Analysis

Following collection, data were organized, coded, and entered into IBM SPSS Statistical software (version 17.0) for analysis. In order to ensure quality control, appropriate checking procedures during coding, data entry and data preparation for analysis were utilized. Improperly coded data and outliers were identified using descriptive statistical techniques, and were subsequently removed from the dataset (Tabachnick & Fidell, 2001). Descriptive statistics were used for exploratory purposes to describe and summarize the characteristics of the sample (Tabachnick & Fidell, 2001; Rogerson, 2010).

In order to calculate the composite recreation specialization index, the 8 specialization items, which were a mixture of ordinal, interval and ratio level variables, were converted to standardized Z-scores for ease of analysis (Hvenegaard, 2002; Thapa et

al., 2006; Jett et al., 2009; Smith et al., 2010). Scale reliability of the composite index was verified using Cronbach's alpha (α). K-means cluster analysis was used to classify subjects into discrete groups based on their similarity across specialization variables. The procedure uses algorithms to assign individuals to coherent subgroups in which members are more similar to each other than to those in other clusters (Lorr, 1983). In addition to being well-suited to large sample sizes (Lee & Scott, 2004), cluster analysis takes into account the multi-dimensionality of the specialization construct and introduces less researcher bias into the assignment of recreationists to specialization groups (McIntyre & Pigram, 1992; Scott et al., 2005; Scott & Thigpen, 2003). Cluster analysis has been used to segment anglers (Chipman & Helfrich, 1988), campers (McIntyre and Pigram, 1992), hunters (Needham et al., 2007) and bird watchers (McFarlane, 1994; Hvenegaard, 2002; Scott & Thigpen, 2003; Lee & Scott, 2004; Scott et al., 2005). For the present study, cluster analyses ranging from 2 to 7 groups were generated until the most suitable solution was identified. The final solution resulted in relatively equal clusters that had sufficient cases to perform multivariate statistical analyses (Scott & Thigpen, 2003). Differences between subgroups across each of the specialization dimensions were assessed using one-way analysis of variance (ANOVA) tests (Smith et al., 2010).

A principal component analysis (PCA) with varimax rotation was used to aggregate and describe the environmental attitude items. The goal of PCA was to reduce variables down to a select number of components that express as much of the total variance in the data as possible (Tabachnick & Fidell, 2001). Varimax rotation was used as its overall effect is to further increase factor loadings that are high prior to rotation, and

decrease those that are low (Tabachnick & Fidell, 2001). Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure were assessed prior to analyzing the PCA. Factor analysis was deemed appropriate if Bartlett's test was significant (i.e., $p \leq 0.05$) and the KMO was greater than 0.6 (Tabachnick & Fidell, 2001). Components with eigenvalues greater than 1 were extracted, and factor loadings of 0.40 or more were used to identify which variables were associated with a particular component. Factor scores for each component were subsequently computed to facilitate analysis. The relationship between specialization level and environmental attitude factors was assessed using one-way ANOVA tests, as was the association between specialization and management preference items (Salz et al., 2001; Dyck et al., 2003; Smith et al., 2010). Post hoc procedures utilized Tukey's Honestly Significant Difference (HSD) test (Hvenegaard, 2002).

4.5 Results

Of the 600 questionnaires that were distributed, 434 were returned (72.3%). A total of 413 (95.1%) were collected in the field, and an additional 21 (4.9%) were received in the mail. Eighty-two non-ATV users were identified and replaced through the DOPU method and only 7 individuals refused to participate when contacted at the door. Fourteen surveys completed by non-ATV users were removed from the analysis, which resulted in a total of 420 usable questionnaires (70.0%). The majority of respondents were men (80.4%) who had lived in their respective communities for over 20 years (84.0%). The age variable was normally-distributed, with 51% of the sample lying between the ages of 45 and 69. ATV users reported an average 18 years experience (S.D., 9.7), while

the mean number of days spent riding during the past 12 months was 43 (S.D., 64.9). A total of 52.5% of respondents rated their skill level as advanced. Subjects owned between zero and 4 ATVs and/or Side by Sides; however the majority (69.4%) owned one and only 10 respondents (2.4%) reported owning more than 2 machines. The most common mode of participation was as an operator (58.6%). Over 97% of respondents who had only been operators were male compared to just 2.2% of females. Only 9.0% of respondents had only been passengers, of which the majority (62.9%) were female. The remaining 32.4% of respondents, which consisted of 82 males and 44 females, had participated as both operators and passengers.

4.5.1 Recreation Specialization

Scale reliability of the 8-item recreation specialization index was good at $\alpha = 0.81$ (Vaske, 2008). Due to missing values, only 365 responses (60.8%) were included in the cluster analysis. The K-means procedure produced 3 meaningful sub-groups of ATV users that were significantly different across all specialization variables (see Table 4.1). Based on responses, groups were labeled as *casual*, *active*, and *dedicated* ATV users (Scott et al., 2005). Groups differed most across the affective dimension variables dealing with the importance ($F=280.76$, $p \leq 0.001$) and centrality of ATVing to the respondent's lifestyle ($F=286.72$, $p \leq 0.001$). The social connections related to ATV use were also significantly different across groups ($F=217.11$, $p \leq 0.001$). Differences also existed for ATV ownership ($F=35.84$, $p \leq 0.001$), as well as years ($F=41.31$, $p \leq 0.001$) and frequency of participation ($F=66.85$, $p \leq 0.001$).

Table 4.1. Comparison of specialization items across groups

	Specialization Group				
	Casual (n=113)	**Active** (n=177)	**Dedicated** (n=75)		
Composite Specialization Index (*Cronbach's α = 0.81*)	*Mean*	*Mean*	*Mean*	*F (sig.)*	X^2 *(sig.)*
Behavioral Dimension					
How many years have you been riding?[1]	13.22	19.56	24.56	41.31**	NA
During the past 12 months, approximately how many days did you ride?[1]	16.05	36.20	109.68	66.85**	NA
Cognitive Dimension					
How would you rate your skill level?[2]	2.33	3.17	3.31	NA	119.42**
How many ATVs or Side by Sides do you own?[1]	0.74	1.12	1.40	35.84**	NA
Affective Dimension					
ATV riding is very important to me.[3]	2.44	4.43	4.87	280.76**	NA
I find that a lot of my life is organized around ATVing and ATV-related activities.[3]	1.53	3.01	4.49	286.72**	NA
If I stopped ATVing I would probably lose touch with many of my friends.[3]	1.41	1.91	4.11	217.11**	NA
I would rather go ATVing than do other types of outdoor recreation activities.[3]	1.66	3.15	4.27	128.92**	NA

**Significant at the .001 level

[1]Based on total count.

[2]Scale: 1 = beginner, 2 = intermediate, 3 = advanced, 4 = expert

[3]Scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree

Casual ATV users comprised 40.0% (N = 113) of all respondents and scored the lowest means across all dimensions of involvement. On average, casual users had 13 years of experience, and had participated in ATVing 16 times over the previous 12 months. The self-assessed skill level of the average casual user was in the intermediate range ($\bar{x}$=2.33). This group was also the least likely to own an ATV ($\bar{x}$=0.74). Casual ATV users expressed the most disagreement with all 4 affective items, with means ranging from 2.44 to 1.41.

Active ATV users were the largest subgroup, accounting for 48.5% (N=177) of respondents. Active users had an average 20 years of experience, and reported 36 days of participation over the previous 12 months. The mean skill level for active ATV users was advanced ($\bar{x}$=3.17), and ATV ownership was more likely for this group ($\bar{x}$=1.12). Active ATV users reported agreement with the affective variable relating to the importance of ATV use ($\bar{x}$=4.43), but were neutral regarding the centrality of the activity ($\bar{x}$=3.01), as well as their preference for it over other activities ($\bar{x}$=3.15). Active users disagreed with the variable which measured the relative importance of ATVing to maintaining social connections ($\bar{x}$=1.91).

