VIEW FROM A CANOE: MODELLING WILDERNESS CANOEISTS' PERCEPTIONS AND PREFERENCES FOR NORTHERN ONTARIO'S BOREAL LANDSCAPE

by

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ABSTRACT

Canoe paddlers' campsite and route preferences as well as landscape perceptions of pristine and disturbed landscapes in northern Ontario are solicited in a novel internet survey. The survey instrument combines elements of the Scenic Beauty Estimation (SBE) and two discrete choice experiments (DCE). The analysis consists of a separate scenic beauty model, a campsite selection model, and a route choice model. The best fitting route choice model combines the route choices with scenic beauty evaluations and the campsite choice model in one sequentially nested logit model. Scenic beauty ratings are affected by several biophysical and contextual factors, including forest class and landscape disturbance level. The route choices are influenced strongly by forest type, minimum SBE, and campsite quality. Finally, management implications of these findings are discussed. For example, canoeists are very sensitive to human disturbances in the form of buffers, but are more accepting of water crossings.

To my wife Jesse,
For all her love, support, and friendship

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LIST OF ABBREVIATIONS

BS ....Black spruce

BSB................Black spruce bog

CRCA ....Canadian Recreational Canoe Association

DCE ....Discrete Choice Experiment

HS ....Hardwood species

JP ....Jack pine

JPBS ....Jack pine and Black spruce

MNL ....Multinomial Logit

OMNR ....Ontario Ministry of Natural Resources

ORCA ....Ontario Recreational Canoe Association

PWU ....Part Worth Utility

RUM ....Random Utility Model

RWP ....Red and White pine

SBE*..............Standardized Scenic Beauty Estimate

WSEWCBF ...White spruce, Eastern white cedar and Balsam fir

CHAPTER 1 INTRODUCTION

1.1 Rationale

Recent ecological studies have suggested that in a boreal forest setting, impacts from timber harvesting in riparian areas on the aquatic ecology may not be as severe as previously believed (Steedman, 2000; Steedman et al, 2001). One potential consequence of these studies is a reduction in the width of buffering reserves along shorelines in order to access valuable timber supplies in these areas (Hunt and Haider, 2004). Across northern Ontario, forests are managed along the principles of multiple-use. As such, they provide an important backdrop for recreational experience of anglers and canoeists who are attracted to water based settings (Twynam and Robinson, 1997). Therefore a reduction in shoreline reserves may have unintended effects on the social value of these areas.

Canoeists have an added interaction with the Boreal forest environment. Not only do they make use of the boreal forest as a backdrop to their recreation experience, but the forest also plays an important role as the location of their campsites. As a consequence of this added role, canoeists with experience on multi-day paddling trips have an added stake in the management of forests along their routes. While previous research has shown that logged settings may be conducive to consumptive and motorized recreation, promotion of physically demanding non-consumptive recreation types are best suited to areas segregated from logging (Hunt *et al.,* 2000).

Though wilderness canoeists in Ontario have been the subject of several past studies (e.g. Rollins, 1997; Boxall and Adamowicz, 2002), the focus of these studies has remained on canoeing within the provincial park system, where no timber harvesting occurs, or the harvest is strictly managed with recreational interests in mind, e.g. Algonquin Provincial Park, and Nopoming Provincial Park in Manitoba. Because of this gap in knowledge, this project seeks to explore canoeists' perceptions of and preferences for the northern Ontario landscape on crown land in general.

1.2 Research Goal

The goal of this project is to investigate wilderness canoe trippers' preferences for northern Ontario's boreal forest landscapes. Recognizing that the landscape forms an important component of a wilderness experience, this study seeks to increase the understanding of canoeists' perceptions of the landscape, and the effect of these perceptions on canoe route and camping preferences. This research goal will contribute to policy / management prescriptions concerning land use along waterways that play a role in outdoor recreation in general, and wilderness canoe trips in particular. At the same time, this goal provides an opportunity to test a novel methodology for outdoor recreation research by combining landscape perception research techniques with discrete choice experiments in an innovative study design.

1.2.1 Objectives

- To explore the effects of forest classification, natural and human landscape disturbance, and other biophysical features of the landscape on the attractiveness of boreal forest shorelines to canoe campers.

- To develop a discrete choice experiment of campsite selection, examining the importance of landscape elements and proximity to an alternative site among other attributes.

- To develop a discrete choice experiment that integrates measures of scenic beauty and campsite quality amongst other land use attributes to assess canoeists' preferences for different canoe routes.

- To explore the implications of these preferences on resource management policy in northern Ontario

- In achieving these objectives, the challenge of this project is to create a task oriented survey instrument allowing respondents to assimilate complex information about each route and integrate this information to their stated preferences.

1.3 Outline of Project Methods

Both the scenic beauty estimation (SBE) method (Daniel and Boster, 1976) and stated preference methods (Louviere and Woodworth, 1983) are well established in the fields of recreation research and resource management. Visual stimuli have been included as attribute descriptions in stated preference research, either in a single attribute context as in the scenic beauty estimation paradigm, or as digitally calibrated images presenting multiple attributes (e.g. Haider et al., 1998; Arnberger et al., 2004). However, to my knowledge these methods have not been utilized before in the complementary manner presented here. Using an internet survey, respondents were shown several canoe routes. In this context, respondents were asked to rate a series of photographic images representing the landscape along the shoreline. In this way, respondents provided scenic beauty evaluations, while at the same time building knowledge of the route. At the end of this rating task, a discrete choice experiment combining both visual and descriptive attributes in a campsite selection task was presented. Finally, after two routes were presented, respondents were asked to select their preferred route. This novel approach allowed each analytical paradigm to be utilized both separately and integrally, to the benefit of both. The canoe route context improved the ability of the scenic beauty estimates to capture those features of importance to the canoeing experience, while the image rating task improved respondents knowledge of each canoe route, allowing more complex trade-offs to be modelled. As a result, a more complete picture of the perception of the landscape and its effect on preferences for recreation experience was gained.

1.4 Report Organization

This document is divided into six chapters. Chapter One presented the rationale for the project, its goal and objectives and a brief description of the methods used to achieve them. Chapter Two provides a review of the relevant literature, including discussions of landscape perception research paradigms, and recreation site selection in the context of both canoeing and camping. The third chapter presents an overview of issues in using the internet for conducting surveys, followed by detailed descriptions of the scenic beauty estimation method and stated preference modelling techniques. This chapter also presents the survey instrument and the canoe route simulations used to integrate the two methods. Chapter Four presents and discusses the results of the canoe route simulations, while Chapter Five focuses on the implications of the simulations for land use planning and forest management. Finally, the last chapter concludes the report with an overview of this study's limitations and some suggestions for further research.

CHAPTER 2 LITERATURE REVIEW

2.1 Landscape Perception Research

Over forty years of landscape perception research has given rise to several competing paradigms for landscape assessment. These include the expert, psychophysical, cognitive, and experiential approaches (Zube *et al.* 1982). The expert paradigm, as its name implies, relies on the evaluation of the landscape by skilled observers, trained in design principles, ecology or resource management fields where sound management is assumed to lead to intrinsic aesthetic qualities. The psychophysical approach allows testing by segments of the general public, and assumes that correlations exist between landscape properties and observers ratings. The cognitive paradigm involves the search for meaning associated with landscapes, based on past experiences, future expectations and socio-cultural conditioning. Finally, the experiential approach considers the iterative process of human-landscape interaction to be the basis of landscape value.

Of these, only the expert and psychophysical approaches have been used to address issues of forest management (Ribe, 1989). The expert paradigm has been widely used by the US Forest Service (USDA Forest Service, 1974), in British Columbia (Dearden, 1983; BC Ministry of Forests, 1995) and Alberta (Alberta Forestry, Lands and Wildlife, 1990) to develop guidelines.

Whereas the expert approach discounts laypersons' perceptions, the psychophysical paradigm embraces them. This approach examines the relationships between physical properties of a landscape and observers' evaluations of that landscape and was initially developed for the scenic evaluation of forest landscapes (Daniel and Boster, 1976). As such, it has been extensively used to study several issues related to forest management including classifying biophysical factors related to aesthetics (e.g. Brown and Daniel, 1986; Haider, 1994), and identifying the aesthetic effects of timber harvesting (Brown, 1987; Brunson and Shelby, 1992; McCool et al., 1986) and insect infestation (Buhyoff et al., 1982).

In the field of recreation, the public is intrinsically involved with the resource. Thus, the relationship between user and landscape is the primary focus of landscape perception research in this field. As a result, the psychophysical approach is the dominant paradigm (Zube *et al*. 1982). Few scenic beauty studies, however, have presented images in the context of a specific outdoor recreation context. One such study found in the literature combined contingent valuation methods with scenic beauty estimation in forested campgrounds (Daniel *et al.*, 1989) and found a nearly perfect linear relationship between perceived scenic beauty and willingness to pay. This same study served to test the validity of photo-based preference judgements in a recreation context (Brown *et al.*, 1988), finding that while direct ratings were consistently higher than photo based ratings, the two ratings were highly correlated. The authors concluded that photo-based scenic beauty measures provide a reasonably good indication of relative onsite scenic quality.

Despite the wide application of the scenic beauty estimation method to measuring forest aesthetics, most studies have focused on in-stand or near view perspectives. Haider and Hunt (2002) provide two reasons for this limitation. The first of these reasons is grounded in practical application: previous studies have sought to avoid additional noise introduced into the data or been constrained to near view perspectives by the added costs of data collection for more distant vantages. The second reason appears to be that past researchers have assumed only in-stand perspectives were suitable for the psychophysical approach. As a result, very few studies have employed this paradigm to study the aesthetics of forest edges. Hull and others (1987) applied this approach to road corridors, while Brown and Daniel (1991) studied stream flows. Eletheriadis and Tsalikidis (1990) applied this method to coastal pine forest landscapes in Greece. Each of these studies however, limited their vantage to that of a near-view perspective.

Since the 1990's however, the Ontario Ministry of Natural Resources has assembled an extensive database of forested shoreline photographs, along with a corresponding biophysical inventory for each image (Hunt and Haider, 2000). This collection has formed the basis for an extensive study, applying the psychophysical approach to the riparian forest edge from the vantage point of 140 meters offshore (Haider and Hunt, 2002; Hunt and Haider, 2004). These studies developed a series of regression models to examine the relationships between scenic beauty and natural and man-made landscape disturbances (Hunt and Haider, 2004). These models also examined the existing forest ecosystem classification system, and several biophysical factors including slope, tree mortality, tree size, density, amount of hardwood, and amount of coniferous shrubbery (Haider and Hunt, 2002).

While these studies demonstrated the importance of forest harvesting activities and various biophysical characteristics of Ontario's boreal forest in determining the perceived scenic beauty of these landscapes, the researchers did not supply a context in which to evaluate the slides. Rather, each respondent was asked simply to judge each photo at face value. While this approach is useful for establishing public preferences for landscape features from an aesthetic perspective, these preferences do not necessarily reflect the values of stakeholders or recreationists, such as canoeists, anglers, hunters, and trappers among others, whose interaction with the landscape occurs in a context unique to each group.

2.2 Recreation Site Choice Research

In contrast to much scenic beauty estimation research, recreation site choice is highly context driven as characteristics of a given location affect its suitability for different activities. Depending on the setting or location in which an individual or group recreates, the experiences or social-psychological outcomes they derive from participation may be enhanced or reduced (McCool *et al.*, 1985). Consequently, the importance of understanding recreation site choice has been recognized as critical for effective recreation management, allowing for reduced conflict, especially between renewable resource management activities and recreation values (McCool *et al.*, 1985).

Past research has identified a wide array of environmental, social and economic factors influencing specific users in specific locations. The following subsection focuses on that literature specific to wilderness canoeing in boreal environments, while a later subsection focuses on the campsite selection literature. In both sections, the diversity of approaches used to study this topic, their contributions and their limitations are explored.

2.2.1 Wilderness Canoeing

Because paddling is a dominant activity in several parks with high rates of visitation both in Ontario (e.g. Quetico and Algonquin Provincial Parks,) and elsewhere (e.g. Nopiming Provincial Park in Manitoba; and the Boundary Waters Canoe Area Wilderness and Grand Canyon National Park in the U.S.A)., canoeists have been relatively well studied. Most of these studies, however, focus on crowding/congestion norms (e.g. Lewis *et al., 1996;* Tarrant end English, 1997; Tarrant *et al*., 1997; Vaske and Donnelly, 2002). Hall and Shelby (2000) examined the role of perceived crowding in displacing boaters from a high-use reservoir. Boxall and others (2003) used contingent valuation methods to estimate the cost of congestion in Algonquin, Quetico and Killarney Provincial Parks in Ontario. This research focus is not surprising given the concentration of users at these sites. A much smaller subset of the literature has examined other factors in the canoeing experience. These studies suggest that travel costs, fees/regulations, campsites, forest aesthetics and facility development are also important factors in selecting a canoe route. Methods used range from likert scale ratings to contingent valuation to choice modelling of both revealed and stated preference data.

A contingent valuation study of user benefits from wilderness canoeing was conducted in Ontario. Using a dichotomous choice approach, Rollins (1997) found that canoeists were willing to pay on average as much as $39.56 per day in general trip costs for a 12 day tip; whereas on average they would only pay a total of $24.48, if the increase in costs was solely due to backcountry permit fees. This study focused on users of the three most popular provincial parks for canoeing, namely Algonquin, Quetico and Killarney. While providing useful information on the value of wilderness canoeing in these parks, the results of this study say little about the benefits of canoeing outside this study area. Furthermore, the methods used to assess this value do not allow tradeoffs to be made between cost and other attributes.

Another study, representing the only other effort to examine the role of Boreal forest types in the recreation site selection of canoeists, assessed willingness-to-pay using the travel cost method. Boxall and others (1996) used revealed preference data from canoeists in Nopiming Provincial Park in Manitoba to model preferences for forest and park management features. In four separate random utility models, they examined the effects of four forest ecosystems, fire damaged forest, cut blocks, portages and cottages, and travel costs on site choice. In each of the four models, travel costs were found to have a significant negative slope, indicating that all else being equal, respondents prefer to visit sites closer to their homes. Travel costs associated with the presence of burns ranged from $5.88 per trip to $21.09 per trip. Oddly, the area of recent cut blocks had a nearly significant ($P<0.11$) positive affect on site choice, suggesting that respondents were either unaware of the extent of forest harvesting in the park, or they truly prefer sites with cut blocks. One reason for this latter possibility is that the removal of trees from an area provides enhanced opportunity for paddlers to view wildlife. In the same study, canoeists also demonstrated a significant preference for mature Jack pine and White spruce forests, while Black spruce and aspen stands, as well as recent burns had a negative influence. The use of a choice model represents a further contribution to valuing canoeing in that it allows the effect on travel cost of other attributes (e.g. burns) to be determined.

Using another approach to assess revealed preference data coupled with a mail survey, McFarlane and others (1998) examined the role of past experiences for route selection in Nopiming Provincial Park and also included several setting attributes. These attributes included the presence of man-made structures (e.g. bridges), evidence of logging, presence of cottages, and campsite location, among others. In their analysis, respondents were segmented by past canoeing experience and ratings of each of the setting attributes were compared across segments. Cluster analysis was conducted on the physical, management and social attributes of the canoe routes available in Nopiming, establishing four distinct types of route. Finally, route selection behaviour was assessed for each segment based on these four route types.

A major limitation to the use of revealed preference data for modelling canoe route selection is the typically low number of options available within a manageable study area. In addition, inferences about each attribute are constrained by those combinations that currently exist. To date, however, only one study has taken a stated preference approach to examining canoeist preferences for canoe routes in Canadian Boreal forest regions.

Boxall and Adamowicz (2002) conducted a branded choice experiment in which canoeists were to select a route from among five parks, including Nopiming and Atikaki, Wabakimi, Boundary Waters Canoe Area, Quetico, and Woodland Caribou. Attributes included user fees, chances of entry due to management restrictions such as quotas, campsite type, level of development (including the presence of fishing lodges or roads), and encounters with other groups. Using a latent class approach in order to differentiate the preferences of canoeists whose motivations differed, four segments emerged, including ‘escapists’, ‘weekend challengers’, ‘nature nuts’ and ‘wilderness trippers.’

The literature outlined above demonstrates the diversity of attributes affecting paddlers’ route preferences and the various approaches that have been used to assess their importance. The choice of canoe route, however, is not the only site decision affecting this recreational experience. Nested within a multi-day canoe trip are the daily decisions of where to camp for the night. The following section explores this aspect of the wilderness experience.