Although it included only 20.5% (N=75) of respondents, dedicated ATV users had the highest means across all three specialization dimensions. On average, dedicated users had 25 years of experience, and rode 110 days over the previous 12 months. Similar to the active subgroup, dedicated users had an average self-assessed skill level in the advanced range ($\bar{x}$=3.31), and were more likely to own multiple ATVs ($\bar{x}$=1.40). Dedicated users

were the only group to agree with all 4 affective items with means ranging from 4.11 to 4.87.

4.5.2 Environmental Attitudes

An initial PCA analysis was run on all 18 environmental attitude variables. Bartlett's test of sphericity was significant ($p \leq 0.001$), and the KMO measure was 0.87, which confirmed the appropriateness of the factor analysis. The final solution produced 4 factors with eigenvalues greater than 1 which accounted for 53.78% of the total variance. Loadings across all 4 factors were greater than 0.50. As is evident in Table 4.2, six of the variables loaded on the 1st factor and accounted for 28.27% of the total variance. Scale reliability of factor 1 was good (α =0.83). The 2nd and 3rd factors each consisted of 5 variables, and explained 10.75% and 8.72% of the total variance. Both factors 2 (α =0.76) and 3 (α =0.63) had adequate scale reliability. The final 2 variables loaded on factor 4 and explained 6.44% of the total variance. Although it was eliminated from the analysis as a result of poor scale reliability (α =0.39), factor 4 was labelled *Protectionist Values* based on its associated variables "ATV riding in Newfoundland and Labrador is a privilege, not a right" ($\bar{x}$=3.84) and "It is important to protect the environment even though it prevents ATV use in some areas", which scored the highest overall mean ($\bar{x}$=4.29) across all 18 attitude items.

The remaining 3 factors represented distinct dimensions of the environmental attitude items and were labelled as *Environmental Impact*, *Social Benefits*, and *Subsistence/Utilitarian Values*. The *Environmental Impact* factor consisted of variables that were intended to measure perceptions of the effect of ATV use on wildlife,

Table 4.2. Principal component analysis results for environmental attitude items

Environmental Attitude Factor Items	Factor 1: Environmental Impact	Factor 2: Social Benefits	Factor 3: Subsistence/Utilitarian Values	Factor 4: Protectionist Values	α	M
Environmental Impact					0.83	
ATVs disturb wildlife.	**.75**	-.11	-.21	.05		3.28
ATVs significantly erode trails.	**.76**	-.09	-.04	.14		3.16
ATVs increase illegal hunting.	**.74**	-.12	-.10	-.07		3.03
ATVs trample vegetation.	**.82**	-.02	-.15	.09		3.30
ATVs interfere with the enjoyment of other recreationists.	**.54**	-.22	-.17	-.19		2.19
Given the amount of untouched wilderness on the island of Newfoundland, ATVs are having very little impact on the environment.	**-.56**	.15	.49	-.13		3.08
Social Benefits					0.76	
ATVing generates tourism revenue for the province.	-.20	**.74**	.10	.07		3.55
ATV riding strengthens the bonds between family and friends.	-.17	**.76**	.12	.02		3.69
ATVing provides economic benefits to small communities.	-.21	**.79**	.06	-.06		3.57
ATVing is physically demanding and has significant health benefits.	.10	**.53**	.09	-.14		3.05
ATVs help people who have difficulty walking get out into the backcountry.	-.09	**.64**	.16	-.02		4.20
Subsistance/Utilitarian Values					0.63	
The benefits I get from ATV riding outweigh the potential impact of the activity.	-.26	.36	**.59**	.25		3.44
I need my ATV to accomplish other important tasks.	-.32	.18	**.61**	.14		3.97
ATV riding is an important part of Newfoundland and Labrador's culture.	-.06	.16	**.54**	.23		4.01
It is my right to ride where I want on public land.	-.20	.11	**.54**	-.39		2.31
Protecting the environment causes too many inconveniences for ATV riders.	-.10	.01	**.60**	-.41		2.25
Protectionist Values					0.39	
ATV riding in Newfoundland and Labrador is a priviledge, not a right.	-.04	-.06	-.01	**.65**		3.88
It is important to protect the environment even though it prevents ATV use in some areas.	.09	-.02	.11	**.73**		4.29
Eigenvalues	5.09	1.94	1.50	1.16		
Percentage of total variance explained	28.27	10.75	8.32	6.44		
Cumulative variance explained	28.27	39.01	47.34	53.78		

Scale for means: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree

vegetation, and other recreationists. On average, mean scores for all respondents across this factor were neutral (from 3.03 to 3.30), with the exception of the variable "ATVs interfere with the enjoyment of other recreationists," which met with disagreement ($\bar{x}$=2.19). The variable "Given the amount of untouched wilderness on the island of Newfoundland, ATVs are having very little impact on the environment" generated a negative factor loading, indicating that the statement was associated with this factor in the opposite direction. In order to account for this, the item was reverse-coded prior to computing a factor score for the Environmental Impact factor.

The second factor, *Social Benefits*, referred to potential economic, physical and social outcomes of ATV use. Average responses to the economic and social variables fell between neutral and agreement ($\bar{x}$=3.55-3.57) for the entire sample, but was neutral for the variable "ATVing is physically demanding and has significant health benefits" ($\bar{x}$=3.05). Attitudes toward the final variable, "ATVs help people who have difficulty walking get out into the backcountry" were both stronger and more positive ($\bar{x}$=4.20). Factor 3, *Subsistence/Utilitarian Values*, was comprised of statements that assessed attitudes toward the cultural and functional importance of ATV use in Newfoundland and Labrador. On average, respondents agreed that "ATV use is an important part of Newfoundland and Labrador's culture" ($\bar{x}$=4.01). Results were similarly positive for the variable which asked about using ATVs to complete non-recreational tasks ($\bar{x}$=3.97), as well as for the statement "The benefits I get from ATVing outweigh the potential impact of the activity" ($\bar{x}$=3.55). Conversely, respondents disagreed with the statements "It is my

right to ride where I want on public land" ($\bar{x}$=2.31) and "Protecting the environment causes too many inconveniences for ATV users" ($\bar{x}$=2.25).

Using factor scores computed from the PCA, the relationship between specialization level and the environmental attitude dimensions was assessed through a series of one-way ANOVA tests (see Table 4.3). Significant differences ($p \leq 0.001$) were found between groups across all three attitude dimensions, thus supporting the first hypothesis. The greatest difference was noted for the Subsistence/Utilitarian Values factor (F=47.96), followed by the Social Benefits factor (F=40.24) and the Environmental Impact factor (F=30.40). Post hoc tests confirmed that casual ATV users were significantly more concerned about the environmental impact of ATVing than both the active and dedicated subgroups ($p \leq 0.001$). There was no significant difference between active and dedicated users across this dimension; both were more likely to disagree that ATV use has a negative effect on the environment and other recreationists. All three groups differed significantly across the Social Benefits and Subsistence/Utilitarian Values

Table 4.3. Comparison of specialization groups across environmental attitude dimensions using ANOVA

	Specialization Group			
	Casual (n=113)	**Active** (n=177)	**Dedicated** (n=75)	
Environmetal Attitude Factors	*Mean*	*Mean*	*Mean*	*F (sig.)*
Environmental Impact	3.42[a]	2.77[b]	2.53[b]	30.40**
Social Benefits	3.20[a]	3.73[b]	4.18[c]	40.24**
Subsistence/Utilitarian Values	2.77[a]	3.35[b]	3.68[c]	47.96**

**Significant at the .001 level

[abc] Groups with different superscripts are significantly different at the 0.05 level of confidence

dimensions ($p \leq 0.001$). Dedicated ATV users exhibited both the strongest and most positive attitudes toward the social and subsistence benefits of the activity, while casual users had more neutral attitudes toward the social benefits of ATVing, and disagreed with the subsistence/utilitarian dimension altogether.