2.2.2 Campsite Selection

Camping is an important component of any multi-day wilderness trip, and canoeing is no exception. Even where fixed-itinerary systems have been employed by parks limiting campsite selection to the planning phase of a trip, users have been found to deviate from their itineraries as much as 38% of the time (Stewart, 1991). Several studies have attempted to understand campsite choice behaviour, however great variability exists across settings (Brunson and Shelby, 1990).

Several reasons for this variability exist. First, camping is a broad term associated with several distinct experiences. For example, much of the camping in many parks is limited to road accessible campgrounds. Many studies focus on these roaded settings (e.g. Irwin, 1984; Brox and Kumar, 1997), and therefore focus on many attributes not applicable in a dispersed wilderness setting, such as proximity to bathrooms and other services. Still others focus on wilderness users such as climbers, hunters and horse-packers, who have specific needs, e.g. (Lucas, 1990; Lynn and Brown, 2003). Differences have even been found in campsite preferences based on recreational specialization within a user group (McFarlane, 2004). Finally, geographic settings impose their own requirements for assessing potential campsites. For example, protection from the wind may be of primary concern in one location (Pfister, 1977), while afternoon shade may play a key role in another (Stewart *et al.*, 2003). Despite these variations, some patterns do emerge.

Brunson and Shelby (1990) conducted an analysis of campsite selection among anglers and whitewater boaters along the Deschutes River in Oregon. They used rating scales to assess the importance of eleven attributes ranging from the most broadly applicable (flat ground) to area specific (away from railroad). Using these attributes and those of six campsite selection studies conducted between 1965 and 1988, they have suggested a framework of campsite selection involving a hierarchy of campsite attributes. According to this framework, most important are *necessity attributes*, such as flat ground, shade, or a good landing site for boats. The absence of any one of the attributes at this level will most likely result in the rejection of a site. Of secondary importance are *experience attributes*, such as good fishing nearby and solitude/privacy. The authors suggest that these attributes are considered only after the necessity attributes are deemed acceptable. Finally, if multiple alternatives still remain after evaluating the attributes enhancing the experience of a site, *amenity attributes*, such as the amount of bare ground or the presence of a fire ring are considered.

Frissell and Duncan (1965) reported that almost half of all respondents in the Boundary Waters Canoe Area in Minnesota inspected more than one campsite when selecting a camping location for the night. In keeping with Brunson's and Shelby's framework, the most commonly cited reason for rejecting a site was a lack of tent space. When asked about their ideal campsite, a flat tent space, an island location, availability of firewood and a good landing area were most frequently cited. In contrast to Brunson and Shelby's (1990) framework, however, Frissell and Duncan concluded, that at the end of the day, campsite choice seemed to be determined largely by what was available, suggesting that even *necessity* attributes may be compensable.

Experience attributes are also frequently cited as reasons for campsite rejection. Lucas (1990) reports that among hikers, horse-packers, rafters and hunters in the Bob Marshall Wilderness area, the condition of the campsite plays the largest role in choosing another site. These attributes included the presence of litter, bare ground, and campfire remains. In addition, hikers were also sensitive to the presence of horse manure, while horse-packers were not. Lynn and Brown (2003) also looked at the effect of recreational use impacts on hiking experiences and found that litter, plant damage and fire rings had the greatest negative impact on hikers' experiences.

It is not surprising that recreational impacts should have a significant effect on an individual's campsite selection. Because users remain in a relatively small area over several hours while at backcountry campsite, impacts tend to be concentrated in these areas (Leung and Marion, 1999). Not only do campsite impacts often have ecological consequences, but because campsites are destinations and therefore focal points of each day, impacts upon the resource can detract from the recreational experience (Roggenbuck *et al.*, 1993). As a result of these effects, park managers have developed an array of regulatory and policy responses to reduce campsite related impacts. In addition, a large body of research has emerged to quantify and address both the ecological (e.g. Marion and Merriam, 1985; Collingwood and Frost, 1988; Cole, 1989; and Cole and Monz, 2004) and social (e.g. Shelby and Shindler, 1992; and Farrell *et al.*, 1991) ramifications of campsite impacts.

These earlier studies have shown that the natural environment plays a key role as the main attraction for many outdoor recreation activities, an understanding of how features of the landscape are perceived can contribute directly to the goal of identifying and preserving recreation values of these areas. Several methodologies have been used to explore the issue of how site features impact the recreational experience, ranging from the purely perceptual to the purely behavioural. Features examined include aspects of the ecological, social, and economic environments.

Each of the studies has contributed greatly to the understanding of canoeist's preferences for routes in the Boreal regions of Ontario and Manitoba, however, each of the methods used has its own strengths and limitations. While revealed preference models have been shown to be well suited for examining landscape features, their use is limited to features present along actual routes. Expectations based on past experiences may also contribute to the selection of a route. Furthermore, canoeists with no prior experience in the area may not have the *a priori* knowledge to factor these attributes into their decisions. Discrete choice experiments, such as that done by Boxall and Adamowicz (2002) have the advantage of allowing hypothetical scenarios to be evaluated, but have not been used to assess the visual component of the canoeing experience. While each of the studies reviewed above presents an integral piece of the recreation site choice puzzle, each is limited to canoe routes in protected areas.

The next chapter presents the methods used to integrate scenic beauty estimation into a discrete choice analysis of landscape features to assess canoeing preferences at both the route level and campsite level. Further contributions to the understanding of canoeist's perceptions and preferences are made through the application of these methods to canoeing opportunities outside the provincial park system.

CHAPTER 3 METHODS

During the summer of 2004, an internet survey was conducted. Potential respondents were contacted via an email sent by the Ontario Recreational Canoe Association (ORCA) (See Appendix A), and through a posting on the My Canadian Canoe Route internet forum (CCR) at http://www.myccr.com. This chapter presents an overview of the issues associated with an internet survey, followed by a description of the survey instrument. Particular attention is paid to the canoe route simulation, along with a discussion of the theoretical constructs behind scenic beauty estimation and discrete choice modelling. Finally, I present the methods used to combine these two paradigms into a single model for canoeists' route preferences.

3.1 Surveying Respondents over the Internet

Several issues of concern are associated with the use of online surveys for academic research in general, including sample bias (Coomber, 1997; Dillman et al., 2004), technological issues (Dillman, 2000; Sax et al., 2003; Dillman et al., 2004), and ethical issues (Cho and LaRose, 1999; Stewart, 2003). In addition to these general issues, the question of whether the medium of the internet is appropriate for landscape preference research is also explored.

3.1.1 Sampling Issues

Sampling related biases are of concern to all surveys, web-based or not. Dillman *et al.* (2004) lists these potential sources of error as the falling into one of the following four types:

- *Sampling error* is the result of surveying only a portion of the entire sampling population.
- *Measurement error* is the result of inaccurate answers to questions, owing to poor survey design and/or behaviour of the respondent.
- *Coverage error* is the result of having a disproportionate representation of one (or more) segments of a sample population included in the sample. Thus, some units of the population may have a zero probability of being sampled.
- *Non-response error* is the result of not getting some people to respond to the survey request who, if they had responded, would have answered differently than those who did respond to the survey.

While the internet provides the means for cheap, fast recruitment of large numbers of respondents, thereby reducing sampling error, careful attention must also be paid to the other three forms of survey error. Measurement error is largely reduced through sound survey design and administration. Dillman *et al.* (2004) provide a thorough discussion of principles of Internet survey design. These principles formed the basis for the construction of the survey instrument in this study.

The most challenging error types associated with a web survey are coverage error and non-response error. While the internet is growing in prominence as a medium for information exchange, coverage error is still a concern because access to email and/or the internet is not universal. As a result, caution must be applied when attempting to generalize the responses of an internet recruited sample to a wider population.

Two sources of non-response error are of particular concern for internet surveys:

1. Given the quick timeframe in which data can be collected over the internet, respondents who do not respond quickly may be missed if data collection ends too soon. Unlike conventional mail surveys, respondents do not have their own copy of the survey instrument. Whereas a respondent on a paper survey can still submit her response during the window of time in which data is being entered, once an internet survey is taken down, further responses are not possible.

2. Given a growing concern with unwanted email messages (spam), invitations to participate may be automatically deleted before respondents even see them. The research may not know about this, because unlike undeliverable email, spam filters do not provide feedback to the sender that the message was not received.

In this project, these sources of error were minimized by adhering to as rigorous an approach to sample recruitment (see Dillman, 2000) as was possible, given financial and other constraints in the project.

3.1.2 Technological Issues

Technological issues arising from the use of internet surveys focus largely on the diversity of hardware and software in use. Because of rapid technological advances in the field of computing, respondents' ability to view the internet may differ markedly (Dillman et al., 2004). Taking these differences into account, and designing the survey for the lowest common technology is critical to ensure the highest possible response rates (Sax et al., 2003).

3.1.3 Privacy Issues

As with all social science research, ethical conduct in internet surveying is an additional concern. Because of the ease with which information is shared across the internet, the issue of privacy has come to dominate ethical considerations in using the internet to collect data. Cho and LaRose (1999) outline four types of privacy as they relate to internet surveying.

Unsolicited survey requests violate physical privacy by intruding on an individual's space with sights or sounds (Cho and LaRose, 1999). This initial intrusion is compounded by the prenotification and follow-up procedures recommended by Dillman (2000). Online surveys disrupt physical privacy in ways that other survey methods do not. Some internet users still pay usage fees, making time spent downloading survey requests, or participating in online surveys akin to mail surveys where postage is due. While some means to recruit respondents is necessary, respecting respondent's physical privacy by limiting notifications to a predetermined number of reminders, and providing them with a means to opt out of future contacts is recommended (Cho and LaRose, 1999).

Informational privacy is the desire to control the flow of personal information. Ultimately, confidentiality and anonymity are issues of trust between respondents and researchers. Informational privacy is breached when respondents' personal information is used to solicit a survey response without their consent. Furthermore, the internet provides researchers with the tools to collect a great deal of personal information without the knowledge of survey participants. This information ranges from their computer IP address to logging their keystrokes, and may be highly beneficial for the research being conducted. For example, respondents may not know their screen resolution or the number of colours presented by their system, but this information may provide critical insight into how images being rated are viewed. Gaining respondents' informed consent to collect these types of information is crucial to respecting their rights to informational privacy.

3.1.4 Issues in Using the Internet for Landscape Perception Research

In addition to the above issues with conducting surveys over the internet, Wherrett (1999) has also identified and tested several concerns in using the internet for landscape preference research, ranging from the medium of display to the technological issues of colour and pixel resolution of the images. Bishop and Leahy (1989) found that the average rating of a digitized image was lower than that of a slide depicting the same scene. In more recent studies, the correlation between ratings of printed images and those on a screen was 0.72 (Wherrett, 1999), while that between slides and scanned images viewed on a 27 inch monitor was 0.95 (Daniel, 1997). Similarly, Wherrett (1999) reports no significant differences between respondents who viewed scenes on monitors capable of only 256 colours (8-bit) compared to those capable of 16 or 24 million colours (16-bit or 24-bit), nor were there differences in ratings based on different monitor sizes. These results indicate that computer displays offer a valid medium for landscape preference research.

3.2 Survey Design

Despite the additional issues to contend with, the internet offers several advantages over traditional methods for scenic evaluation and stated preference research that make this project possible. These advantages include the low cost of including colour graphics, the dispersed nature of the sample population, and the ability to customize survey questions for each respondent.

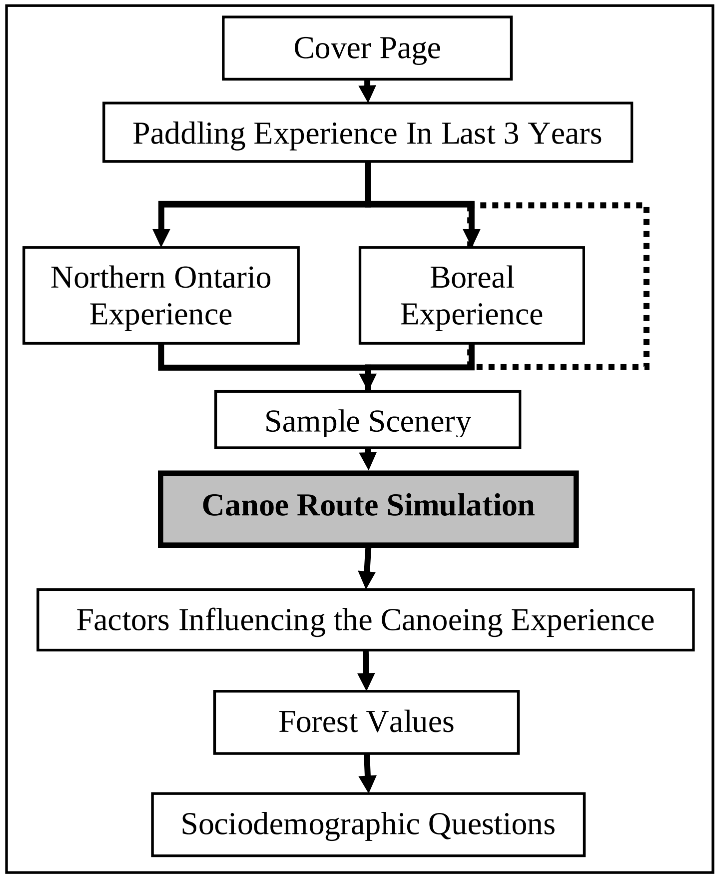
Several principles suggested in the literature for dealing with these issues were applied to the design and construction of the survey instrument. For more information on these suggestions, the reader is referred to Cho and LaRose, (1999); Dillman, (2000); Dillman (2004).

In addition to following general web survey design principles, three additional pieces of information were collected as a means to corroborate Wherrett's (1999) findings and control for differences in technology between users. Respondents were asked to indicate their monitor size, and since respondents were thought unlikely to know their screen resolution and colour resolution offhand, Javascript was used to collect this information automatically. Rather than attempt to manufacture comparable viewing experiences using different survey versions, a single survey version catering to users with the minimum anticipated screen resolution of 800 by 600 pixels was created and *a posteriori* comparisons were made between the responses of users differing in these variables.

3.3 Survey Organization

Questions on the first web page of the survey directed respondents to the appropriate follow up questions (see Figure 3.1 for a flowchart of the survey layout). Respondents were asked about their paddling experience during the last three years. Based on their responses, they were then asked about their time spent paddling in the six most northern tourism districts of Ontario. If they had none, their experience in Boreal regions of other Canadian provinces was investigated. A third path was also available directing respondents who had neither of these forms of experience directly to the image task. In practice, however, given the method of recruitment all respondents had experience paddling in either northern Ontario or other Boreal regions. Once these sections had been completed, respondents were familiarized with the type of image used in the landscape evaluation. Participants were asked to indicate how representative the scenery depicted in four sample images was of the scenery in their experience before proceeding to the main component of the survey.

Figure 3.1 **Overview of the web survey structure.**



Note: The dotted line indicates a contingency pathway, not used by any respondents.

At the core of the survey was on a series of simulated canoe routes. Respondents were asked to evaluate the scenic beauty of stretches of shorelines, make campsite site selection decisions and indicate their overall preference for canoe routes. Later survey sections examined three additional aspects of canoeists' relationship with the landscape. Respondents were presented with a list of several factors pertaining to development and resource use in Boreal forests. Using Likert scales, these impact of each factor on the canoeing experience was assessed. Following this section, respondents were asked to indicate their level of agreement to several statements about forest values. To view the complete survey, the reader is directed to Appendix C and the accompanying CD-ROM.

3.4 Canoe Route Simulations

The largest section of the survey was comprised of a series of four simulated canoe routes, which formed the basis for scenic beauty estimation, as well as stated choice models for campsite selection and canoe route preferences. Each route depicted a 16km paddling day presented to the respondent as a map outlining several development features. These features included roads, provincial parklands and remote fishing outpost camps, and two potential campsites. As the respondent progressed through a route, he/she was shown eight images depicting the scenery for the route. Each image represented a section of shoreline varying in length, from 0.5km, to 3.5km in 1.0km increments. Respondents were initially asked to rate the attractiveness of the scenery depicted in the photographs for a canoe trip in northern Ontario. This task formed the basis for calculating scenic beauty estimates for images in the routes. The respondents were then asked to decide on where to camp for the night. In this way, participants were gradually introduced to the complex mix of features present on any given canoe route. After completing this process for two canoe routes, respondents were asked to choose their preferred canoeing option from among the routes they had just completed.