4.5.3 Management Preferences

The relationship between specialization level and management preferences was also assessed using one-way ANOVA tests (see Table 4.4). Significant differences were noted between 8 of the 14 management variables; however the second hypothesis was only partially supported. Post hoc tests revealed that only casual ATV users differed from both the active and dedicated subgroups across each of the 8 items. Of the 4 indirect management actions, only the variable pertaining to additional ATV trail creation resulted in a significant difference ($p \leq 0.001$). Both active and dedicated users agreed that more trails should be created, while casual users were neutral. Of the direct management strategies, casual users were more supportive of mandatory environmental education and safety courses, preventing hunters from retrieving game using ATVs in prohibited areas, and increasing both ATV-related fines and the number of enforcement officers in the field. Active and dedicated users were more likely to disagree with each of these strategies with the exception of mandatory environmental education courses which which active users neither agreed nor disagreed with. Significant differences also existed for limiting ATVs to mineral soil or frozen ground ($p \leq 0.05$), as well as for limiting the number of ATVs in some areas ($p \leq 0.001$), however all three groups disagreed with these variables to some degree.

There was no significant difference between groups for indirect management strategies related to distributing and posting regulations, or for creating a provincial ATV federation to represent all users. All 3 subgroups generally agreed with these options.

Table 4.4. Comparison of specialization groups across management preferences

	Specialization Group			
	Casual (n=113)	**Active** (n=177)	**Dedicated** (n=75)	
Management Actions	*Mean*	*Mean*	*Mean*	*F (sig.)*
Indirect				
Distribute regulations to ATV users	4.25	4.19	3.92	2.45
Post regulations in visible areas	4.16	4.21	4.29	0.45
Create a provincial ATV Federation	3.21	3.33	3.39	0.45
Create more ATV trails	3.77[a]	4.39[b]	4.56[b]	17.88**
Direct				
Mandatory safety courses	3.67[a]	2.99[b]	2.93[b]	9.60**
Mandatory environmental education programs	3.51[a]	3.06[b]	2.93[b]	5.59**
Allow children under 16 to ride full-size ATVs	1.78	1.75	1.96	0.81
Prohibit hunters from retrieving game using ATVs	3.03[a]	2.32[b]	1.91[b]	13.42**
Only allow ATVs on mineral soil or frozen ground	2.90[a]	2.61[b]	2.35[b]	3.62*
Create buffer zones where ATVs are not allowed	3.86	3.69	3.62	1.02
Limit the number of ATVs in some areas	2.70[a]	2.01[b]	1.95[b]	11.88**
ATV users should police themselves	3.70	3.70	3.66	0.03
Stiffer fines for ATV-related offences	3.57[a]	2.83[b]	2.79[b]	11.39**
Increase number of enforcement officers	3.41[a]	2.84[b]	2.71[b]	7.87**

*Significant at the .05 level

**Significant at the .001 level

[ab] Groups with different superscripts are significantly different at the 0.05 level of confidence

Likewise no differences were noted for direct management strategies pertaining to age restrictions, buffer zones, and allowing ATV users to police themselves in the field. ATV users exhibited neutral to positive attitudes toward buffer zones and self-enforcement, but disagreed with allowing children under the age of 16 to operate full-size ATVs.

4.6 Discussion

This study examined recreation specialization among ATV users and its relationship to environmental attitudes and management preferences. Using cluster analysis, 3 distinct sub-groups of ATV users were identified on the basis of their behaviour, skill level, and psychological attachment to ATVing. Specialized users had more years of riding experience, participated more frequently, owned more machines, and assigned greater importance to ATVing than less specialized users. These findings support the framework proposed by Bryan (1977) and add to the literature by applying the specialization continuum to a specific group of motorized recreationists.

An additional goal of this research was to understand how the environmental attitudes and management preferences of ATV users differ across specialization levels. Contrary to results reported for self-propelled outdoor activities (Mowen et al., 1996; Dyck et al., 2003; Thapa et al., 2009), but consistent with other studies on motorized recreation (Jett et al., 2009), specialization among ATV users was found to be negatively related to environmental attitudes. More experienced ATV users were less likely to agree that ATVs have a negative impact on the environment and other recreationists, while less specialized users exhibited greater concern about these issues. Conversely, specialized ATV users had more positive attitudes toward the social and subsistence benefits of ATVing, which were significantly less important for novice participants. Despite these differences, all ATV users exhibited strong positive attitudes toward protecting the recreation environment. This discrepancy suggests that ATV users not only differ across

specialization levels, but also in terms of how they perceive both the environment and the ecological impact of ATV riding.

According to Mowen et al. (1996), higher specialization for consumptive and motorized activities corresponds to an increased emphasis on the functional value of the environment. As specialization increases, outdoor recreationists become progressively more dependent on specific aspects of the recreation resource-base (Bryan, 1977; Ditton et al., 1992). Several studies have uncovered a positive relationship between specialization and consumptive orientation among anglers (Chipman & Helfrich, 1988; Ditton et al., 1992; Fisher, 1997). Chipman & Helfrich (1988) found that specialized anglers were more concerned with catching trophy-size fish than with enjoying the social and aesthetic aspects of fishing, while both Ditton et al. (1992) and Fisher (1997) concluded that experienced anglers placed more importance on both the number and size of fish caught, than on outdoor enjoyment and just catching fish in general. Although no studies have specifically investigated resource-dependency among motorized recreationists, Smith et al. (2010) found that specialized OHV users relied on the recreation setting to achieve goals related to personal growth. No significant differences were noted across general environmental attitudes, however experienced OHV enthusiasts were more dependent on the recreation setting to improve riding proficiency, test vehicle capabilities, and improve leadership skills (Smith et al., 2010). These findings are consistent with the results of the current study which demonstrated that specialized riders were more likely to use ATVs to complete other tasks and hence ascribed greater value to the subsistence and utilitarian benefits of the activity. Although it is difficult to

distinguish between recreational riders who enjoy using ATVs to hunt, fish, collect wood and pick berries from those who rely on the machines to satisfy basic needs, both applications have inherent social, psychological and cultural benefits that increase personal attachment to the recreation resource-base (Glass et al., 1990). This was addressed in the focus groups sessions wherein several participants commented that although relatively few Newfoundlanders rely on ATVs to supplement cash incomes, many dedicated users simply take pleasure in participating in a variety of consumptive activities on their ATVs.

In addition to valuing the recreation environment in different ways, ATV users also vary in their perceptions of the impact of the activity. ATVs are large, heavy machines that are capable of causing significant damage (Havlick, 2002); yet specialized riders were less likely to agree that ATVs have a negative impact on the environment. While it is possible that experienced users are more technically skilled, and therefore better able to control their ecological footprint, Wellman et al. (1982) point out that perceptions also change with specialization. When no variation was found in the attitudes of canoeing sub-groups toward depreciative river behaviours, Wellman et al. (1982) speculated that experienced canoeists were more likely to overlook aspects of river running that might be considered significant among beginners, such as the potential danger of whitewater rapids. Thus actions and impacts that are initially apparent to novice recreationists become increasingly less so with continued participation. This research substantiates this notion by demonstrating that less specialized ATV users were more aware of the environmental impact of the activity. Findings suggest that as experienced

riders become more conditioned to impacts over time, the detrimental effects of ATVing become both less obvious and less concerning. Moreover, navigating advanced-level trails requires greater focus and concentration which might further prevent experienced riders from perceiving impacts on wildlife and the surrounding area.

In addition to becoming more accustomed to impacts, specialized users are also more tolerant of the effects of outdoor recreation activities. Specialized SCUBA divers were not only more accustomed to the negative impacts of the activity, but were also more likely to accept them as part of the recreational diving experience (Thapa et al. 2006). This suggests that as recreationists progress along the specialization continuum, they develop an expectation of encountering impacts that are an accepted part of the conventional norms for a chosen activity. If the social norms of a recreational pursuit support depreciative behaviour, committed participants may likewise be less concerned with environmental degradation (Mowen et al., 1996). By emphasizing high-impact equipment and trail creation, the social norms of ATV use dictate that the environmental impact of ATVing is not only an expected outcome of the activity, but also a necessary precursor. This is particularly true on the Burin Peninsula where ATVing is generally restricted to approved trails created expressly for the purpose. The findings of the current study suggest that more specialized ATV users are more socially invested in the activity, and hence more likely to concur with social norms that accept environmental impacts as part of the tradition of ATV riding. In contrast, novice participants were less affected by the social aspect of ATV use, and exhibited greater environmental concern.

Preferences for management actions among ATV users corroborate the findings of Bryan's (1977) initial study in which he found that more experienced recreationists disapproved of management strategies that compromised resource utilization. Similar results were reported by Salz & Loomis (2005) who found that experienced saltwater anglers were less supportive of access restrictions to marine protected areas. No studies have examined the management preferences of motorized recreationists, however Jett et al. (2009) found a negative relationship between motor-boating specialization and manatee conservation, and postulated that it too might be related to implied access restrictions. Whereas novice ATV users were generally supportive of management intervention, specialized ATV users were critical of all 7 direct management options and only showed support for the indirect management strategy which proposed building more trails. Attitudes were strongest and most negative for the 3 direct management actions which recommended prohibiting ATV use in certain areas. These findings suggest that, as with anglers and motor-boaters, experienced ATV users are least supportive of regulations which limit resource utilization, and would rather face fine increases and mandatory environmental education courses than lose access to the resources on which they depend. Based on the attitude-behavior discourse, management strategies which involve fines and compulsory courses are therefore unlikely to deter depreciative behavior among the most active and dedicated ATV users.

4.7 Management Implications

Growing interest in outdoor pursuits, as well as advances in recreation technology have increased the potential for environmental degradation and conflict among

recreationists with differing motivations, expectations and goals. Identifying meaningful sub-groups of ATV users through the recreation specialization framework can assist resource managers in addressing these issues in a variety of ways. First, by understanding the attitudes and perceptions of different types of ATV users toward the environmental and social impact of ATVing, resource managers can develop policies that meet the needs of a broader spectrum of ATV riders. This study revealed that the majority of ATV users had stronger and more positive attitudes toward the social and subsistence benefits of the activity, and were less concerned with the environmental impact. Thus implementing strict regulations to curtail the depreciative behaviour of a few users might instead be detrimental to the social and psychological well-being of the bulk of participants. In contrast, education programs and regulations which focus on the protection of subsistence resources might be both more appropriate and more effective. A second application of the recreation specialization framework is to assess how proposed management actions are likely to affect ATV users. Over two-thirds of respondents (69.4%) disagreed with the direct management actions that proposed access restrictions. Attitudes toward increased fines and enforcement were somewhat less negative, suggesting that this approach might be the preferred strategy for holding users accountable for their actions without limiting access to resources for subsistence or utilitarian purposes.

Although this research was successful in applying the recreation specialization framework to ATV users, managers should be aware of the limitations of the construct. The lack of a consistent protocol for measuring and analyzing specialization has been identified as a limiting factor by several researchers (Scott & Schafer, 2001; McFarlane,

2004; Jett et al., 2009). The current study used an additive index which included behavioural, cognitive and affective dimensions; however half of the index was comprised of affective variables. Although scale reliability was high, the overall specialization index was heavily weighted by the affective dimension. A second limitation of the framework relates to the ability to generalize findings to other jurisdictions. The present study offers insight into a group of recreationists that has received very little attention from the research community; however results are only representative of ATV users on the Burin Peninsula. Attitudes and preferences are shaped by local culture and value systems, and are also subject to socio-demographic variation (Smith et al., 2010). As a result, application of these findings to management strategies is intended only for the province of Newfoundland and Labrador. Even within the province, residents of the Avalon Peninsula, an area characterized by a more urban population, may feel differently about these resource management issues and have different proportions of dedicated, active and novice ATV users in their respective populations. Further research would reveal whether common province-wide policies or regulations that are sensitive to regional differences are more appropriate. Findings are also limited to the attitudes of individual ATV users, and not the larger ATV industry and advertising sector, which might reveal a different perspective on the issue when examined from that scale.

Despite these limitations, this research adds to the existing literature by assessing how the attitudes, perceptions and management preferences of ATV users change at different stages of involvement. Given the exploratory nature of this research, further attention should be devoted to exploring within-group differences among ATV users in

other areas where the activity is likewise a concern. As the results of this research and previous studies demonstrate, using the recreation specialization framework in management planning minimizes the trade-off between conservation objectives and public values, and fosters broader acceptance of resource management initiatives overall.

4.8 References

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Chapter 5 – Conclusion

This chapter reviews the objectives of this research, highlights key findings, and integrates results into the existing literature on the human dimensions of ATV use. This chapter also addresses the limitations and challenges of this study, suggests future directions for research, and provides recommendations for ATV management in Newfoundland and Labrador.

5.1 Environmental Attitudes

> "*Love to ride my ATV but the environment is the most important. We have to do our best to conserve it*." – Respondent

The first objective of this research was to apply a cognitive hierarchy model of human behaviour to identify and document the attitudes of ATV users toward both the environment and the biophysical and social impacts of the activity. Attitudes of ATV users toward the environment were positive. Overall, respondents agreed that protecting the environment takes precedence over ATV riding in some areas, and does not interfere with their enjoyment of the activity. Further, the majority of respondents felt that ATVing is a privilege rather than an inherent right, and disagreed with unrestricted ATV use on public lands. Notwithstanding these results, respondents exhibited more moderate attitudes toward the current impact of ATV use in Newfoundland and Labrador; the majority of those surveyed neither agreed nor disagreed that ATVs are having a significant effect on the environment given the vastness of the province's wilderness. Although perceptions of the biophysical impacts of ATV use on wildlife, vegetation and soil were largely neutral, the majority of respondents expressed strong positive opinions

about the economic and social benefits of the activity. While participants generally agreed that ATV riding bolsters local economies, tourism revenue, and social bonds between family and friends, the activity was perceived to be most beneficial for individuals with limited mobility who rely on the machines for backcountry access. As rural populations in Newfoundland and Labrador continue to age, a significant challenge will be to provide accessible, yet environmentally-friendly recreation opportunities. ATVing offers backcountry access to participants of all levels of fitness, and is often one of the few remaining activities in which individuals with heart conditions and arthritis can still participate (Mann & Leahy, 2009). With a large proportion of the population at or nearing retirement age, resource managers will have to take a proactive approach in minimizing the new set of demands that this generation is expected to place on outdoor recreation areas (Mitchell & Dearden, 2005).

Results of the regression analysis presented in the second manuscript revealed that the attitudes of ATV users are significantly shaped by beliefs about the environmental impact of the activity. Negative perceptions of the biophysical effects of ATV riding contributed to positive attitudes toward the environment. ATV riding for both recreational and utilitarian/subsistence purposes, stronger agreement with the social and economic benefits of the activity, and participation in voluntary trail maintenance were also underlying factors that shaped attitudes, however these items were found to contribute to lower levels of environmental concern. Residency in a rural area, extended residency in a community, and more frequent participation in ATV riding were also associated with lower levels of environmental concern. External factors such as socio-demographic

indicators (i.e., age, gender), ATV club membership, and years of participation were not significant determinants of environmental attitudes.

This thesis contributes to the existing literature by further exploring the nature of the relationship between environmental attitudes and outdoor recreation participation. In the 1st hypothesis of their 1975 thesis, Dunlap and Heffernan posited that outdoor recreation behaviour is positively associated with environmental concern. While several researchers have examined this relationship among OHV/ATV users, results have either been inconclusive (Van Liere & Noe, 1981; Nord et al., 1998; Tarrant & Green, 1999), or have shown that OHV/ATV users are less concerned about the environment than individuals who participate in self-propelled activities (Theodori et al., 1998; Thapa & Graefe, 2003). By demonstrating that the environmental attitudes of ATV users are primarily shaped by negative perceptions of the biophysical impacts of the activity, the current research suggests that a positive association exists between participation in ATV use and environmental concern. This notion is substantiated by the strong support shown for restricting ATV use in ecologically sensitive areas. Overall, attitudes toward environmental protection were both stronger and more positive than those expressed toward the functional and cultural importance of ATV use in the province. These findings support the 1st hypothesis of the Dunlap-Heffernan thesis (1975) and differ from those of Thapa & Graefe (2006) who reported that ATV users in Pennsylvania prioritized ATV riding over environmental protection. In contrast, residents of Newfoundland and Labrador have a long history of living off the land, and are thus posited to feel a deeper sense of responsibility and respect toward the natural environment.