3.5 Scenic Beauty Estimation

A scenic beauty model of Boreal shorelines, following the psychophysical approach, i.e. the scenic beauty estimation method (Daniel and Boster, 1976), was undertaken for two reasons. First, this approach requires no special training on the part of observers, allowing the participation of stakeholders directly affected by the scenic quality of the shorelines depicted. Stakeholder participation of this kind is also consistent with calls for public involvement in issues of forest management (e.g. Canadian Forest Service, 1999). Second, this paradigm links observers' ratings to biophysical data characterizing the landscape. While resource managers have little control over the cognitive process of aesthetic evaluation, this method allows them to predict the aesthetic quality based on landscape characteristics.

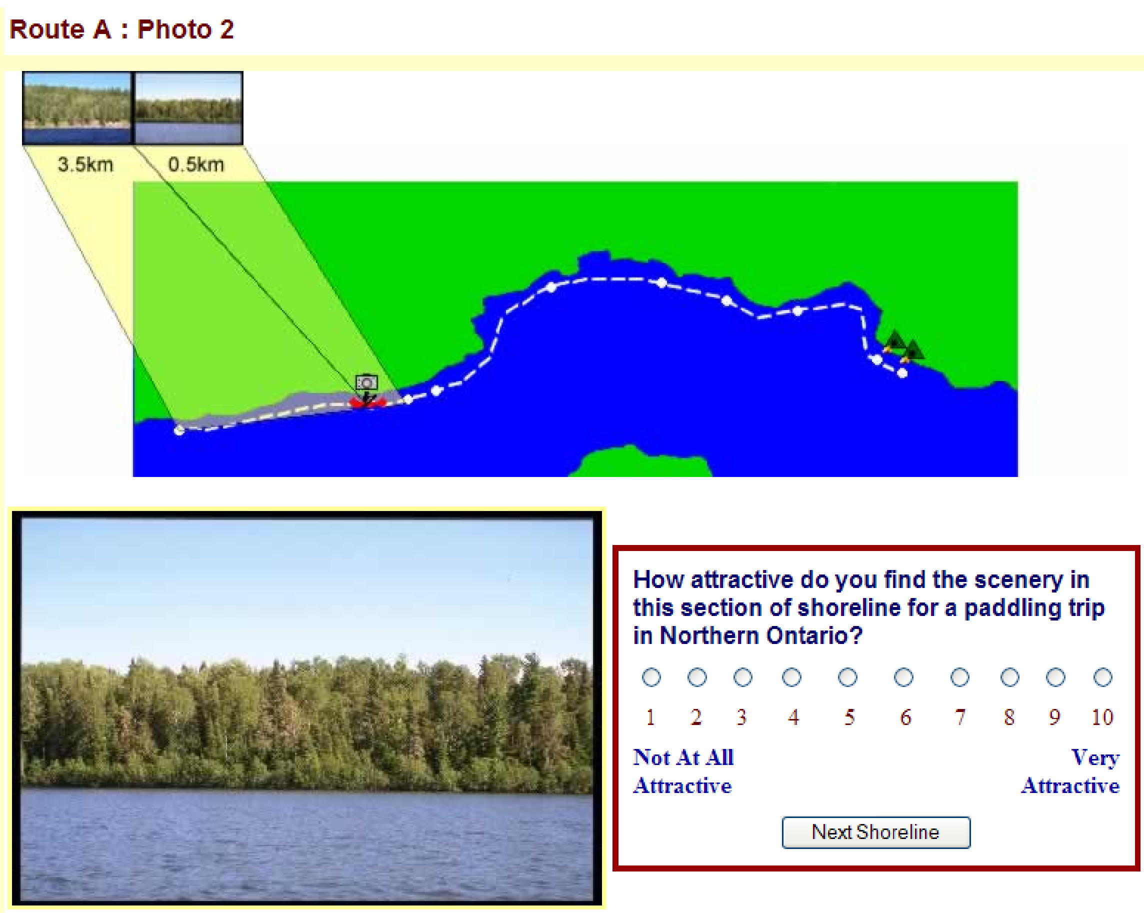
Typical for the scenic beauty estimation method, respondents are shown a series of photographic slides depicting the landscapes in question and asked to judge each slide on a 10-point integer scale. These raw ratings are then transformed into a standardized interval scale index of preference (Daniel et al., 1989).

Photographs were selected from a subset of the sites studied by Haider and Hunt (2002). Of the original 202 slides selected for evaluation by Haider and Hunt, 83 were included in this study. These photographs were taken 140m offshore using a 75mm lens and depicted 66m of shoreline. To control for solar angle, these photos were taken at approximately the same time of day, and were comprised of mainly shorelines with a southern exposure. Because of the ability and tendency of canoeists to paddle close to shore, an additional 83 photographs from the same sites, but taken only 15m offshore were also used. These photographs were centred on one of three transects made while collecting biophysical data for each site.

Photographs were obtained on CD-ROM at a resolution of 712 by 648 pixels. For viewing over the internet, they were optimized in the jpeg file format at 96 pixels per inch, and 400 pixels wide by 267 pixels high. This image size and resolution was chosen based on considerations for image quality, download speed, a baseline monitor resolution of 800 pixels by 600 pixels and the screen space required by other information presented simultaneously.

Each photograph was defined as representing one section of shoreline out of a total of eight segments encountered during a day of canoeing. Respondents began their day with the first segment, and as their virtual day progressed they were shown each successive segment. Thumbnail images (75 pixels by 50 pixels) of each photograph already viewed accumulated above route map, in this way building a complete representation of the route (see Figure 3.2).

Figure 3.2 Screenshot depicting the second shoreline rating task of a route.



Respondents rated the attractiveness of each scene on a 10-point rating scale ranging from 1 (Not At All Attractive) to 10 (Very Attractive). These ratings were then transformed into standardized Scenic Beauty Estimates (SBE*) using the "by-stimulus" method of RMWin 2.1, a version of RMRATE for the Windows Operating System (Brown et al., 1990). This scaling procedure was originally developed for scenic evaluation of forest landscapes (Daniel and Boster, 1976), and is based on Thurstone's "Law of Categorical Judgement" (Torgerson, 1958).

To calculate SBE*, three computational steps were undertaken. First, the mean Z of each stimulus was calculated using the following equation (Brown and Daniel, 1990):

$$MZ_i = \frac{1}{m-1}\sum_{k=2}^{m}\Phi^{-1}(CP_{ik})$$

Where

MZ_i	=	the mean Z of stimulus *i*
m	=	the number of rating categories
Φ^{-1}	=	the inverse normal integral function
CP_{ik}	=	the proportion of observers giving the stimulus a rating $\geq k$

In the second step, the same equation was used to calculate the mean Z of the baseline stimuli (*BMMZ*). The Scenic Beauty Estimate (SBE) was calculated by subtracting BMMZ from the stimulus mean Z and multiplying the result by 100 to remove the decimals (Brown and Daniel, 1990):

$$SBE_i = (MZ_i - BMMZ)*100$$

The final step involves standardizing the SBE to the interval of the baseline. This step was accomplished by dividing SBE_i by the standard deviation of the mean Z for baseline stimuli (*BSDMZ*) (Brown and Daniel, 1990):

$$SBE_i^* = SBE_i / BSDMZ$$

The result was an equal-interval scale measure of perceived values, which had been standardized to the baseline (Brown and Daniel, 1990).

3.5.1 Scenic Beauty Analyses

Two series of analyses were conducted to scenic ratings. The first series of models focused on the biophysical characteristics of the scenery presented in the photographs and examined the relationships between the ratings and ecosystem classification, disturbance regime and six biophysical factors established by Haider and Hunt (2002). The second series of analyses tested the relationship between the contextual information presented in the image and as well as additional information given by the map depicting the route.

First, a scenic beauty estimate was calculated for each image in the context of the route in which it appeared. Thus, if a given image appeared in two separate routes, two separate estimates were determined. These SBE* were then imported into an SPSS 11 database containing corresponding biophysical attributes of the image and discrete choice attributes of the route.

3.6 Stated Choice Models

To analyse the trade-off behaviour inherent to the campsite selection and route preference tasks a stated preference model was used. Initially developed in the fields of transportation and market research (Train, 1986), stated preference models have been applied extensively in recreation research to study public preferences for a range of recreation site attributes, including wilderness management (Lawson & Manning, 2002; McCormick & Haider, 2003), tourism destination choice (Haider & Ewing, 1990; Morley, 1994), beach preferences (Stewart et al., 2003), and trail characteristics (Haider et al., 2004; Morey et al., 2002). The primary advantage of stated preference choice models over revealed preference models lies in their ability to predict public response to hypothetical policy and management options (Haider, 2002). This provides resource managers with a tool for exploring scenarios not yet in place. An additional advantage of stated preference models includes the efficiency with which preferences for large numbers of individuals may be solicited and modelled (Louviere et al., 2000). Finally, stated preference models have been shown to be capable of predicting actual behaviours. For example, Haener and others (2001) found that moose hunters' responses to the hypothetical choices in a questionnaire reflected actual site choice behaviour, contributing to the ever present debate over the validity of stated preference models.

In stated preference choice models, respondents are typically asked to indicate their preference among alternative configurations of a hypothetical multi-attribute good (Louviere & Timmermans, 1990). Each alternative or profile is presented as a set of attributes to be evaluated as a whole. The primary advantage of these models over traditional likert-scale type evaluations of individual components making up the good is that each attribute is evaluated in context. The profiles are constructed using statistical design principles to ensure orthogonality (Raktoe et al. 1981; Montgomery 2001), and therefore the individual contribution of each attribute to the preference can be calculated efficiently.

If respondents rate or rank a single profile at a time, the technique is referred to as conjoint analysis (Green & Srinavasan 1978). In a discrete choice experiment (DCE), however, two or more profiles are combined into a choice set, and respondents choose the most or least preferred profile from each set they are asked to evaluate (Louviere et al. 2000). DCEs provide a considerable advantage over traditional conjoint analysis in that, behaviourally, the decision process is closer to actual behaviour than either rating or ranking tasks. Furthermore, DCE's are grounded in the rigorous Random Utility Theory (McFadden, 1974).

This theory states that choices are a function of the attributes of the alternatives, and is grounded in the assumption that individuals select the option that maximizes utility (McFadden, 1974; Ben-Akiva & Lerman, 1985). While individual behaviour is considered deterministic, because of the inability of the research process to account for all influencing factors and the need to aggregate individual choices across individuals, choice models must contain a stochastic component (Train 1986, Ben-Akiva & Lerman 1985). Therefore, the overall utility (U_i) contained in any one alternative is represented by a function containing both a deterministic component (V_i) and a stochastic component (ε_i). Thus, the overall utility of alternative *i* is represented as (McFadden 1974):

$$U_i = V_i + \varepsilon_i$$

Selection of one alternative over another implies that the utility (U_i) of that alternative is greater than the utility of any other alternative (U_j). Given the stochastic component, the probability that one alternative will be chosen over another depends on the magnitude of difference in the deterministic components of their utilities, compared to that of the random components (Louviere et al. 2000).

Most commonly, the stochastic elements of the utilities are assumed to follow a Gumbel distribution since it is both easy to compute and ensures fairly robust results (Louviere et al, 2000). A result of this assumption is that alternatives must be independent of irrelevant alternatives (IIA), meaning that “the ratio of choice probability for any two alternatives is unaffected by addition or deletion of alternatives” (Carson et al., 1994, p. 354). Under this assumption, the multinomial logit (MNL) model can be specified as (Adamowicz et al., 1994):

$$\text{Prob}\ \{i \text{ chosen}\} = \exp^{V_i} / \sum_{j \in C_n} \exp^{V_{jn}}$$

The analysis produces regression estimates, along with standard error values and *t*-values for each attribute level. These regression estimates, or part-worth utilities (PWU), may be used to calculate the choice probability of a given alternative as a function of its attributes and the attributes of each of the other profiles in the choice set.

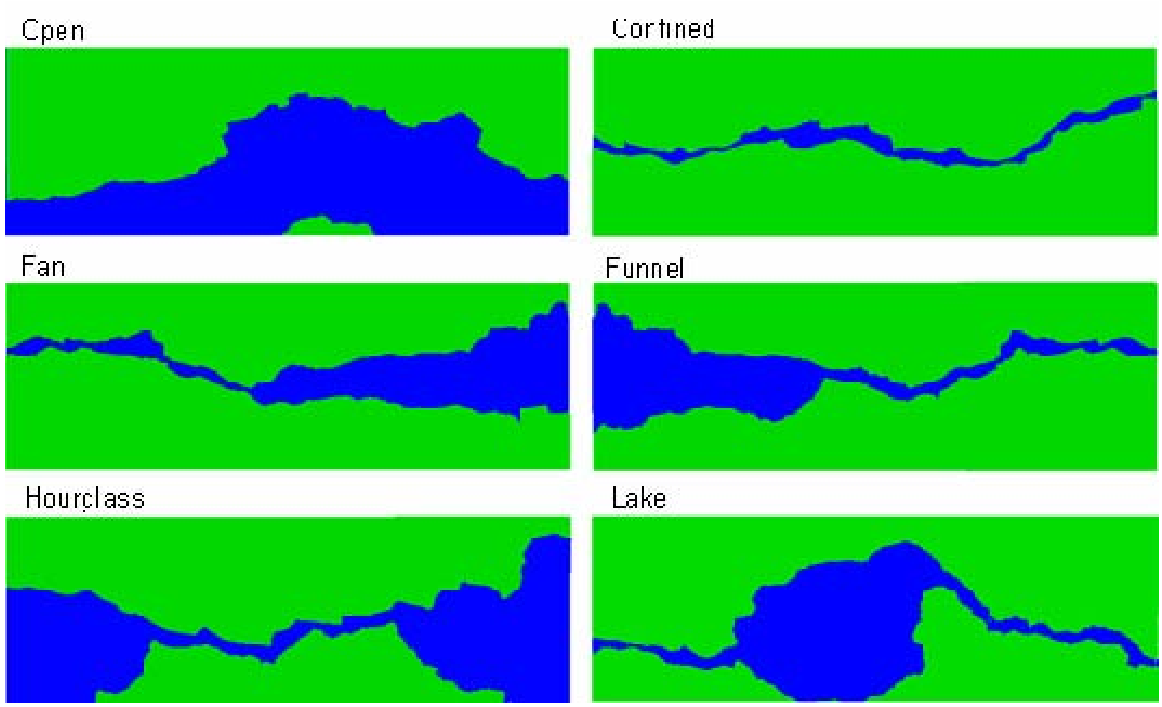
3.6.1 Route Attributes

The purpose of the DCE was to investigate the importance of certain biophysical and land use characteristics common to the Boreal region of northern Ontario for canoe trippers. In order to account for the potential dominance of trip aspects such as trip length and difficulty, the focus of this portion of the survey was limited to a single typical day in the middle of a multi-day canoe trip of unspecified duration. Therefore, attributes were selected based on their applicability to a single day of paddling.

Two groups of attributes were presented to respondents. The first set of attributes related to the day's paddling and were represented either in the selection of photos used for a given route, or as symbols on the accompanying map. The second set consisted of campsite attributes given as written descriptions with an accompanying photo of the site's landing area.

Each route was created from one of six base maps depicting varying amounts and configurations of open and confined waters (See Figure 3.3). The use of these maps served two purposes: to provide respondents with a visual cue when they started a new route and to serve as a backdrop to the selection of photos along the route. On these maps, 140m images were presented on sections of open water, while 15m photos were reserved for confined waters. One additional variant was created, in which 15m images were used throughout the lake map to allow the effect of photographic distance to be estimated. In addition, variation in these configurations allowed respondents' preferences for different paddling environments to be tested.

Figure 3.3 Route task basemaps



Several attributes were presented as features on the map including the presence or absence of development and land use features. These attributes, summarized in Figure 3.4, included road access; fishing outpost camps; and provincial parks. Additional symbols marked the respondent’s progress along the route, potential campsites, and the route itself.

Road access to waterways is a crucial criterion upon which Ontario excludes rivers from its Waterway Park system. While roads provide access to wilderness waterways for canoeists as well as emergency evacuation routes in case of trouble, they also facilitate industrial access to timber and other natural resources, as well as access for other recreation users such as anglers, hunters and all terrain vehicle enthusiasts. Where possible, roads and bridges were positioned at the narrowest point of the waterway. The only exception to this rule was on the “Open” base map, which allowed point access to the water, but no bridge access.

Another key commercial recreational user group of Ontario’s water are fishing lodges. Therefore, based on the experimental design, 25% of the routes contained a remote fishing outpost camp positioned on the southern shore of the first available section of open water.

Provincial parks are often associated with spectacular scenery and pristine landscapes. As was the case for fishing camps, 25% of the routes entered a park at the end of the day, resulting in six sections of shoreline outside the park, while the last two sections and campsites were positioned within the park boundary.

Figure 3.4 Map legend

Forest classes and disturbance levels of the photos selected for each route were determined by a single eight level variable. Forest type was divided into “southern Boreal” and “northern Boreal,” each of which was defined by the subset of seven forest classes available to the route (see Table 3.1). These forest classes were taken from the simplified ecosystem classification presented by Haider and Hunt (2002), consisting of Red and White pine (RWP); hardwood (HS); White spruce, cedar and Balsam fir

(WSEWCBF); Jack pine (JP); Jack pine and Black spruce(JPBS); Black spruce (BS); and Black spruce bog (BSB). For the purposes of this study, southern Boreal was defined by the subset {RWP; HS; WSEWCBF; JP; JPBS; BS}, while northern Boreal was defined by the subset {WSEWCBF; JP; JPBS; BS; BSB}. In both cases, each forest class had an equal probability of being selected by a random number generator for each of six pristine sections of a route. Due to this random process, variation in the number of images from each category did occur (see Table 3.1).

The remaining two sections of the route were designated for disturbed scenes. These WSEWCBF, JP and JBBS images depicted three levels of human disturbance (clear cuts with narrow (< 30m) reserves, medium (35m to 70m) reserves, or wide (75m to 150m) reserves); forest fires; or pristine control images. These images were used to represent the six disturbance levels along the route: pristine, narrow reserve, medium reserve, wide reserve, mixed reserve (wide followed by narrow), and fire. The resulting attribute consisted of the following eight levels: Southern Pristine; Southern mixed disturbance; Northern Pristine; Northern Fire; Northern Narrow Reserve; Northern Medium Reserve; Northern Wide Reserve.

Once the forest class for each of the six dedicated pristine images was determined, the specific image was selected from among seven choices. Having multiple images for each forest class was necessary for two reasons. First, this ensured that an individual image could not appear a second time in any given canoe route. Second, by using several images for each forest type, the peculiarities of an image, (e.g.: excessive cloud cover) did not unduly bias the mean scenic beauty estimate for an entire forest class. These images were selected from a rotational design to ensure that no specific image was repeated in any given route, while enabling each image to appear in any position in a route with near equal probability.

Table 3.1 Number of photographs representing each forest class and disturbance type

Forest Class	# 15m Photos	# 140m Photos
Red and White pine (Southern)	7	6
hardwood (Southern)	7	6
White spruce, Cedar, Balsam fir (Both)	7	7
Jack pine (Both)	7	7
Jack pine and Black spruce (Both)	7	7
Black spruce (Both)	7	7
Black spruce bog (Northern)	7	7
Disturbance Images		
Narrow Reserve Width	7	6
Medium Reserve Width	6	5
Wide Reserve Width	7	5
Fire	5	4
Pristine	6	6

While the level and type of disturbance was governed by the eight level photo selection attribute, their location and the distance attributed to all eight images presented was controlled by a separate four level attribute. To avoid potential dominance of disturbances on route selection, disturbances were limited to sections of less than 1.5km in length, with a maximum of 2.0km of disturbed shoreline allowed per route. Furthermore, disturbances were arranged so they were either adjacent to one another or separated by two pristine sections. The complete attribute is presented in Table 3.2.

Table 3.2 Route section distance / Disturbance placement attribute levels

	Route Section							
Level	(route start) 1	2	3	4	5	6	7	(route end) 8
1	0.5 km	3.5 km	3.5 km	**0.5 km***	**1.5 km***	2.5 km	2.5 km	1.5 km
2	3.5 km	0.5 km	**0.5 km***	3.5 km	2.5 km	**1.5 km***	1.5 km	2.5 km
3	2.5 km	1.5 km	3.5 km	**0.5 km***	**0.5 km***	3.5 km	1.5 km	2.5 km
4	1.5 km	2.5 km	**0.5 km***	3.5 km	3.5v	**0.5 km***	2.5 km	1.5 km

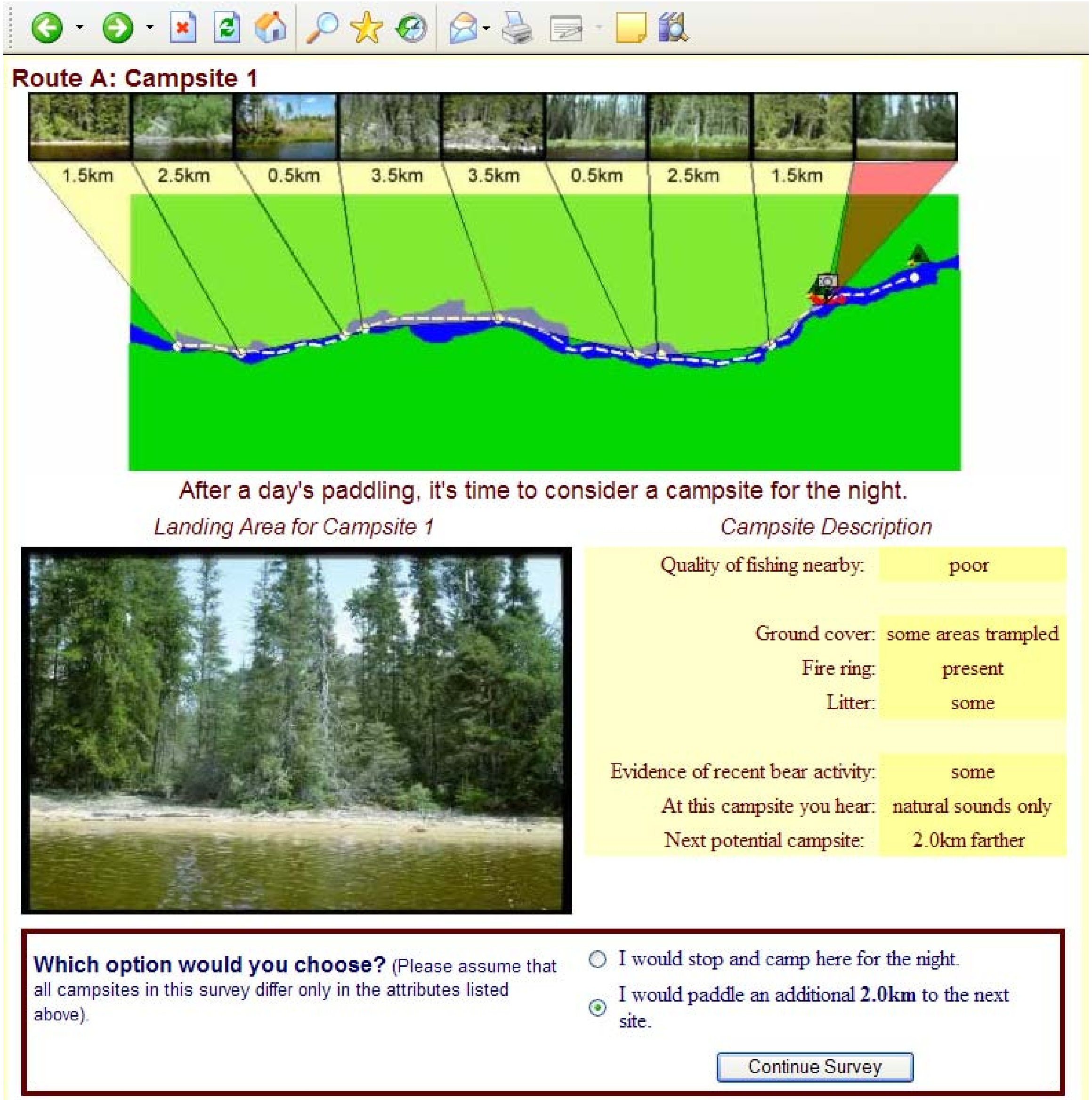
*designated disturbed scenes

3.6.2 Campsite Attributes

At the end of the day's paddling, each route included two potential campsites located 0.5km, 1.0km, 1.5km, or 2.0km apart. The remaining attributes of the design were used to describe each of these campsites (See Figure 3.1).

Two attributes from the orthogonal design were presented in the accompanying photograph of the campsite's landing area, namely Forest Type (RWP, HS, JP, or JPBS) and landing area ground cover (Vegetated, Sandy Beach, Boulders, Sheet Rock). The remaining attributes were simply listed in a table: evidence of previous camping, including the presence of vegetation damage in the form of trampled ground cover, litter and/or an established fire ring; quality of fishing (good, poor); and evidence of recent bear activity in the area. In addition, the auditory environment of the campsite was also described. Half the campsites had only natural sounds audible, while one quarter were described as having occasional distant road sounds, and the remaining had an occasional distant motor boat.

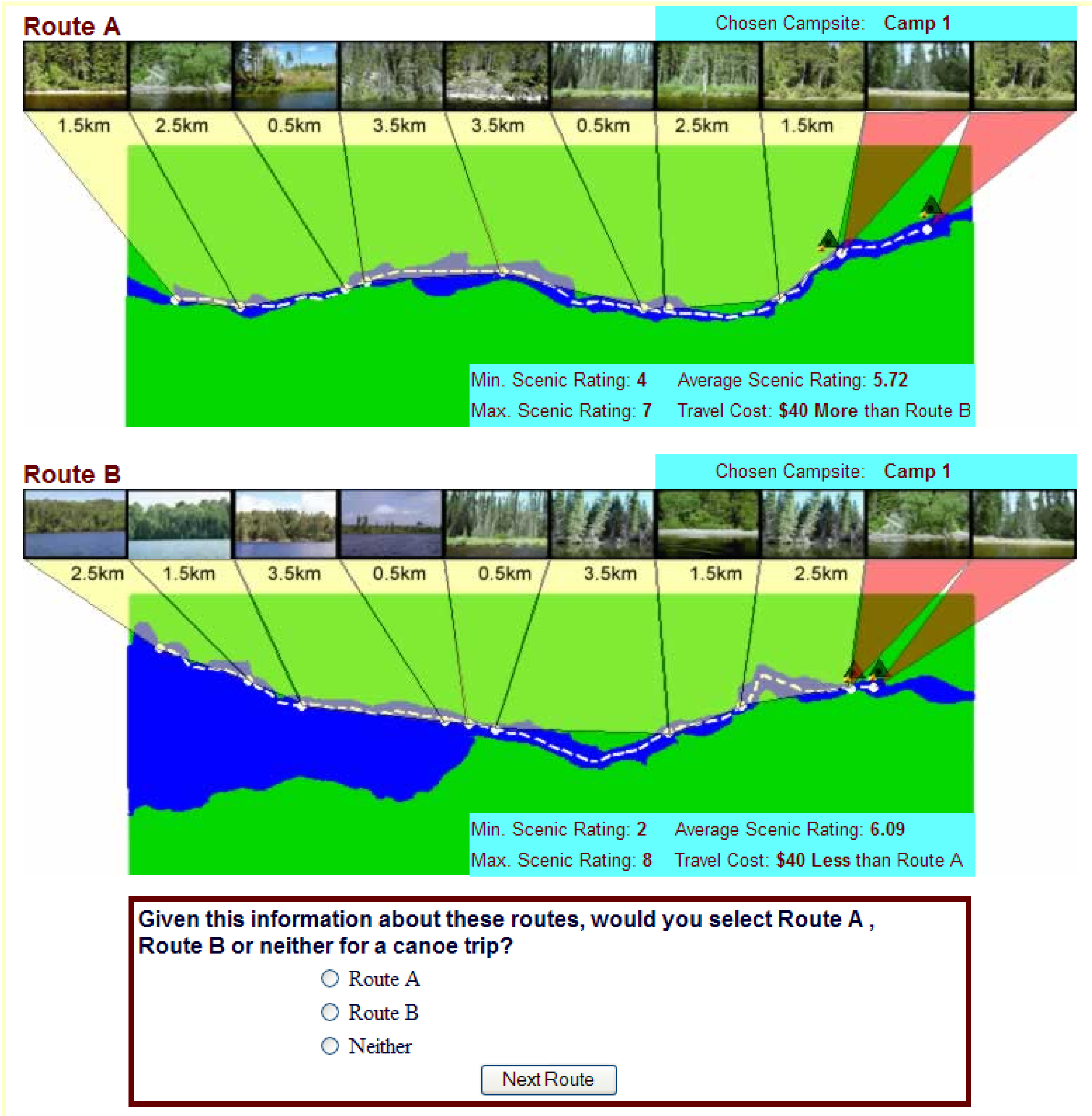
Figure 3.5 Screenshot of an example campsite selection task.



Upon reaching the first campsite, respondents were given the choice of stopping to camp for the night, or of continuing a given distance to the next campsite. Stopping to camp terminated the route and moved the respondent on to the next task. If he/she decided to continue paddling, the respondent was presented with the second campsite description and the following three options: stop and camp for the night, paddle back to the last site (at a round trip cost of between 1km and 4km of needless paddling), or to continue paddling even though it is getting late. After completing this second camping choice, respondents were presented with the next task, either the next canoe route or a route choice.

After completing two canoe routes, respondents were presented with maps of both routes they had evaluated already, including thumbnail photographs of the scenery in each section and campsite. By clicking their mice on a photograph, respondents were presented with the full size image. Clicking on the campsite photographs also presented them with the full campsite description. In addition to this information, respondents were also reminded of their previously chosen campsite, as well as their personal mean, minimum and maximum scenic beauty ratings for the route. Finally, respondents were shown the difference in travel cost between the two routes. One route could cost $20CDN or $40CDN more than the other. Faced with this information, the respondent was asked to indicate his/her preference for one or other of the two routes, or neither (See Figure 3.6). In total, respondents completed four routes each, comprising two complete choice sets.

Figure 3.6 Example route choice task



In order to develop a statistically valid model, estimating the main effects independent of other main effects, a total of 32 choice sets were required. These were randomly assigned to each respondent without replacement so that the probability of selecting any given choice set first was 1:32, and the probability of selecting any other choice set second was 1:31.

3.6.3 Choice Model Analysis

Choice sets were analysed in a multinomial logit (MNL) regression, in which the individually coded frequency of responses to each alternative served as the dependent variable. Data analysis was undertaken in LIMDEP 7.0 (Green 1998), and Latent Gold Choice 3.0.6 (Vermund and Magidson, 2003).

3.7 Campsite Selection Modelling

Three different campsite selection models were developed and compared to assess the effect of the decision context faced by respondents at the two campsites. At the first campsite, respondents had perfect knowledge of that site, but no knowledge of the second other than the distance to be paddled to get there. At the second campsite, respondents had perfect knowledge of both sites. However, returning to campsite one came at the cost of backtracking over distance already covered. The first two models examined each of these decision contexts separately, while the third combined them. In this final model, respondents were coded as having four options from which to choose. They could opt to (1) stop at the first campsite, (2) stop at the second campsite, (3) return to the first campsite, or (4) keep paddling even though it is getting late. The first and third options differed only in the coding of their distance attributes. In all three models, the same coding scheme was used.

For each of the campsite selection models, most attributes were simply effects coded (Louviere, 2000). Using this coding scheme, estimates for each attribute become centred around their mean level. The only attribute treated differently was the distance between campsites. Campsite distance was split into two separate variables. The first variable measured the distance to be paddled to reach a chosen campsite. This variable was context dependent in that the campsite at which a decision was made, by definition had no distance to be paddled to reach it. The second variable measured the interaction of the first distance attribute with returning to campsite one, thereby capturing only distance backtracked. These distance variables were coded to produce linear estimates (Louviere, 2000).

3.8 Route Choice Modelling

In order to develop an overall model of landscape preferences along canoe routes, the scenic beauty estimates and campsite preference data developed in previous analyses were incorporated into a multinomial logit model based on the remaining canoe route attributes (see Figure 3.7). Several options to achieve this integration were initially explored, with a sequentially nested structure finally chosen. While the minimum, maximum and mean SBE*s for each route were included simply as continuous variables in the choice model, the campsite preference data required considerably more manipulation for inclusion.

Three alternative approaches to modelling route preference were considered. The first of these options treated each campsite attribute on par with the route attributes to model the three outcomes of the route decision, namely the two canoe routes, and "neither route." In total, this model form contained 34 separate attributes per canoe route, exceeding the capability of the available software to perform the analysis. The second model structure to be considered estimated canoe route preferences based on seven outcomes specifying both the route and campsite selected, i.e. Route A and Campsite 1, Route A and Campsite 2 etc. Because of the sequence of tasks undertaken by respondents, the unobserved component of the part worth utility cannot be assumed to be independent among all of the alternatives. In short, the assumption of independence from irrelevant alternatives fails. To account for this failure, a nested logit was used for the model.