Results also challenge the 2nd hypothesis of the Dunlap-Heffernan thesis (1975) which proposes that appreciative activities engender greater concern for the environment than consumptive activities, while "abusive" activities, such as ATV use, are negatively associated with environmental concern. Although no studies have reported a negative relationship between ATV use and environmental attitudes, Theodori et al. (1998) and Thapa and Graefe (2003) found that individuals who participated in OHV/ATV riding exhibited less environmental concern than recreationists who participated in appreciative or consumptive activities. Thapa and Graefe (2003) also reported that ATV users expressed more technocentric attitudes than either appreciative or consumptive recreationists, and were less aware of the negative consequences of their activity. This differs from the current research which revealed through regression analysis that although respondents ascribed value to the subsistence and utilitarian benefits of ATVing, they also felt strongly about minimizing the potential impacts of the activity. These findings concur with those of Barker and Dawson (2010) who likewise reported a positive association between participation in ATV use and concern for the environment, as well as those of Teisl and O'Brien (2003) who found that the attitudes of ATV users toward forest management were as positive as those expressed by individuals who participated in appreciative activities such as hiking, camping and cross-country skiing.

Despite the pro-environmental attitudes demonstrated by the majority of those surveyed, upon closer examination of the different types of ATV users, the results of the regression analysis also revealed that more frequent participation in ATV riding was associated with less concern for the environment. Regular participation in both

recreational and utilitarian/subsistence ATV use, as well as more frequent riding over the past 12 months contributed to more anthropocentric attitudes toward the environment. These findings differ from those of Barker and Dawson (2010) who found that more frequent participation in OHV/ATV riding lead to more positive attitudes toward the recreation setting. These results suggest the existence of an environmental tension or ambiguity, whereby active participants exhibit pro-environmental sentiments, yet also feel that the social and economic benefits of ATV riding outweigh the negative impacts. This finding neither supports, nor contradicts the Dunlap-Heffernan thesis, but adds an important layer of complexity to the claims of this body of literature.

Although the findings of this study were mixed with respect to the Dunlap-Heffernan thesis (1975), the results of the regression analysis support the cognitive hierarchy model of human behaviour by demonstrating that the attitudes of ATV users are governed by beliefs about the environmental impact of the activity. Based on the cognitive hierarchy model, salient beliefs give rise to overarching value orientations, which regulate the direction and intensity of attitudes (Fulton et al., 1996). Attitudes, defined as positive or negative evaluations of a particular object or issue, are in turn thought to exert a direct influence on behaviour (Vaske, 2008; Fishbein & Ajzen, 2010). The findings of the current research showed that the majority of ATV users expressed positive attitudes toward the environment. Therefore, based on the cognitive hierarchy framework, as well as the results of the regression analysis which confirmed the belief-attitude relationship, the majority of ATV users do not intend to participate in depreciative behaviour, but rather support environmental protection. Conversely, results

also suggest that the minority of respondents who expressed more anthropocentric attitudes are less concerned about the environmental impact of ATV riding, and are thus theoretically more likely to engage in potentially harmful behaviour.

5.2 Recreation Specialization

> "*I have over the past 35 years spent in excess of $75,000 in ATVs and $50,000 in skidoos. It's high time someone is trying to help me enjoy these machines a little better*." – Respondent

The second objective of this research was to apply the recreation specialization framework to develop a typology of ATV users on the island of Newfoundland. As is presented in the third manuscript, results confirm the existence of within-group differences among ATV users in the study area. Using cluster analysis, ATV users were classified into 3 discrete groups, labeled *casual*, *active*, and *dedicated*, based on a number of affective, behavioural and cognitive measures of involvement in the activity. Factors that contributed to within-group differences among ATV users included the centrality of the activity to the respondent's life, self-assessed skill level, length and frequency of participation in ATV riding, and ATV ownership. More specialized ATV users ascribed more personal importance to the activity, perceived themselves to be more skilled, reported more years of total riding experience, had participated more frequently over the previous 12 months, and owned more machines than less specialized users. These findings support the recreation specialization framework proposed by Bryan (1977), and concur with the results of Smith et al. (2010) who likewise found that OHV users in Utah consisted of 3 distinct subgroups based on their behaviour, skill and commitment to the activity.

An additional goal of this study was to deploy the recreation specialization framework to assess whether the environmental attitudes of ATV users change at different stages of involvement in the activity. Contrary to results reported for self-propelled outdoor activities (Mowen et al., 1996; Dyck et al., 2003; Thapa et al., 2009), but consistent with other studies on motorized recreation (Jett et al., 2009), this study uncovered an inverse relationship between recreation specialization and environmental concern; as specialization increased, environmental concern decreased. Casual ATV users were significantly more concerned about the environmental impact of ATVing than both the active and dedicated subgroups. Conversely, specialization was found to have a positive influence on attitudes toward the social and subsistence benefits of ATV riding. Although all 3 groups were significantly different across these items, more specialized riders were significantly more likely to express a positive opinion about the impact of ATVs on the economy, tourism revenue, interpersonal relationships, and utilitarian pursuits such as hunting, fishing and firewood collection.

Despite having different perceptions of the biophysical, social and economic impacts of ATV use, attitudes toward protecting the recreation environment were generally positive across all 3 specialization subgroups. A possible explanation for this discrepancy is that ATV users value the recreation resource for different reasons. Whereas specialized riders were more likely to use ATVs for transportation, hunting and fuel wood collection, novice participants rode primarily for recreation. This suggests that while more specialized ATV users value the recreation resource for functional purposes, less specialized users appreciate it for its intrinsic worth.

The results of this research also point toward different perceptions of the environmental impact of ATV riding between specialization groups. As one respondent wrote:

> "*I was a passenger on an ATV. It was my first ride, [I] was very nervous. Enjoyed the scenery but was very aware of the dangers of travelling on an ATV. I wish everyone felt like that and used the machines carefully*."

This comment corresponds with the findings of this study which demonstrate that although attitudes toward environmental protection were uniformly positive across all subgroups, less specialized ATV users were more aware of the impacts of the activity than experienced participants. This implies that as individuals progress along the recreation specialization continuum, they become either more proficient at reducing their environmental footprint, or less aware of the impact of the activity. An additional possibility is that as ATV riding develops into a central life interest for specialized users, they become conditioned to the environmental impact of ATVing, or consider it an unavoidable and possibly necessary consequence of the activity.

The conclusions presented above contribute to a growing body of work on recreation specialization by examining how specialization influences environmental attitudes and perceptions among ATV users. Few studies have examined this relationship among motorized recreationists (Donnelly et al., 1986; Jett et al., 2009), and only one has explored recreation specialization among OHV users (Smith et al., 2010). In their study of OHV users in Utah, Smith et al. (2010) confirmed the existence of within-group differences, but found no relationship between specialization and general attitudes toward

the environment. By demonstrating that less specialized ATV users exhibited more concern for the recreation environment than specialized users, this study expands upon the findings of Smith et al., (2010) and suggests that motorized recreationists, and in particular ATV users, may not progress along the recreation specialization continuum in the same manner as individuals who engage in traditional, self-propelled activities.

This dissertation also highlights the social and psychological importance of ATV riding among more specialized participants. Results revealed that the 3 subgroups differed most in their responses to questionnaire items which assessed the affective component of ATVing. While casual ATV users ascribed very little personal importance to the activity, dedicated users not only exhibited strong emotional attachment to ATV riding, but found it fundamental to their identity. These findings are consistent with Mann & Leahy (2009, 2010) and Smith and Burr (2011) who likewise found that OHV/ATV users not only value ATV riding, but find it meaningful to their lives. The current research also demonstrated that the social connections fostered by ATV use were significantly more important to dedicated users. These findings corroborate those of Mann & Leahy (2009) who also found that ATV enthusiasts were primarily motivated by the "special connections" they made with family and friends while out riding. By demonstrating that dedicated ATV users derive more meaning from the activity than casual users, the findings presented here document a more nuanced range of attitudes among ATV recreationists, and show that the social-psychological benefits of the activity are similar to those associated with other, more traditional forms of outdoor recreation (Mann & Leahy, 2009).