Two approaches are available to estimate a nested model (Ben-Akiva and Lerman, 1985.) The first approach, known as simultaneous nesting, involves jointly estimating parameters for both canoeing and camping along with a parameter accounting for correlation in the unobserved utilities of alternatives within a nest. The second approach, sequential nesting, involves estimating a separate campsite model and calculating the expected maximum utility. This new parameter is then entered into the canoe route choice model.

This sequential nesting structure has a long history in the transportation literature (McFadden *et al.*, 1977; Ben-Akiva and Lerman, 1985), and has been applied in a range of contexts from coffee purchasing decisions (Guadagni and Little, 1998) to recreational trip choices of marine anglers (Shaw and Ozog, 1999). Typically, a nested structure is used to model sequential decision-making processes in order to make the model more behaviourally realistic (Morey, 1999). The nested logit, however, makes no behavioural stance on the decision making process (Hunt *et* al. 2004). In this case, the nested structure chosen did not reflect the decision behaviour typical of choosing a real canoeing trip location. However, it did reflect the sequence of choices made by respondents in this survey.

Calculation of the global camping parameter, called a maximum expected utility in the literature, is given by the following equation (Bierlaire, 1997):

$$U_c = \ln(\sum_{o=1}^{n}\sum_{a=1}^{m} e^{Att})$$

Where:

U_c = the maximum expected utility of camping options presented in a given route

n = the number of options in the choice set

m = the number of attributes in each profile

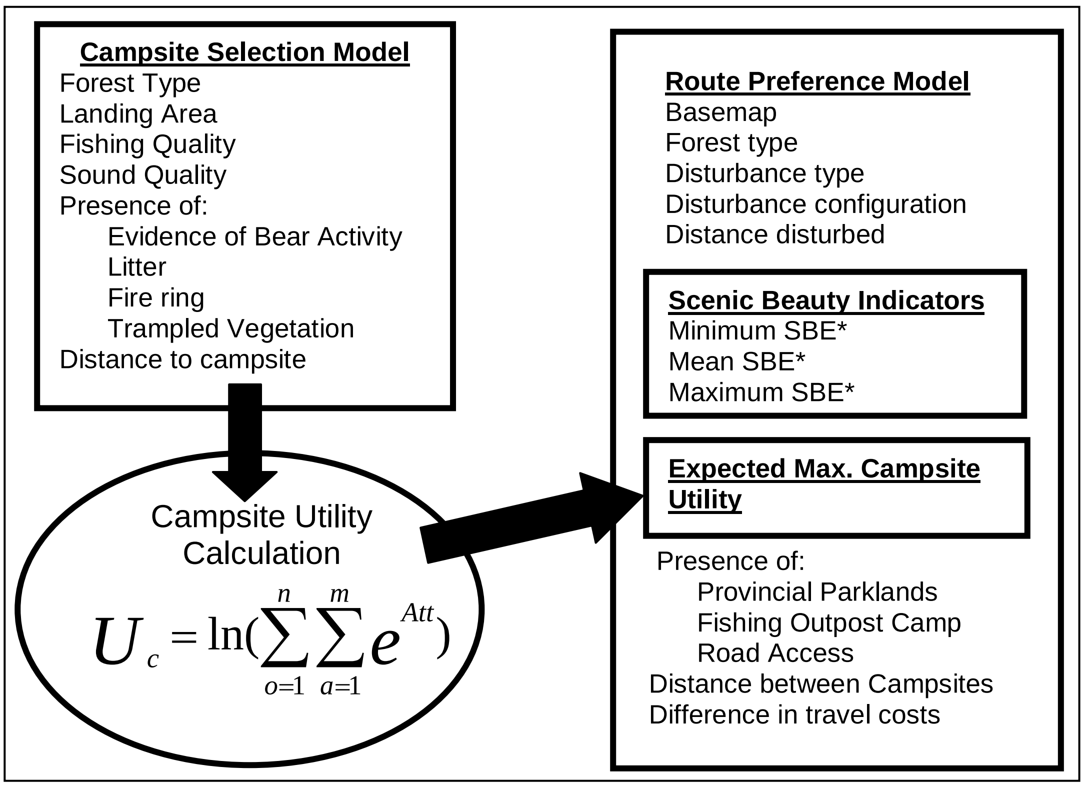
Att = the coefficient of the attribute level presented in the route

The outcome of this equation is a single parameter for each route representing the maximum expected utility of all campsite options on the route, which serves as an indicator of the quality of camping options available on a given route. While simple to calculate, however, this sequential approach does result in inefficient standard errors. Because the expected maximum utility is an estimate, error is left unaccounted for. Nonetheless, sequential estimation is well suited to the series of tasks undertaken by respondents in this survey. Furthermore, commercially available analytical software cannot account for multiple pieces of choice information within one model. Therefore, sequential estimation presents a reasonable compromise over writing custom software.

By using this single parameter instead of the 22 distinct campsite attributes in each route (eleven in each of two campsites), the route selection model is made more parsimonious. The assumption, however, is that respondents have synthesized these attributes into a single component in the context of the route selection process. This cognitive step was encouraged by the unique task of selecting a campsite, and by reminding respondents of their preferred campsites for each route.

All but two of the remaining attributes were effects-coded (Louviere, 2000). These two, the marginal cost of Route A versus Route B and the distance between campsites, were coded to produce linear estimates (Louviere, 2000).

Figure 3.7 Overview of the route preference model structure



CHAPTER 4
RESULTS AND DISCUSSION

Overall, the survey results demonstrated that scenic beauty and the attributes included in the canoe route simulations have a significant influence on respondents' preferences for canoe routes. While the survey contained several additional sections related to respondents past canoeing experiences and attitudes towards forest values, this chapter focuses on the canoe route simulations outlined in the last chapter. It is preceded by a brief discussion on response rate and the socio-demographic characteristics of respondents. Descriptive statistics for the remaining sections of the survey are available in tabular form in Appendix E.

4.1 Response Rate

An email notifying potential respondents about the survey distributed to 1126 ORCA members, and the posting on myccr.com was viewed 347 times (see Appendix A) with a reminder sent two weeks later (see Appendix B). The email distributed to ORCA members resulted in 457 separate visits to the survey cover page and 285 completed surveys. Of those who visited the survey but did not complete it, the majority showed little interest by not responding to any questions. Fewer than 50 respondents who actually started the survey dropped out before completing the canoe route simulations. Because the notification was not sent directly to recipients, but was distributed by ORCA, no statistics on undeliverable emails were available. As a result, the ORCA response rate of 25.3% may be considered a conservative estimate. The CCR posting was viewed 347 times, resulting in 230 separate visits to the survey cover page and 133 completed surveys. Because of the data capturing structure of the online forum, the number of unique viewers was not available, thus 347 viewings may contain repeated visits by the same individuals. As a result, the CCR response rate of 36.3% should also be considered a conservative estimate. Never the less, the CCR response rate was significantly higher than that of the ORCA members ($P<0.002$). Combined, the overall response rate is approximately 28.4%. While this response rate is fairly low, it is not uncommon for internet surveys (Crawford *et al., 2001*; Sax *et al.*, 2003), and is also in line with typical response rates of randomly distributed market surveys. It may be explained by two factors. One reason is the diversity of paddling activities represented by ORCA. Because the organization also represents white-water day trippers, river kayakers and sea kayakers, not all members may take an interest in multi-day canoe tripping in northern Ontario. The second reason for limited response rate lies in the timing of the survey mail out. Because the survey was released in May, just prior to the start of the paddling season, members who work in the industry may have been focused on getting ready for the season. Finally, the complexity and length of the survey may also have contributed to a low response rate.

4.2 Socio-Demographic Characteristics

Several socio-demographic characteristics were obtained in the final section of the survey. The majority of respondents were male, well educated with college or university degrees, and Canadian. Most age ranges up to 65 were well represented in the sample, with the largest proportion of respondents being from 46 to 65 years of age. Only 4 respondents were over the age of 65. This lack of representation may reflect a bias related to the medium of the survey.

Two additional questions served as indicators of commitment to the activity. Respondents were asked if they held any canoeing related certifications (see Table 4.2), and how many paddle craft they owned as well as the price of the most expensive one (see Table 4.3). In general, respondents were quite committed to their activity. Overall 33% of respondents indicated that that they held a canoe instructor certifications. About 86% of respondents owned at least one canoe, with the mean number of canoes owned being 2.23 (SD=2.95). This level of commitment is not surprising given the populations from which respondents were recruited.

Table 4.1 Socio-demographic characteristics of survey respondents

		Freq.	%	Valid %	Cum. %
Age Category	18 to 30	94	22.5	25.9	25.9
	31 to 45	114	27.3	31.4	57.3
	46 to 65	151	36.1	41.6	98.9
	over 65	4	1.0	1.1	100.0
	Missing	55	13.2		
Sex	Male	263	62.9	72.1	72.1
	Female	102	24.4	27.9	100.0
	Missing	53	12.7		
Maximum Level of Education Achieved	8th grade	1	0.2	0.3	0.3
	some high school	11	2.6	3.0	3.3
	high school graduate	19	4.5	5.2	8.4
	some university/college	59	14.1	16.1	24.5
	university/college graduate	161	38.5	43.9	68.4
	some graduate school	27	6.5	7.4	75.7
	Masters, Doctoral or Professional Degree	89	21.3	24.3	100.0
	Missing	51	12.2		
Country of Residence	Canada	329	78.7	90.6	90.6
	USA	32	7.7	8.8	99.4
	Other	2	0.5	0.6	100.0
	Missing	55	13.2		

Table 4.2 Related canoeing/backcountry certifications held by respondents

	Freq.	% of Respondents
Canoe Instructor	140	33%
Kayak Instructor	36	9%
Wilderness First Aid	113	27%
Swiftwater Rescue Technician	35	8%
Other	53	13%

Table 4.3 Boat ownership statistics

	N	Min.	Max.	Mean	Std. Dev.
Number of Canoes owned	361	0	4	2.23	2.95
Number of Kayaks owned	275	0	5	0.85	1.35
Number of Inflatables owned	238	0	3	0.14	0.41
Cost of most expensive boat ($CDN)	306	$99.00	$5,000.00	$1,792.27	$ 907.13

	Type	Freq.	%	Valid %	Cum. %
Most expensive paddle craft owned	canoe	255	61.0	70.4	70.4
	kayak	53	12.7	14.6	85.1
	Inflatable	3	0.7	0.8	85.9
	N/A	51	12.2	14.1	100.0
	Missing	56	13.4		

One option for evaluating the reliability of survey data is to compare them with characteristics of the population elicited by other means. While the Survey of the Importance of Nature to Canadians (SINC) does collect information on canoeing, this activity is grouped with both kayaking and sailing. As a result, comparison of the socio-demographic information between this study and SINC is questionable. Therefore, I did not use SINC data to evaluate whether canoeists sampled for this project were representative of the canoeing public as a whole. Table 4.1 presents the frequency of responses for many of these variables.

4.3 Scenic Beauty Analysis

In all, six series of analyses were conducted to assess various factors affecting scenic beauty. These included assessments associated with three sets of biophysical data collected onsite and examined previously in other contexts (Haider and Hunt, 2002; Hunt and Haider, 2004), and some additional contextual data, previously unrecorded. The biophysical attributes examined included: forest ecosystem classification (FEC), landscape disturbance types and levels, and the six biophysical factors identified by Haider and Hunt (2002). These factors included measures of tree size, amount of hardwood, species variety, plant mortality, tree density and the amount of coniferous shrubs. Additional factors examined included the perspective from which the photograph was taken, meteorological variation evident in the photographs, and the presence of large exposed rocks. Finally, because each set of eight ratings was grouped together in a single route, and thumbnail images served to remind respondents of this connection, the effect of scenic evaluations of previous images on the current image's SBE* rating was also examined.

4.3.1 Forest Classification

In their original study, Haider and Hunt (2002) reduced the 38 vegetation types of the Northwest Region Forest Ecosystem Classification to eight groups. Based on photo availability and similarities in scenic beauty estimates, two of these groups, eastern white cedar and balsam/white spruce, were combined for this study. Mean SBE*s for the seven resulting FEC groups were then compared using a generalized analysis of variance (ANOVA) fit to the undisturbed scenes. This model was significant ($F=25.085$; $df=6,505$; $P<0.001$) explaining 37.3% of the variance in the dataset. Several pairwise

Bonferroni adjusted comparisons yielded significant differences between pairs of FEC groups (see Table 4.4 and Table 4.5). Pine forests (Jack pine and Red/White pine) were considered significantly more attractive than other FEC groups, followed by hardwoods and the white spruce/cedar/balsam fir group. Black spruce and Jack pine, and forests of solely black spruce followed, with the scenic beauty of black spruce bog forests rated significantly lower than all other FEC groups. These results were similar to those found by Haider and Hunt (2002), with one major exception. While in their study, Jack pine forests were not considered more attractive than Black spruce or Black spruce/Jack pine, in this case Jack pine forests are considered highly attractive, insignificantly second only to Red and White pine forests. It appears that in the context of canoeing, Jack pine forests may be a good northern substitute for the southern Red and White pine forests.

Table 4.4 Aesthetic quality of Forest Ecosystem Classes

	ANOVA				F	25.085
					df (within groups)	6
					df (between groups)	505
					P	0.000
Forest Ecosystem Class	N	Mean	Std. Error	Sig. Differences*		P
Red/White pine	26	105.00	12.25	WSEWCBF,JPBS,BS,BSB		0.000
Jack Pine	67	65.31	9.89	WSEWCBF,JPBS,BS,BSB		0.002
Hardwood	23	58.86	11.08	JPBS,BS,BSB		0.047
White Spruce/Balsam Fir/Cedar	73	5.92	9.24	RWP,JP,BSB		0.002
Jack Pine & Black Spruce	144	-1.80	9.30	HS,RWP,JP,BSB		0.047
Black Spruce	75	-16.79	7.49	HS,RWP,JP,BSB		0.007
Black spruce bog	104	-70.90	8.52	HS,RWP,WSEWCBF,JP,JPBS,BS		0.001

*pairwise comparisons based on Bonferroni adjusted t tests at the 95% confidence interval.

These differences in scenic beauty also carried across to the two level classifications applied to the design of the canoe routes (see Table 4.5). Southern routes, comprised of all forest types except Black spruce bog, were considered significantly more attractive than northern routes comprised of all forest types except hardwoods and Red/White pine.

Table 4.5 Comparison of mean SBE* for routes classified by southern and northern forest types.

		N	Mean	Std. Error	t	p
SBE*	Southern	16	40.712	8.708		
	Northern	16	4.636	9.246	2.840	0.005

Note: to remove the effects of different disturbance treatments between these groups, only pristine and mixed reserve routes are included in the analysis.

4.3.2 Disturbance Levels

To examine the impact of disturbance on perceptions of scenic beauty, three models were developed. The first model compared the mean SBE* for routes based on the six disturbance categories included in the design. For this analysis, southern routes were excluded to avoid artificially raising the means for pristine and mixed disturbance routes. The second model focused on only those images in the two segments designated for disturbed scenes. These images contained the same mix of forest types across all disturbance categories. Finally, reserve width, as a continuous variable, was plotted against mean SBE* and a linear regression analysis conducted.

The mean SBE* for northern canoe routes differing in disturbance type and level were compared using a generalized analysis of variance (ANOVA) fit to all scenes. This model estimated significant differences in scenic beauty based on these disturbance classes ($F=4.288$; $df=5,47$; $P<0.002$) but explained only 5.4% of the variance in the dataset. Several pairwise Bonferroni adjusted comparisons yielded significant differences between only two pairs of disturbance classes (see Table 4.6). Mixed reserves (i.e. a narrow reserve width followed by a wide reserve width) were perceived as significantly more attractive than either all narrow reserves or all medium reserves. Because the wide reserve was always shown after the narrow one, an order effect is likely. Brown and Daniel (1987) found that presenting a string of low scenic beauty slides leads observers to set a low criterion for ratings, such that small improvements to scenic beauty in subsequent slides receive disproportionately higher ratings.