5.3 Management Preferences

"*Let us be! Our off-trail riding is not impacting the environment where riders have to be fined or punished.*" – Respondent

"*ATV riding makes it easier for me to enjoy the beautiful landscape of our province. That being said, I strongly believe in preserving its beauty and support laws that protect the environment so I can keep enjoying it*." – Respondent

The final objective of this research was to evaluate support or opposition to current ATV regulations and management policies in the province of Newfoundland and Labrador. Overall, preferences for ATV management actions were more positive for the indirect options than for the direct options. The majority of respondents expressed strong positive opinions about indirect management strategies related to distributing and posting regulations, and for creating more approved ATV trails in the province. Attitudes were more moderate toward the indirect option which proposed creating a provincial ATV federation to represent all users, as well as toward the direct strategies pertaining to mandatory safety and environmental education courses, the creation of buffer zones, allowing ATV users to police themselves, and increasing fines for ATV-related offences. Actions which met with disagreement among the majority of respondents included increasing the number of enforcement officers, placing quotas on the number of ATVs permitted in certain areas, restricting ATVs to mineral soil or frozen ground, prohibiting hunters from using ATVs to retrieve game, and allowing children less than 16 years of age to operate full-size ATVs.

Further examination of the above management options through the recreation specialization framework revealed that preferences for management action differed significantly across specialization subgroups. Results presented in the third manuscript show that, while casual ATV users were more supportive of management intervention overall, active and dedicated users were more critical of direct management strategies, and only expressed support for the indirect management action which proposed building more approved ATV trails. Further, active and dedicated users showed the least support for the direct management strategies which advocated restricting access to the recreation setting by either prohibiting hunters from using ATVs to retrieve game, restricting ATV use to mineral soil or frozen ground, or limiting the total number of ATVs allowed in particular areas. These findings are consistent with Bryan's (1977) initial study on recreation specialization in which he found that more experienced recreationists disapproved of access restrictions, and suggest that experienced ATV users would rather face fine increases and mandatory environmental education courses than lose access to the recreation resource.

As only one previous study has assessed the management preferences of OHV users (Kuehn et al., 2011), this research adds to the existing knowledge by contributing baseline data on the attitudes of ATV users toward a variety of indirect and direct management options. Results corroborate those of Kuehn et al. (2011) who found that ATV users in New England preferred indirect management strategies rather than direct actions. Kuehn et al. (2011) also showed that the attitudes and intentions of OHV users were influenced by indirect management preferences; individuals who favored these

approaches were less likely to intend to create illegal trails during their next ride. This has implications for the current research in which active and dedicated respondents expressed positive attitudes toward indirect management actions, but disagreed with direct strategies. Although these preferences might be interpreted as a rejection of environmental protection measures, based on the findings of Kuehn et al. (2011), they should not be interpreted as *prima facie* evidence of intentions to engage in unlawful behaviour.

5.4 Limitations

The first limitation of this project concerns the pilot testing of the survey instrument. Due to time constraints, extensive pre-testing of the final questionnaire could only be conducted with focus group participants and could not be expanded to the larger population of ATV users in the study area. No concerns were raised about the questionnaire; however the individuals who attended the focus group sessions were actively involved in ATV riding and perhaps more familiar with current issues regarding ATV management in the province. A larger, more representative pilot test might have identified terminology or content that was unfamiliar to more novice ATV riders, and hence increased the validity of these particular items.

Within the data collection process, another limitation was the lack of a reliable sampling frame. As yearly registration of ATVs is not a legal requirement in Newfoundland and Labrador, no list of ATV users was readily available. Based on information received from government officials and local residents which suggested that there is at least one ATV rider per household on the Burin Peninsula, the sampling frame

was defined as each household in the study area. A detailed map or list of addresses of all households on the peninsula were not available; therefore stratified random sampling proportional to community size was used in order to ensure that an equivalent number of ATV users were sampled in each town (Sheskin, 1985; Vaske, 2008). Households were randomly selected by attending every nth house in the community until the pre-determined number of questionnaires was distributed. This process was itself challenging as a result of the traditional settlement pattern of outport communities on the Burin Peninsula. Despite every effort to ensure the random selection of households, coverage errors could have occurred in which individuals were inadvertently not included in the sampling frame as a result of their residence being overlooked or difficult to access. In order to account for this limitation, the target response rate for completed questionnaires was high (i.e., 400) to produce results that more closely resemble the distribution of the source population, and thus decrease variability.

A final limitation of this research relates to the ability of the findings to be generalized to other locations. This study was limited to the Burin Peninsula region of Newfoundland and Labrador and, due to time and financial constraints, could not be extended to the rest of the province. As a result, findings are only representative of ATV users on the Burin Peninsula. Although application of these results to management strategies in other areas is not appropriate, findings could be useful for making comparisons with ATV recreationists in other parts of the province, country, or internationally.

5.5 Future Research

This dissertation provides baseline data on the human dimensions of ATV use and represents a first step toward better understanding these recreationists in the province of Newfoundland and Labrador. In order to expand upon the results presented herein, future research should focus on conducting similar studies in other parts of the province to assess whether environmental attitudes and management preferences differ regionally. For example, residents of more urban areas, such as the Avalon Peninsula on the east coast of the island of Newfoundland, may consist of different proportions of casual, active and dedicated ATV users who may differ in their attitudes and perceptions of resource management issues. Further research would reveal whether the current practice of instituting province-wide ATV policies, or enacting regulations that are sensitive to regional differences, is more appropriate. Similar studies could also be conducted in other jurisdictions in Canada, the United States, and internationally to examine how ATV users differ.

In addition to spatial variation, future research should also focus on attitude change over time. A number of human dimensions researchers have noted that environmental values among the general public appear to be gradually shifting from anthropocentric to biocentric in nature (Bengston, 1994; Zinn et al., 2002; Manfredo et al., 2003; Manfredo, 2008). Although this has not been shown to be the case on the Burin Peninsula, longitudinal studies would confirm whether any trends exist in the attitudes of ATV users in Newfoundland and Labrador, and could also be used to evaluate the effectiveness of future ATV policies and environmental education programs.

From a methodological perspective, further testing of the drop-off/pick-up (DOPU) method of quantitative data collection would confirm the effectiveness of the technique for future human dimensions studies in Newfoundland and Labrador, as well as in other jurisdictions. Using the DOPU method, this research exceeded the target response rate of 400 completed questionnaires, and achieved a total response rate of 70%. This exceeds the results of similar human dimensions studies conducted in the province that reported response rates of 50% (Sutherland, 2010) and 65% (Lundrigan, 2000) using mail surveys preceded by an initial telephone contact. The DOPU method also has promising implications for future research on ATV users specifically. The response rate for this project surpassed those of recent studies of ATV users in the United States that achieved rates of 42% (Smith et al., 2010), 48% (Kuehn et al., 2011), and 50% (Barker & Dawson, 2010) using mail surveys alone.

In addition to improved quantitative data collection techniques, qualitative methods could also be applied to future studies of ATV users. Of the 423 usable questionnaires collected, 177 included additional written comments in the blank space provided on the last page. Examining these comments through content analysis could provide insight into other issues that are outside the scope of the questionnaire, yet nevertheless important to ATV users in the province. Future research could also utilize qualitative interviews to augment the breadth of findings. While delivering questionnaires, a number of respondents were eager to express their opinions about ATVing and current legislation in the province. Information gleaned from qualitative interviews could provide a greater depth of understanding than data collected from

quantitative surveys, and could also be used to uncover individual differences between ATV users. Future research could also include a study of the advertizing and promotion of ATVs in the province to determine whether marketing campaigns, ATV designs, and the industry itself have any effect on the attitudes and behaviour of end users.

5.6 Management Recommendations

> "*It's hard to say what is best but ATVs are a way of life for NL and [I] don't want to see it too regulated*." – Respondent

In addition to the academic and theoretical objectives of this research, this project had an additional applied goal of contributing to the provincial decision-making process regarding ATV management in the province of Newfoundland and Labrador. The first recommendation for resource managers is to formulate a knowledge mobilization plan to disseminate results. Throughout the data collection phase, respondents expressed interest in learning more about the findings of this project. Results should be shared with ATV users, and should also be made available to concerned citizen groups and the general public. Distributing results would not only encourage greater public involvement in ATV management issues, but could also help address some of the misconceptions of ATV users in the province.