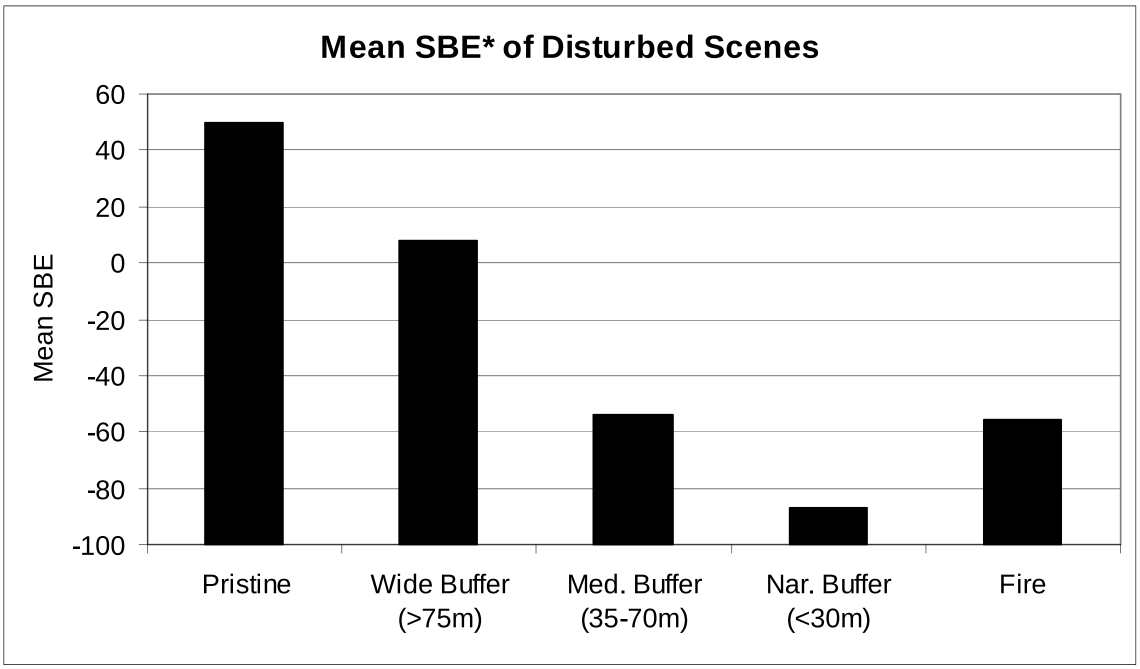
Table 4.6 Aesthetic quality of northern routes based of different disturbance classes,

	ANOVA			F	4.288
				df (within groups)	5
				df (between groups)	47
				P	0.001
	N	Mean	Std. Error	Sig. Differences*	P
Pristine	8	-18.82	11.8754		
Fire	8	-16.71	10.70239		
Narrow Reserve	8	-36.88	11.83803	Mixed	0.002
Medium Reserve	8	-36.56	10.18845	Mixed	0.002
Wide Reserve	8	-0.55	12.56657		
Mixed (Narrow and Wide)	8	28.09	13.6446		

*pairwise comparisons based on Bonferroni adjusted t tests at the 95% confidence interval.

When individual scenes were compared, however, differences between the disturbance categories became more apparent. ANOVAs conducted on these images yielded a significant model (F=8.764; df=4,123; P<0.0001) explaining 22.2% of the variance in the dataset. Furthermore, trends in mean SBE* conformed more to expectations, with pristine forests and wide reserves rated more highly than disturbances whose impacts were more visible (see Figure 4.1). Pair wise Bonferroni adjusted comparisons yielded more significant differences between disturbance groups (see Table 4.7). Pristine images were rated significantly more highly than fires, as well as narrow and medium reserves. Narrow reserves were also significantly less attractive than scenes containing wide reserves.

Figure 4.1 Mean SBE* of disturbed scenes.



Note: The same FEC groups comprised all scenes.

Table 4.7 Aesthetic quality of scenes designated for disturbances

	ANOVA			F	8.764269
				df (within groups)	4
				df (between groups)	123
				P	0.0000
	N	Mean	Std. Error	Sig. Differences*	P
Pristine	32	49.89	12.27	Fire, Narrow, Medium	0.012
Fire	16	-55.67	25.76	Pristine	0.009
Narrow	32	-86.81	26.96	Pristine, Wide	0.003
Medium	16	-53.62	21.35	Pristine	0.012
Wide	32	7.92	11.56	Narrow	0.003

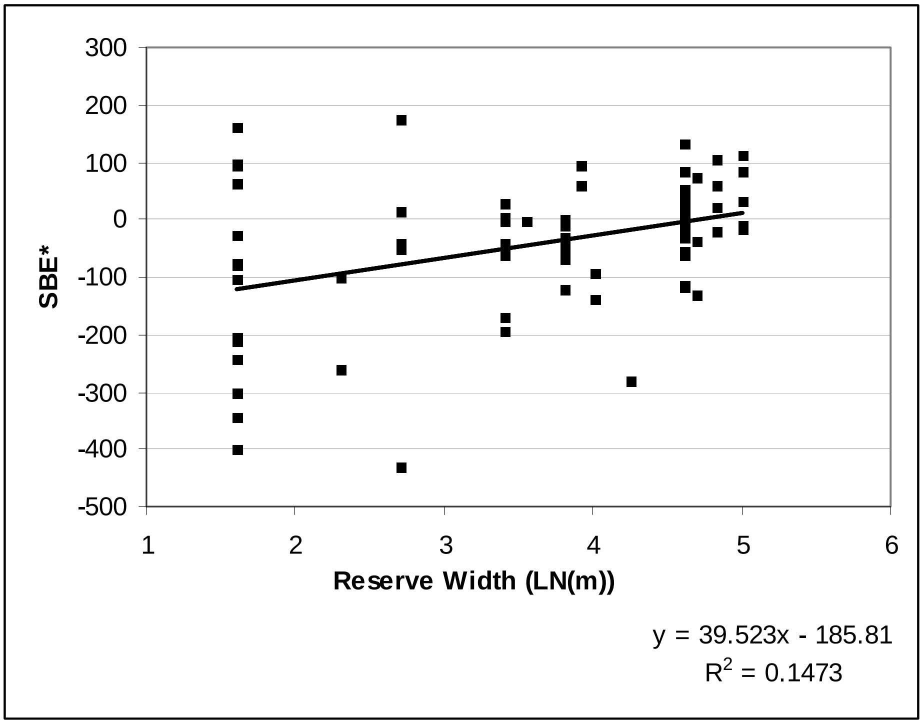
*pairwise comparisons based on Bonferroni adjusted t tests at the 95% confidence interval.

Finally, a regression model for scenic beauty as a function of reserve width was developed (see Table 4.8, Figure 4.2). For this model, pristine images and burns were excluded. Pristine images were excluded because the reserve widths are not applicable to these sites. Burns were excluded for two reasons. First, the burned area, in each case, extended all the way to the shoreline and second, applying a reserve width to a natural disturbance is not managerially practical. As in the model developed by Hunt and Haider (2004), buffer width was log transformed, to account for a diminishing effect as reserve width increased. While this model was highly significant ($F=13.48$; $df=1,78$; $P<0.000$), it explained only 13.7% of the dataset variation (14.7% unadjusted).

Table 4.8 **Regression coefficients for scenic beauty as a function of reserve width**

	Unstandardized Coefficients				
	B	Std. Error	Beta	t	P
(Constant)	-185.88	41.01		-4.53	0.000
LN Reserve Width	39.56	10.78	0.384	3.67	0.000

Figure 4.2 **Scenic beauty as a function of reserve width.**



While each of the three models outlined above predicts scenic beauty as a function of the level and type of disturbance only weakly, each was highly significant in terms of slope. While considerable variation exists in the ratings, a trend is clearly evident. Nevertheless, though increasing levels of disturbances are negatively perceived on average, considerable variation exists. In an attempt to explain this variation, several additional factors were examined.

4.3.3 Exposed Rocks

Based on comments received by respondents, images containing exposed rocks, which is a characteristic landscape feature of the Canadian Shield, were compared against those without rocks. A significant difference emerged. The presence of exposed rock was significantly preferred over its absence ($p<0.001$, see Table 4.9). Because of colinearity between soil substrate and FEC, and between reserve width and substrate visibility, this result must be considered independently of either of the previous two models. More importantly, this result may provide insight into some of the route preference results presented later in this chapter.

Table 4.9 Independent samples t-test comparing scenes based on the presence of exposed rocks

	N	Mean	SD	t	p
Exposed Canadian Shield Present	128	43.09	123.25		
Exposed Canadian Shield Absent	384	-14.366	86.47	4.888	0.000

4.3.4 Biophysical Factors

The biophysical component scores from Haider and Hunt's (2002) original study were examined in a multiple regression model. These scores, derived from a principle components analysis of the inventory data taken at each site, accounted for 76.4% of the variation and comprised six factors: tree size, amount of hardwood (including both trees and shrubbery), species variety, vegetation density, tree mortality, and the amount of coniferous shrubbery. In this study, the same ($F=14.519$; $df=7,210$; $P<0.001$; see Table 4.10) explained 30.4% of the variation in SBE* (32.6% unadjusted) and included the six biophysical characteristics, as well as the slope and an intercept value.

The two most important variables were mortality (β=-3.87) and tree size (β=0.247). The significant negative relationship between scenic beauty and mortality captures respondents' aversion to landscape disturbances resulting in high tree mortality. The positive relationship between SBE* and tree size suggests respondents find taller and wider trees more attractive. Conifer shrubbery was the next most important variable (β=-0.222). Its negative relationship with scenic beauty suggests that respondents prefer less coniferous shrubbery along the shoreline. Less important (β=-0.121) but also significant, was the hardwood component. Taken together with the conifer shrubs, these results indicate a preference among respondents for less under story vegetation along the shoreline. Two reasons why canoeists may favour these shorelines are that they offer easy access to land their boats and wildlife along the shore may be more easily sighted. The component relating to species variety and the slope variable were both significantly and positively correlated to scenic beauty, although not as important as those variables outlined above. Two components of the model were not significant below P=0.05. While the intercept was significant at the 9% level, the density variable was not significant at all.

Table 4.10 Multiple regression estimates of biophysical variables to predict scenic beauty.

	Unstandardized Coefficients				
	B	Std. Error	Beta	t	P
(Constant)	-20.814	12.172		-1.710	0.089
slope	5.197	2.448	0.123	2.123	0.035
tree size	19.159	4.784	0.247	4.005	0.000
hardwood	-12.926	6.393	-0.121	-2.022	0.044
mortality	-38.828	6.041	-0.387	-6.428	0.000
species variety	12.547	5.669	0.132	2.213	0.028
density	-2.247	5.488	-0.024	-0.409	0.683
conifer shrub	-29.875	7.787	-0.222	-3.837	0.000

4.3.5 Contextual Factors

Other variables assessed as contributors to respondents' evaluations of the scenery depicted along a route were grounded more in the perspective of the camera or the context of a canoe trip. Four types of contextual variables were examined. The first set of variables included the distance from which the image was taken from shore. The second set of variables includes contents of the photographic images, which were not captured by the biophysical inventory, namely the apparent meteorological conditions of the images as represented by cloud cover and water conditions in the image. The third set comprised the attributes of the route presented in the accompanying base map. These variables provided users with a bigger picture, and may have established expectations for the remaining scenery. Finally, the effect of previous image ratings was examined. Since the order in which one views scenery during a day of paddling is not random, but rather follows an established sequence, potential order effects were deemed important elements to explore.

4.3.5.1 Distance from Shoreline

Unlike previous studies using images from the same collection (i.e. Haider and Hunt, 2002; Hunt and Haider, 2004), photographs taken from both 15m offshore and 140m offshore were utilized. Ratings for these two sets of images were not separated for the SBE* calculation. As a result, SBE* for both types of image were centred around a global mean. To test for differences in ratings caused by the distances from which the photos were taken, mean SBE* was compared across 15m images and 140m images. However, no significant differences were found to exist (see Table 4.11).

Table 4.11 Comparison of mean SBE* based on image perspective.

		N	Mean	SD	t	p
Mean SBE* of Images	15m from shore	288	1.5055	103.87		
	140m from shore	224	-1.9357	94.99	0.386	0.700

4.3.5.2 Meteorological Conditions

Two indicators of varying meteorological conditions, i.e. cloud cover and water conditions, were present in the photographs. Both of these were found to have a significant effect on mean SBE*. Three categories of cloud cover were examined: the absence of clouds, small cumulus clouds, and overcast/stormy clouds. A generalized ANOVA revealed a significant difference between these three groups at the $p<0.05$ level, but explained only 2.3% of the variation in the dataset. Post hoc Bonferroni tests demonstrated these differences to be greatest when some clouds are present and under stormy conditions (see Table 4.12). However, these differences were not significant at p<0.10. Respondents seem to prefer images with small cumulus clouds (mean SBE*=8.35) over stormy skies (mean SBE*=-33.09).

Table 4.12 Post hoc Bonferroni test showing the effect on mean SBE* of different levels of cloud cover

	ANOVA				
				F	3.1
				df (within groups)	2
				df (between groups)	444
				P	0.046
	N	Mean	Std. Error	Sig. Differences*	P
None	278	-12.71	6.27	Some Cumulus	0.148
Some Cumulus	134	8.36	8.91		
Stormy/Overcast	35	-33.09	11.18	Some Cumulus	0.097

***pairwise comparisons based on Bonferroni adjusted t tests at the 95% confidence interval.**

Water conditions in the images were also classified into three categories: glassy, small chop, and large chop. One-way ANOVA revealed a significant difference in the mean SBE* at the p<0.001 level (see Table 4.13). Post hoc Bonferroni tests indicate that small chop is preferred over both glassy (p<0.02) and choppy conditions (p<0.001). This result may reflect a trade off between safety concerns associated with too much wind and potentially buggy or hot, muggy conditions on a completely windless day.

Table 4.13 One Way ANOVA of differences in mean SBE* based on water conditions

	ANOVA				
				F	9.591
				df (within groups)	2
				df (between groups)	509
				P	0.000
	N	Mean	Std. Error	Sig. Differences*	P
Glassy	221	-6.449	7.321	Small chop	0.019
				Large chop	0.081
Small Chop	214	19.371	6.376	Large chop	0.000
Large Chop	77	-35.325	8.914		

***pairwise comparisons based on Bonferroni adjusted t tests at the 95% confidence interval.**

4.3.5.3 Map Features

Each of the attributes present in the design of the discrete choice experiment was also examined for its effects on scenic beauty. Of thirteen variables tested, only three proved to have a significant effect at the 10% level or less. Two of these three were parameters specifying the forest class and disturbances, and have already been presented. The third attribute to affect scenic beauty was the presence of a provincial park. Canoe routes containing a park were found to have somewhat lower mean SBE* (see Table 4.14). Interestingly, this difference is only present when the canoe routes are treated as a whole. When the segments that could possibly be within a provincial park were examined, no significant difference existed. These results indicate that respondent's may have higher initial expectations of scenic beauty near protected areas. After a day of paddling, these expectations may then have declined, such that once inside the park this effect was nullified.

Table 4.14 Comparison of mean SBE* for canoe routes and segments based on provincial park presence

		N	Mean	SD	t	p
Mean SBE* for Route	Park present	16	-14.392	107.987		
	Park absent	48	4.797	96.866	1.885	0.060
Mean SBE* for segments 7 and 8	Park present	32	6.604	100.177		
	Park absent	96	12.429	91.668	-0.291	0.772

4.3.5.4 Order Effects

The order in which scenes are presented has been shown to have a considerable effect on scenic beauty evaluations in earlier studies (e.g. Brown and Daniel, 1987). Complex order interactions may affect the perception of individual scenes (Meitner, 2004). Because the scenes in this study were presented as a set of eight images representing a single canoe route, these effects may be especially important. Pearson correlation coefficients were calculated between each image's SBE* and those of preceding images. Overall, these correlations were highly significant and decayed in magnitude with increased distance between images (see Table 4.15). The correlation between adjacent images was 0.254, while that of the first and last images in a route was only 0.097.

Table 4.15 Pearson correlations between SBE ratings and those of successively distant previous images.

	Correlation Coefficient	Sig. (1 tailed)	N
SBE*	1	.	512
1 Previous Image SBE*	0.254	0.000	448
2 Previous Image SBE*	0.201	0.000	384
3 Previous Image SBE*	0.195	0.000	320
4 Previous Image SBE*	0.210	0.000	256
5 Previous Image SBE*	0.163	0.012	192
6 Previous Image SBE*	0.164	0.032	128
7 Previous Image SBE*	0.097	0.222	64

When these variables were taken into a linear regression analysis, colinearity between them rendered all but the adjacent image's SBE* insignificant ($P>0.10$). The resulting model explained 22.1% of the variation in the dataset and the coefficient was significant at $P<0.041$ (see Table 4.16).