A second recommendation of this research is to provide more information on the potential impacts of ATV use to participants. In contrast to research that has suggested that ATVs have negative impacts on coastal dunes and Newfoundland marten (Catto, 2002; Newfoundland Marten Recovery Team, 2010), the majority of respondents expressed neutral opinions about the biophysical effects of ATV use, and neither agreed,

nor disagreed that ATVs are having a negative effect on wildlife, soil and vegetation. The moderate responses to these items suggest that there is uncertainty about the extent of the impact of the machines in the province. This represents an opportunity for resource managers to change the beliefs and corresponding attitudes of ATV users through environmental education campaigns. Communication messages should include facts on the specific impacts of the activity, as well as detailed information about how these impacts are likely to affect recreational, utilitarian and subsistence ATV use. Education campaigns could be funded by the ATV industry, which not only has more financial resources than the provincial government, but is also the primary beneficiary of ATV-related profits in the province. In addition to education campaigns, a portion of these profits should be allocated to the design phase of the manufacturing process to allow companies to continuously develop new technologies that reduce the overall impact of the machines. ATV retailers, hunting and fishing organizations, and perhaps even schools could also be used as platforms to promote an ATV rider ethic that encourages environmental protection. While this research has identified that beliefs about impacts are key to influencing attitudes, further research is needed to understand which is the best organization to deliver the message and by what medium. Communication involves identifying the right message and the target audience, which this research has done, however further research is needed to explore the credibility of the messenger and the most effective medium to use. The correct message delivered by the wrong messenger, or by the wrong medium, will not achieve the desired impact.

Further to the above recommendation for increased environmental education, this study also cautions against enacting overly-restrictive regulations based on the actions of the minority of ATV users who engage in destructive behaviour. This study revealed that the majority of ATV users expressed positive attitudes about protecting the recreation environment, and also felt strongly about the social and subsistence benefits of the activity. Moreover, results showed that more respondents used ATVs for transportation, hunting, and wood collection than for purely recreational pursuits. Thus, while environmental protection is important, implementing prohibitive regulations or all-out bans on ATV use in order to minimize the depreciative behaviour of a few users might be detrimental to the social, psychological and economic well-being of the majority of participants. The over-regulation of ATV riding due to irresponsible users was a concern shared by many respondents, including one individual who wrote:

> "*The majority of ATV users are law-abiding, responsible and environmentally friendly people. But as with most things there are a small minority of the population who ruin it for everyone*."

A final recommendation for resource managers pertains to the construction of ATV trails in Newfoundland and Labrador. Although the results of this research support a growth policy regarding the establishment of new trails on the Burin Peninsula, a number of respondents expressed concern about the condition of the current trail system, stating that it is rugged and difficult to navigate in some areas. Rather than increasing the environmental footprint of ATV use by constructing new trails, improvements should first be made to the existing trail system. Primary funding for these trails should come from

ATV manufacturers, as the trails effectively build markets for further ATV buyers. A well-maintained network of ATV trails would encourage greater use of areas that have already been set aside for this purpose, thereby reducing off-trail riding, as well as the need for costly and often labor-intensive conservation enforcement programs. Partial funding for trail maintenance could also come from the annual registration of ATVs which is currently not required in the province, but common in other jurisdictions across Canada and the United States. In addition to assisting with trail infrastructure, an annual nominal ATV registration fee would improve management decision-making by providing resource managers with up-to-date information on the number and type of individuals participating in ATV use. This data could also be used as a sampling frame to facilitate future research on the human dimensions of ATV use in Newfoundland and Labrador.

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Appendices

Appendix A: Questionnaire

Newfoundland and Labrador All-Terrain Vehicle (ATV) User Survey

Dear ATV enthusiast:

Thank you very much for agreeing to participate in this study about ATV use. Your answers will help us understand how you feel about ATV recreation and management in the province of Newfoundland and Labrador.

Please answer all questions as completely as possible. I encourage you to voice your opinions, whether for, against, or neutral. Your views will help guide future management decisions. Your answers will be grouped with those of others and all individual responses will be kept strictly confidential.

***NOTE: For this study, an ATV is defined as a three, four or six-wheeled all-terrain vehicle, quad, or side by side designed for off-road use.**

Snowmobiles and dirt bikes are **not** included as ATVs for the purpose of this study.

If you have any questions about the study, please do not hesitate to contact Celina Waight at (709) 770-2195. Your assistance with this project is greatly appreciated.

Thank you for your help,

Sincerely,

Celina Waight
Project Manager

Dr. Alistair Bath
Project Supervisor

The first questions ask about the ways in which you have participated in ATV use in Newfoundland and Labrador. Please circle your response.

1. Have you ever participated in ATVing either as an operator or a passenger?
   a) Yes
   b) No

2. If you answered yes to the above question, how do you usually participate?
   a) As an operator
   b) As a passenger
   c) Both

The next questions ask about your feelings toward ATV use in Newfoundland and Labrador.

Please circle the response that best represents your opinion, where:

	Strongly disagree 1	**Disagree 2**	**Neither agree nor disagree 3**	**Agree 4**	**Strongly agree 5**
1.	ATV riding is an important part of Newfoundland and Labrador's culture.	1	2	3	4	5
2.	ATV riding in Newfoundland and Labrador is a privilege, not a right.	1	2	3	4	5
3.	The benefits I get from ATV riding outweigh the potential impacts of the activity.	1	2	3	4	5
4.	Given the amount of untouched wilderness on the island of Newfoundland, ATVs are having very little impact on the environment.	1	2	3	4	5
5.	I need my ATV to accomplish other important tasks (i.e.: wood collection, hunting, fishing, etc.)	1	2	3	4	5
6.	It is important to protect the environment even though it prevents ATV use in some areas.	1	2	3	4	5
7.	It is my right to ride where I want on public land.	1	2	3	4	5

		Strongly Disagree				Strongly Agree
8.	Protecting the environment causes too many inconveniences for ATV riders.	1	2	3	4	5

When answering these next few questions, think about where you typically ride your ATV:

Please circle the response that best represents your opinion, where:

	Never 1	Rarely 2	Sometimes 3	Mostly 4	All the time 5
1.	On my own land or land owned by family or friends.	1	2	3	4	5
2.	On designated ATV trails.	1	2	3	4	5
3.	Cross-country on land where no one else has been before.	1	2	3	4	5
4.	On trails that have been created by someone else.	1	2	3	4	5
5.	On paved roads.	1	2	3	4	5
6.	On gravel access roads.	1	2	3	4	5
7.	On shorelines or beaches.	1	2	3	4	5
8.	On wetlands or bogs.	1	2	3	4	5
9.	Wherever my friends and/or family want to ride.	1	2	3	4	5
10.	I usually decide where to ride on the spur of the moment.	1	2	3	4	5

The following questions ask about your experience with ATVs. Please circle your response:

1. Do you own an ATV or Side by Side?
   a) Yes (*please specify number*): AT V _____ Side by Side _____
   b) No
2. How many years have you been riding? _____
3. During the past 12 months, approximately how many days did you ride? _____

4. During which months do you usually ride? (*Circle all that apply*)

a) January	b) February	c) March	d) April	e) May	f) June
g) July	h) August	i) September	j) October	k) November	l) December

5. Do you belong to any ATV clubs or associations?
   a) Yes
   b) No

6. Have you ever volunteered to do trail maintenance or clean-up?
   a) Yes
   b) No

7. Did you purchase a trail pass this year?
   a) Yes
   b) No

8. How would you rate your skill level?
   a) Beginner
   b) Intermediate
   c) Advanced
   d) Expert

9. Who do you ride with **<u>most often</u>**? (*Circle one*)
   a) Alone
   b) Family
   c) Friends
   d) ATV Club Members

How often do you use your ATV in the following ways? Please circle your response:

	Never	**Rarely**	**Sometimes**		**Mostly**	**All the time**
	1	**2**	**3**		**4**	**5**
1.	As a vehicle to help with wood cutting	1	2	3	4	5
2.	As a vehicle to help with hunting.	1	2	3	4	5
3.	As a vehicle to help with fishing.	1	2	3	4	5
4.	As a vehicle to help with berry picking.	1	2	3	4	5

		Never				All the time
5.	As a vehicle for exploring trails and public lands.	1	2	3	4	5
6.	As a vehicle for excitement and thrills.	1	2	3	4	5
7.	As a transportation vehicle to get to and from the cabin.	1	2	3	4	5

The following questions ask about the Burin Peninsula Trailway. Please circle your response:

1.	Have you heard of the Burin Peninsula Trailway project?	a) Yes	b) No	c) Unsure
2.	Have you used trails that are part of the Burin Peninsula Trailway?	a) Yes	b) No	c) Unsure

		Strongly Disagree				Strongly Agree
3.	There should be a continuous ATV trail that connects most communities on the Burin Peninsula.	1	2	3	4	5
4.	The provincial government should promote the Burin Peninsula Trailway as a tourist attraction.	1	2	3	4	5

The following questions ask about potential positive, negative and neutral impacts of ATV use. Please circle your response:

		Strongly Disagree				Strongly Agree
1.	ATVing generates tourism revenue for the province.	1	2	3	4	5
2.	ATVs disturb wildlife.	1	2	3	4	5
3.	ATV riding strengthens the bonds between family and friends.	1	2	3	4	5
4.	ATVs significantly erode trails.	1	2	3	4	5
5.	ATVing provides economic benefits to small communities.	1	2	3	4	5
6.	ATVs increase illegal hunting.	1	2	3	4	5
7.	ATVs help people who have difficulty walking get out into the backcountry.	1	2	3	4	5

		Strongly Disagree				Strongly Agree
8.	ATVs trample vegetation.	1	2	3	4	5
9.	ATVing is physically demanding and has significant health benefits.	1	2	3	4	5
10.	ATVs interfere with the enjoyment of other recreationists (e.g.: hikers, skiers, etc.)	1	2	3	4	5

The following questions ask about how important ATVing is to you. Please circle your response:

		Strongly Disagree				Strongly Agree
1.	ATV riding is very important to me.	1	2	3	4	5
2.	I find that a lot of my life is organized around ATVing and ATV-related activities.	1	2	3	4	5
3.	If I stopped ATVing, I would probably lose touch with many of my friends.	1	2	3	4	5
4.	I would rather go ATVing than do other types of outdoor recreation activities.	1	2	3	4	5

The next questions ask about your preferences for ATV management in Newfoundland and Labrador. Please circle your opinion of the following ATV regulation strategies:

		Strongly Disagree				Strongly Agree
1.	Regulations should be distributed to all registered ATV owners.	1	2	3	4	5
2.	Regulations should be posted in visible areas.	1	2	3	4	5
3.	Everyone should be required to take a safety course.	1	2	3	4	5
4.	The government should create a provincial ATV Federation to represent all ATV users.	1	2	3	4	5

		Strongly Disagree				Strongly Agree
5.	ATVs should only be allowed to travel on mineral soils or frozen ground.	1	2	3	4	5
6.	More designated ATV trails should be created.	1	2	3	4	5
7.	Environmental education programs should be required for all riders.	1	2	3	4	5
8.	Children less than 16 years of age should be allowed to ride full-size ATVs or Side by Sides.	1	2	3	4	5
9.	Hunters should not be allowed to use ATVs to retrieve game in prohibited areas.	1	2	3	4	5
10.	Buffer zones should be created around bogs and marshes to reduce environmental damage.	1	2	3	4	5
11.	There should be limits on the number of ATVs allowed in certain areas.	1	2	3	4	5
12.	ATV users should be encouraged to police themselves in the field.	1	2	3	4	5
13.	There should be stiffer fines for ATV-related offences.	1	2	3	4	5
14.	The number of enforcement officers in the field should be increased.	1	2	3	4	5

The next questions ask about your experience with ATV enforcement in Newfoundland and Labrador. Please circle your response:

1. Have you ever encountered an enforcement officer while riding your ATV?
    a) Yes
    b) No

2. Have you ever received a fine for an ATV-related offence?
    a) Yes
    b) No

3. Have you ever witnessed another ATV user commit an offence?
    c) Yes
    d) No

The last few questions will help us learn whether the sample of residents in this study is similar to residents in other communities across the province. Please circle your response:

1. Are you: a) Female b) Male

2. What is your age?
    a) 20-24 b) 25-29 c) 30-34 d) 35-39 e) 40-44 f) 45-49
    g) 50-54 h) 55-59 i) 60-64 j) 65-69 k) 70-74 l) 75+

3. How many ATV riders live in your household? _____

4. How many years have you lived in your community?
    a) Less than 1 year b) 1-5 years c) 6-10 years
    d) 11-15 years e) 16-20 years f) Over 20 years

5. Do you own any other recreational vehicles? (C*ircle all that apply*)
    a) Motorcycle b) Speed Boat c) Snowmobile d) Fishing Boat
    e) Jet Ski f) Dirt Bike g) Motorhome/RV h) Amphibious UTV

6. Do you own a cabin or vacation house? a) Yes b) No

If you have any other comments, please share them with us:

_____
_____
_____
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Thank you for taking the time to complete this survey!

Appendix B: Cover Sheet

MAKE YOUR OPINION COUNT!

What do you think about all-terrain vehicle (ATV) use in Newfoundland and Labrador?

Memorial University of Newfoundland (MUN) is interested in learning more about the motivations, preferences and goals of ATV users in Newfoundland and Labrador. Your answers will provide valuable insight into how Newfoundlanders feel about ATVing and how they would like it to be managed in the province.

You have been randomly selected to give your opinions on this issue. The survey should take about 10 minutes to complete. We request that only people **19 years of age or older** participate in the study as questionnaire responses could influence important decisions regarding the future of ATV use in the province. **If there are several ATV users in the household, the adult who is having the NEXT BIRTHDAY should complete the questionnaire.**

When you have completed the questionnaire, please seal it in the envelope provided and hang it on your front door in the plastic doorknob bag.

A research assistant will be by to collect your completed questionnaire on _____ between the hours of _____ and _____.

If you have any questions about this study, please do not hesitate to contact Celina at (709) 770-2195. Your assistance with this project is greatly appreciated.

Thank you for your help,

Sincerely,

Celina Waight
Project Manager

Dr. Alistair Bath
Project Supervisor

Appendix C: Follow-up postcard

MEMORIAL UNIVERSITY

NL All-Terrain Vehicle (ATV) User Survey

We're sorry we missed you. We'd like to know how you feel about ATVing and ATV management in Newfoundland and Labrador.

If you have not completed your survey yet, please take a few minutes to fill it out. Seal it in the envelope provided and hang it on your front door in the door knob bag.

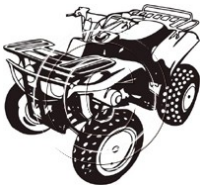
A research assistant will be by to collect your completed survey on _____ between the hours of _____ and _____.

If you have any questions or need another copy of the survey, please do not hesitate to call me at (709) 770-2195. Thank you very much for your help.

Sincerely,

Celina Waight

Appendix D: Final notice



We're sorry we missed you again……

We still want to know what you think about all-terrain vehicle (ATV) use in Newfoundland and Labrador.

A research assistant dropped off a survey about recreational ATV use at your residence a few days ago. We came by to collect it, but unfortunately no one was home. Your participation in this survey is really important to ensure that the results of this project are representative of the Burin Peninsula.

You have been randomly selected to participate in this survey and your voice counts for 2,500 other Burin Peninsula residents!!

When you have completed the questionnaire, please seal it in the postage-paid envelope provided and mail it within the next two days.

If you have any questions about this study, or if you require another copy of the survey, please do not hesitate to contact Celina at (709) 770-2195. Your assistance with this project is greatly appreciated.

Thank you again for your help,

Sincerely,

Celina Waight
Project Manager

Dr. Alistair Bath
Project Supervisor