Table 4.16 Regression model of SBE* based on previous image's SBE*

	B	Std. Error	Beta	t	Sig.
(Constant)	27.786	12.863		2.160	.035
1 Previous Image SBE*	.298	.162	.247	1.841	.071
2 Previous Image SBE*	.196	.142	.190	1.382	.173
3 Previous Image SBE*	-.244	.155	-.238	-1.574	.121
4 Previous Image SBE*	.201	.124	.214	1.617	.111
5 Previous Image SBE*	.052	.106	.059	.490	.626
6 Previous Image SBE*	.210	.150	.187	1.395	.168
7 Previous Image SBE*	.015	.132	.014	.115	.909

Rsq= 0.221

4.4 Campsite Selection

Table 4.17 presents the MNL parameter coefficients, their standard errors, and *t*-values for each of the three campsite models: a model for the first campsite, a model for the second campsite, and a combined model. For ease of interpretation, the results for each model are graphed in Figure 4.3. Readers are reminded that these scenarios were composed of discrete attribute levels; however, the distance attributes were estimated as linear terms. The y-axis presents the part worth utility of each attribute. These part-worth utilities (PWU) are measures of preference and represent the utility for each level of each attribute.

Surprisingly, each of the three models were remarkably similar in the magnitude and direction of the PWUs ascribed to their attributes, indicating that the context of the decision had little bearing on the overall evaluation of these attributes. The biggest difference between the three models lay in the level of statistical significance of each parameter. Despite the fact that the first campsite had a higher overall number of responses (n=818), more parameters of the second campsite (n=558) were significant, and the overall significance of these parameters was higher.

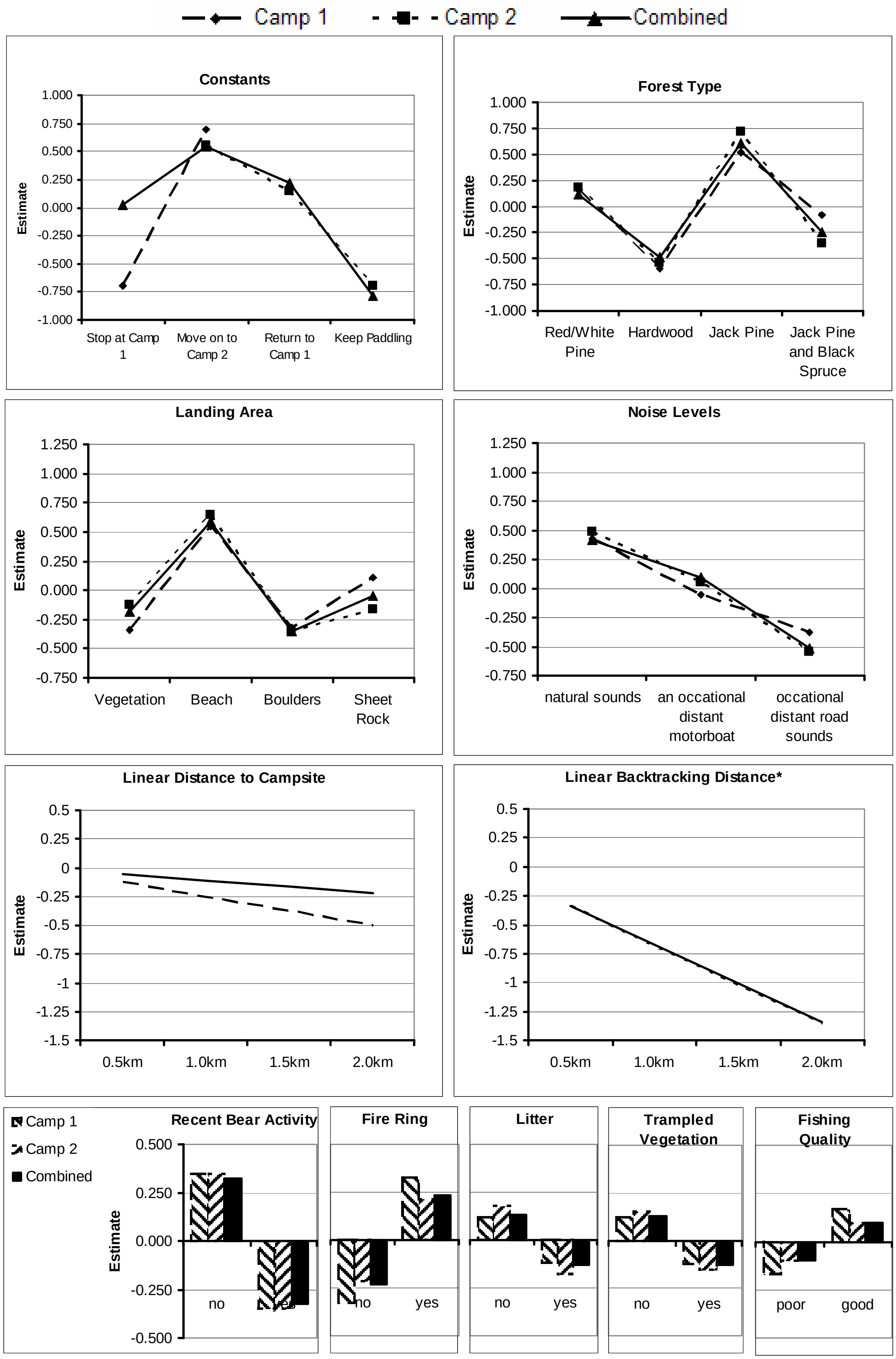
Another difference between the models is found in the intercepts for each of these two models. As Figure 4.3 shows, respondents were much more likely to move on to camp two than stay at camp one. Strong curiosity over what may be available at the next site, coupled with the lack of muscular fatigue typical of an actual day of paddling are likely reasons for this trend. By contrast, once respondents had reached the second campsite, they were slightly less likely to return to the first campsite, and continuing to paddle even though it is getting late was least preferred. This finding is consistent with Frissell's and Duncan's (1965) report that campsite selection was largely determined by what was available at the end of the day. Most of the attributes listed however did show a statistically significant effect on respondents' choice of sites in both the model for the second campsite and the combined campsite model.

Table 4.17 Results of MNL models for campsite selection preferences at camp 1 and camp 2 and a combined model.

	Camp 1 Model			Camp 2 Model			Combined Model		
R^2	0.1099			0.1629			0.1108		
$R^2(0)$	0.2516			0.3236			0.1891		
L-squared (L^2)	-1639.3			-1691.5			-3425.9		
Attributes	coeff.	s.e.	t	coeff.	s.e.	t	coeff.	s.e.	t
Constants									
Stop at Camp 1	-0.691	0.074	-9.33				0.028	0.076	0.37
Move on to Camp 2	0.691	0.074	9.33	0.555	0.074	7.55	0.542	0.105	5.16
Return to Camp 1				0.143	0.127	1.12	0.213	0.125	1.71
Keep Paddling				-0.698	0.082	-8.56	-0.783	0.087	-9.05
FOREST									
R/W Pine	0.161	0.101	1.59	0.182	0.086	2.13	0.118	0.061	1.92
Hardwood	-0.598	0.121	-4.96	-0.544	0.089	-6.10	-0.485	0.068	-7.15
JPine	0.521	0.109	4.78	0.717	0.091	7.90	0.608	0.064	9.51
JPine/BSpruce	-0.084	0.101	-0.83	-0.355	0.085	-4.16	-0.241	0.063	-3.84
SHORE									
Vegetation	-0.338	0.108	-3.13	-0.129	0.083	-1.55	-0.180	0.062	-2.89
Beach	0.549	0.111	4.96	0.647	0.092	7.01	0.583	0.066	8.80
Boulders	-0.317	0.108	-2.94	-0.352	0.087	-4.04	-0.354	0.064	-5.50
Sheet Rock	0.107	0.106	1.01	-0.167	0.094	-1.78	-0.049	0.067	-0.74
BEAR									
no	0.346	0.059	5.91	0.347	0.054	6.47	0.325	0.040	8.16
yes	-0.346	0.059	-5.91	-0.347	0.054	-6.47	-0.325	0.040	-8.16
FIRE									
no	-0.330	0.059	-5.61	-0.213	0.053	-3.99	-0.232	0.040	-5.78
yes	0.330	0.059	5.61	0.213	0.053	3.99	0.232	0.040	5.78
LITTER									
no	0.118	0.060	1.98	0.178	0.056	3.15	0.132	0.041	3.21
yes	-0.118	0.060	-1.98	-0.178	0.056	-3.15	-0.132	0.041	-3.21
VEGE									
no	0.122	0.058	2.08	0.150	0.054	2.80	0.127	0.040	3.18
yes	-0.122	0.058	-2.08	-0.150	0.054	-2.80	-0.127	0.040	-3.18
FISH									
poor	-0.167	0.059	-2.85	-0.100	0.054	-1.85	-0.098	0.040	-2.44
good	0.167	0.059	2.85	0.100	0.054	1.85	0.098	0.040	2.44
NOISE									
natural sounds	0.430	0.080	5.41	0.485	0.071	6.82	0.419	0.053	7.90
motorboat	-0.053	0.095	-0.56	0.058	0.079	0.73	0.095	0.061	1.54
road sounds	-0.377	0.099	-3.83	-0.542	0.083	-6.54	-0.514	0.063	-8.17
DISTLIN									
Distance to campsite	-0.250	0.106	-2.35				-0.110	0.108	-1.01
DISTBACK									
Backtracking distance				-0.678	0.155	-4.36	-0.674	0.152	-4.43

Note: Significant attributes ($p<0.05$) are highlighted in bold.

Figure 4.3 Campsite parameter estimates compared across three discrete choice models



Overall, when selecting campsites respondents preferred pine forests over hardwood or a mix of Jack pine and Black spruce, with Jack pine being most preferred. These results are consistent with Boxall et al.'s (1996) findings from a revealed preference study of canoe routes chosen in Nopiming Provincial Park in Manitoba. Black spruce is typical of low lying areas, while hardwood forests are often characterized by a dense under story. Both of these conditions are ideal habitat for biting insects. In upland pine forests, the ground is likely to be dryer, and the lower density of trees is also more likely to afford better tent sites.

Beach landing areas were strongly preferred over all other types shown. Here, ease of landing appears to be the most important characteristic. Each of the other three types of shoreline shown presented some challenge to landing a canoe and were evaluated the same. This result is consistent with a previous study's findings that the absence of a good landing area was frequently cited as a reason for rejecting a potential campsite (Frissell and Duncan, 1965).

Fishing quality also followed expectations in that good fishing was preferred over poor fishing; however, this parameter was not significant at the second campsite ($t = -1.85$). Good fishing quality at the first site seems to positively influence the selection of that site more than fishing quality at the second site.

With regards to the other variables, respondents preferred sites with no evidence of bear activity. The risks inherent with bear activity near humans appear to be a real concern. Respondents also showed an aversion to litter and trampled vegetation. These findings are consistent with a preference for pristine campsite conditions devoid of impacts associated with previous use (Lynn and Brown, 2000). Inconsistent with these findings, however, was a preference for the presence of an existing fire ring. This finding may be an indication that while litter and vegetation damage are viewed as negative impacts, the presence of fire rings indicate a good campsite. However, the result found here, is corroborated by those of another study (Lee, 1977), in which discrepancies were found between wilderness users stated preference for pristine and solitary wilderness experiences and their selection of sites popular with other users.

Respondents showed a strong preference for a pristine auditory environment with natural sounds only. Of the remaining categories presented an occasional distant motorboat was preferred over occasional distant road sounds. The result is not surprising in that road sounds may be perceived to be more constant than those of a single motorboat. In addition, the presence of a road nearby may detract from the wilderness character of the experience. Motorboat sounds may be more reconcilable with this character because the noise may be perceived to originate from just another recreational user as opposed to the industrial sounds of road-based transportation.

In each of the two separate campsite models, distance to the other site had a significant negative effect on campsite selection. This effect was to be expected, as additional distance paddled is a cost associated with choosing the other campsite. In the combined model, however, distance in the direction of travel became insignificant, while distance in a reverse direction was highly significant. Apparently, the concept of paddling back is not very appealing at all.

While most of these attributes may be considered not as *necessities*, but rather as *experience* attributes, some such as the ease of landing a canoe, were shown to be extremely desirable. The success of this task, however, demonstrates the compensatory nature of campsite attributes suggesting that rather than the strict hierarchical structure of attributes outlined by Brunson and Shelby (1990), a more continuous gradation of importance exists. Canoeists may be willing to trade off important *necessity* attributes as long as the aggregate utility of other attributes is high enough.

4.5 Route Choice Model

Ultimately, a model assessing respondents' preferences for landscape features present over an entire day of canoeing including the quality of campsites available was developed. Because of the similarity between the three campsite models examined, the combined camp model, as the single most complete model, was used in the nested model of route preference. The model's main advantage over the two separate campsite models is that it provides a single estimate for each parameter irrespective of campsite location. This feature allows a single utility value to be calculated for all camping options present on a route. While this value is simply an index of campsite quality, it provides an elegant way to include campsite choice into the overall route model. Table 4.18 presents the descriptive statistics for the maximum expected utility of camping across the 64 canoe routes presented to respondents.

Table 4.18 Descriptive statistics for the maximum expected campsite utilities calculated for each route.

	Minimum	Maximum	Mean	Std. Dev.
Maximum Expected Camping Utility	2.73	3.02	2.90	0.06

Table 4.19 presents the descriptive statistics for the scenic beauty estimate parameters examined in the model. The mean SBE* was weighted by segment distance,

while the minimum and maximum SBE*s were not. The reason for this different treatment is that it mimics the personal rating statistics shown at the time of the route choice task.

Table 4.19 Descriptive statistics for scenic beauty measures included in the route choice model.

	Minimum	Maximum	Mean	Std. Dev.
Weighted mean SBE*	-136.01	143.13	3.53	57.20
Minimum SBE* for Route	-430.30	89.54	-143.24	111.32
Maximum SBE* for Route	-30.41	255.68	110.26	63.12

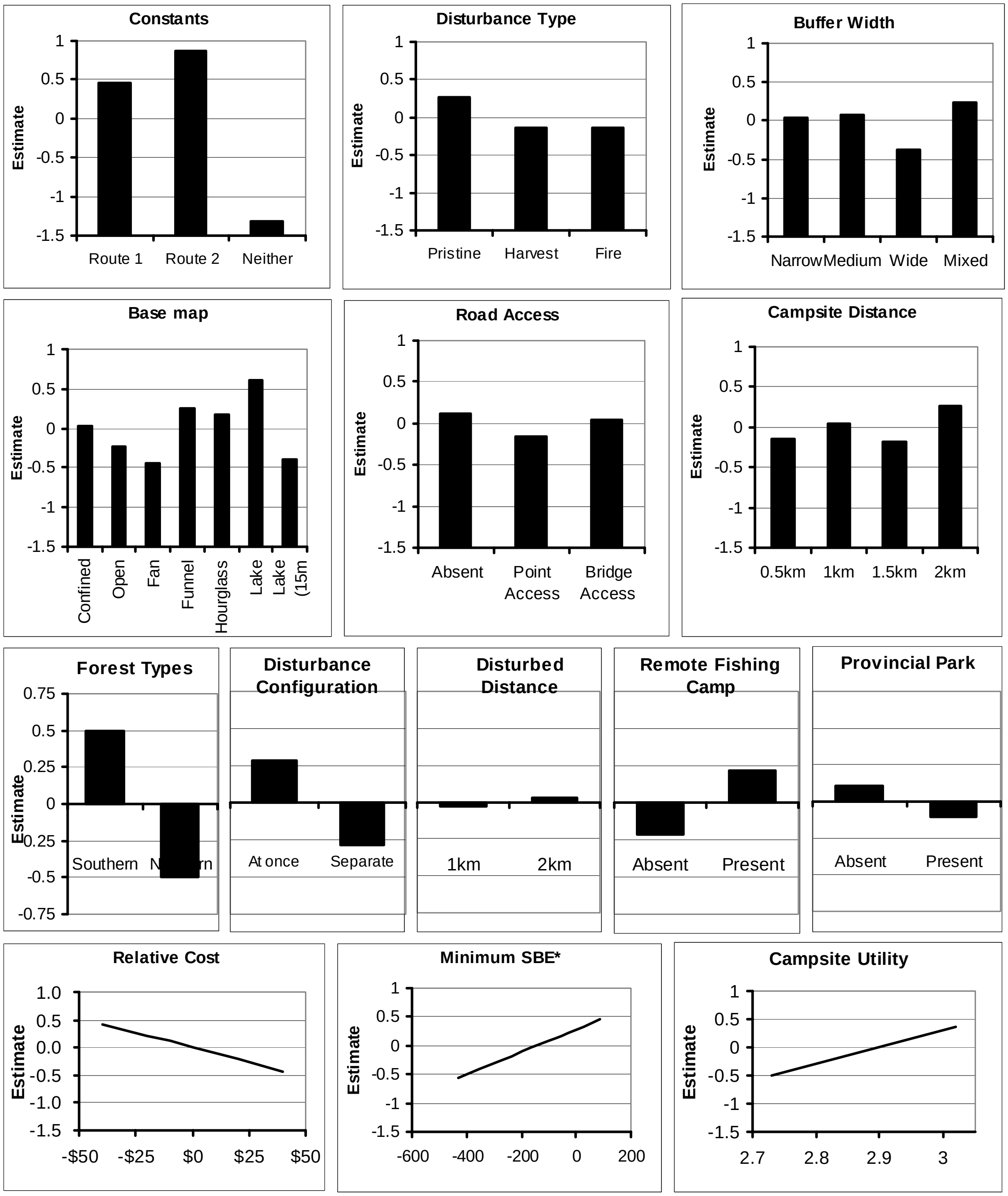
These campsite utilities and SBE* parameters were centred around their means and brought into the canoe route choice model. Given the extreme complexity of the design, the number of significant parameters was surprising. The results of the MNL model are presented in Table 4.20. For ease of interpretation, a graphical presentation of the model is shown in Figure 4.4.

Table 4.20 Results of MNL models for canoe route preferences.

		Route Preferences		
	R^2	0.1039		
	$R^2(0)$	0.2445		
	L-squared (L^2)	-2550.47		
Attributes		coeff.	s.e.	t
Constants	Route A	**0.4528**	**0.0598**	**7.5668**
	Route B	**0.8643**	**0.05**	**17.2773**
	Neither	**-1.3171**	**0.0885**	**-14.8776**
Forest Type Configuration	Southern	**0.4931**	**0.0722**	**6.8276**
	Northern	**-0.4931**	**0.0722**	**-6.8276**
Disturbance Type	Pristine	**0.267**	**0.0776**	**3.4393**
	Harvest	-0.1315	0.0908	-1.4481
	Fire	-0.1355	0.1041	-1.3011
Disturbance Distance	1km	-0.028	0.0637	-0.4391
	2km	0.028	0.0637	0.4391
Disturbance Configuration	At once	**0.2884**	**0.0677**	**4.2594**
	Separate	**-0.2884**	**0.0677**	**-4.2594**
Reserve	Narrow	0.0441	0.1139	0.3874
	Medium	0.0803	0.1053	0.7625
	Wide	**-0.3671**	**0.1071**	**-3.4279**
	Mixed	**0.2426**	**0.1205**	**2.0143**
Base map	Confined	0.0311	0.1476	0.2105
	Open	-0.2295	0.15	-1.5299
	Fan	**-0.449**	**0.1314**	**-3.4168**
	Funnel	**0.2583**	**0.1157**	**2.2334**
	Hourglass	0.1739	0.1009	1.7228
	Lake	**0.6057**	**0.1297**	**4.67**
	Lake (15m Photos)	**-0.3905**	**0.175**	**-2.2311**
Remote Fishing Camp	Absent	**-0.214**	**0.0662**	**-3.2345**
	Present	**0.214**	**0.0662**	**3.2345**
Road Access	Absent	0.1138	0.0664	1.7134
	Point Access	**-0.1597**	**0.0756**	**-2.1128**
	Bridge Access	0.0459	0.0888	0.5172
Provincial Park	Absent	0.1024	0.0571	1.7942
	Present	-0.1024	0.0571	-1.7942
Campsite Separation	0.5km	-0.1419	0.0839	-1.691
	1km	0.0423	0.0818	0.5173
	1.5km	**-0.1753**	**0.0798**	**-2.198**
	2km	**0.2749**	**0.0858**	**3.2023**
Cost of A – Cost of B	Relative Cost Linear Estimate	**-0.0107**	**0.0027**	**-3.985**
Scenic Beauty	Mean SBE Linear Estimate	-0.001	0.002	-0.31
	Maximum SBE Linear Estimate	0	0.001	-0.21
	Minimum SBE Linear Estimate	**0.002**	**0.001**	**2.34**
Campsite Utility	Maximum Utility Linear Estimate	**3.012**	**0.859**	**3.51**

Note: Significant attributes ($p<0.05$) are highlighted in bold.

Figure 4.4 Route choice parameter estimates



Overall, respondents strongly preferred the two routes presented over the alternative of not paddling. The intercept for Route B (0.86), however was somewhat higher than that of Route A (0.45). This difference indicates that all else being equal, respondents were more likely to choose the second route over the first. One possible explanation is that because of the order in which the routes were presented, the second one was simply recalled better. Additionally, the layout of maps on the web page favoured the second route, because most respondents were forced to scroll down the page to finally make their selection; Route B, presented second, would have received more screen time than Route A.

Consistent with respondents' perceptions of scenic beauty based on forest classification, a significant preference was demonstrated for southern routes over northern routes. Since southern routes contained red/white pine and hardwood, both of which were highly rated, while northern routes contained black spruce bog, rated least attractive, it is to be expected that southern routes would be preferred over northern ones.

Similarly, pristine routes were significantly preferred over disturbed routes. Interestingly, no apparent distinction was made between human related landscape disturbances (i.e. timber harvesting) and naturally occurring ones (i.e. forest fire). The overall length of shoreline over which the disturbance occurred was not significant. This counter intuitive result may be indicative that respondents did not consider the distances in the decision process. Interestingly, however, whether the disturbed scenes were adjacent or separated by two pristine scenes was significant. Respondents strongly preferred to pass only one disturbance during the simulated day of paddling. From a management perspective, it appears that minimizing the number of cut blocks encountered by a canoeist in a given day plays a more important role than the size of the blocks.

Strangely, while mean scenic beauty estimates based on reserve widths between shore and cut block followed expectations, the effect of these widths did not appear consistent in the route choice model. While reserves less than 70 meters in width had an insignificant effect on route choice, wider reserves were negatively perceived. Most favoured was a mix of reserves, namely a narrow reserve followed by a wide one. A few possible explanations for these results exist. While narrower reserve widths were negatively perceived when viewed during the rating tasks, the thumbnail images visible during the route selection task did not show the same level of detail. As has been previously shown, the visible presence of rocks was considered highly attractive. Cutting trees closer to the shoreline, while deemed unattractive from a near view perspective, does allow exposed shield to be more easily seen. In the smaller thumbnail images, the cut may not have been as prominent as the exposed rock in influencing respondents' decisions. Wider reserves lacked the visible rocks, so while the reserve width of the individual scenes was considered more attractive, the overall effect on the route as a whole was negative. Finally, the inclusion of the SBE* variables in the model may have created an interaction effect, as the minimum SBE* for the route was more likely to correlate highly with the level of disturbance. The overwhelming preference for the combination of reserve widths is likely the result of all of the above factors combined. Respondents received their exposed Canadian shield from the narrowly buffered cut block, and a reduction in the overall disturbance of the route.

Road access along the route may present a trade off between solitude and safety. While respondents prefer the absence of roads over their presence, roads that cross the waterway are preferred to those that terminate at its edge, despite the fact that a through road is likely to have more traffic than a cul-de-sac. It seems that such primary forest roads associated with major river crossings may provide a useful emergency service in case canoeists need to access outside help though hitchhiking. Cul-de-sacs are not as likely to be as well travelled, and they may be used for timber harvesting operations, and for providing access to the waters by other, mostly motorized, users. As a result, this type of road provides little potential as an emergency exit, but a great potential for unwanted intrusion.

As in the case with road access, fishing outpost camps may also involve trading off solitude and safety. The effect of a fishing outpost camp, consisting of a single cabin with at most two motorboats, along the route also ran counter to initial expectations. Given the documented conflicts between canoeists and motor boaters (e.g. Ivy *et al.* 1992), a negative relationship was expected. Instead, canoeists significantly prefer routes on which a outpost camp exists. Fishing outpost camps may not be associated with motorboat use to the extent initially assumed, or perhaps these camps have other associations that offset sharing the resource with motor boaters. For example, where there is a fishing camp, the fishing quality may be better. Fishing camps may also offer the opportunity for radio communications or evacuation in the event of an emergency situation.

The variable base map was used to differentiate the routes and provide a basis for choosing off shore or near shore images. Respondents appear to have picked up on the relationship between waterway width and photo distance, because the lake base map had a significantly high PWU if the image distance varied, but a significantly negative one when only near shore images were shown. The confined water, open water, and hourglass base maps had no significant effect on route choice, but interestingly, the fan and funnel base maps did. Respondent's showed a strong preference for the funnel map, and an aversion to the fan map. Interestingly, the two most preferred maps included a mix of open water (140m images) and confined water (15m images) with a stretch of confined water towards the end of the day. Those maps whose PWUs are negative are missing at least one of these components. One possibility for this preference is that towards the end of the day, canoeists may start looking for a campsite and the detailed views afforded by the near shore photographs were preferred for this task. Camping on more confined water may also offer more protection from the wind and increased privacy.

Campsite separation distance was found to be insignificant until campsites were 1.5km apart. This distance had a positive effect on route selection, while just half a kilometre farther produced the opposite reaction. Two contrasting factors may be affecting the PWU of this attribute. Increasing campsite distance may be associated with increased privacy; an additional 1.5 kilometres may mean the difference between hearing the neighbouring site or not. On the other hand, increasing campsite distance is also associated with extra paddling at the end of the day; two kilometres into the unknown may just be too far.

Campsite quality along the route, as measured by the maximum expected utility (see Chapter 3.8), was found to have a highly significant positive effect on route selection. Obviously, the experience at a campsite is of great importance to the overall canoeing experience.

Entering a provincial park near the end of the day had a counter intuitive effect on route choice. While the PWU was only significant at p=0.075, a provincial park had a negative effect on route selection. Two potential reasons for this relationship exist. First, camping within a provincial park may be associated with additional camping costs, regulations, and more users. While not included in the choice experiment, these factors may still have influenced respondents. Second, the effect of expectations of scenic beauty on routes containing a provincial park may have affected route choice through the scenic beauty estimate parameters.

The SBE* parameters brought into the model also affected the choice of route. In total, seven otherwise identical models were tested to examine if colinearity in the mean, minimum and maximum SBE*s affected the model's output (See Table 4.21). Regardless of which SBE* parameters were included in the model, only the minimum SBE* of the route had a significant effect on route preference. Furthermore, in early model runs, all quadratic terms also proved to be insignificant, and were consequently removed in the interests of parsimony. Note: Significant attributes (p<0.05) are highlighted in bold.

Figure 4.5 graphs out the linear functions of each of the three parameters from model one. This result contradicts the findings of Meitner (2004), whose study of site preferences in the Grand Canyon found that maximum scenic beauty drove site choice. This difference is probably a result of a fundamental difference between these two recreational opportunities. Grand Canyon National Park is well known for its unique and spectacular scenery and does not experience any human caused disturbances at the landscape level. Visitors are searching for the perfect view. Northern Ontario's forests however are largely homogenous in their make up and have some areas of very low scenic quality. While it appears that in the Grand Canyon people are in search of the best scenery in a grandiose landscape, in northern Ontario, avoiding the worst scenery influences the evaluations. This difference is important for management in that a small but unsightly cut block may spoil a canoeist's wilderness experience more than a larger one with proper visual quality management in place, such as a suitable buffer width.

The relative costs of the two routes presented in each choice set also had a significant linear effect on route selection. Despite two comments from respondents that indicated otherwise (See Appendix D), differences in the range of plus or minus $40, had an effect on route choice similar in magnitude to that of minimum scenic beauty or forest type. For example, canoeists may show no difference in preference for a route whose minimum SBE* value is less than that of another route, so long as the costs of getting there are lower. While a detailed travel cost model is beyond the scope of this report, it is important to note the influence of these costs on site selection.

The canoe route model developed takes many of the attributes examined in past studies, and demonstrates an innovative method to explore the effects of canoeists perceptions of the landscape on recreation site choice. By using landscape photographs to present the scenic context rather than abstract written descriptions, many of the limitations of traditionally structured DCEs were overcome. Furthermore, by retaining the orthogonal design in a generic model, the limitations of revealed preference models and branded choice experiments in presenting hypothetical scenarios are also dealt with.

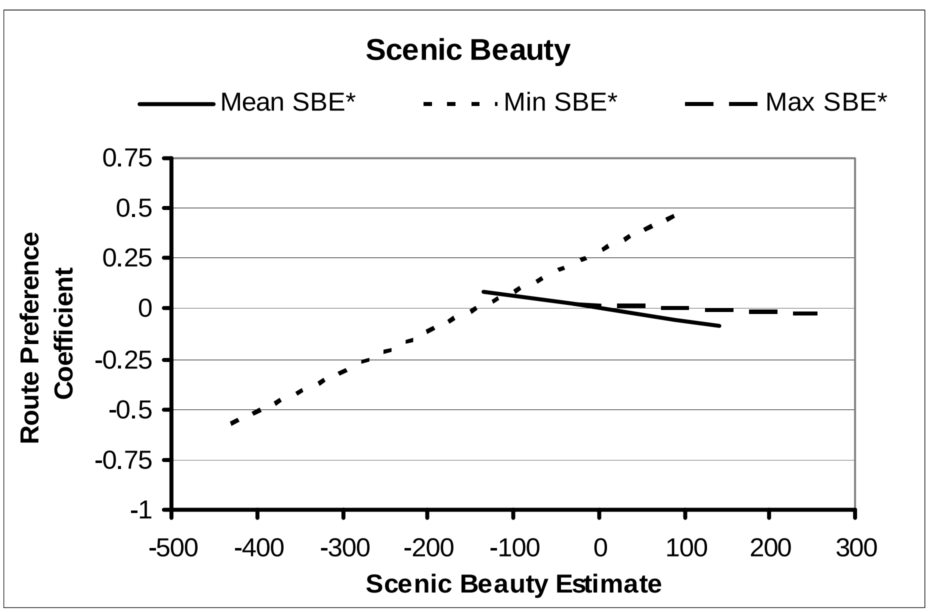
Finally, by coupling the scenic beauty estimation method with a discrete choice experiment, both the factors affecting scenic beauty and the importance of scenic beauty in a larger context were able to be simultaneously assessed.

Table 4.21 Comparison of scenic beauty estimate coefficients in route choice models (remaining attributes are kept constant).

	Attributes	coeff.	s.e.	t
Model 1	Mean SBE Linear Estimate	-0.001	0.002	-0.3094
	Maximum SBE Linear Estimate	0.000	0.001	-0.2061
	Minimum SBE Linear Estimate	**0.002**	**0.001**	**2.3441**
Model 2	Mean SBE Linear Estimate	-0.001	0.002	-0.4761
	Minimum SBE Linear Estimate	**0.002**	**0.001**	**2.5301**
Model 3	Mean SBE Linear Estimate	0.003	0.002	1.5991
	Maximum SBE Linear Estimate	-0.001	0.001	-0.9687
Model 4	Maximum SBE Linear Estimate	-0.000	0.001	-0.4167
	Minimum SBE Linear Estimate	**0.002**	**0.001**	**3.2523**
Model 5	Mean SBE Linear Estimate	0.002	0.002	1.657
Model 6	Maximum SBE Linear Estimate	0.000	0.001	0.0387
Model 7	Minimum SBE Linear Estimate	**0.002**	**0.001**	**3.2227**

Note: Significant attributes ($p<0.05$) are highlighted in bold.

Figure 4.5 Route preference coefficients of three scenic beauty measures.



Note: only the minimum SBE* has a significant slope.

CHAPTER 5 MANAGEMENT IMPLICATIONS AND CONCLUSION

The main goal of this study was to provide information about canoeists' perceptions of the Boreal landscape of northern Ontario and their effect on recreational site preferences. Besides the academically innovative approach used in the study design, the results are supposed to provide resource managers with insights into how the interests of this user group may be incorporated into future resource management decision-making. This chapter begins with an assessment of the validity of the overall model and the limitations of the study, followed by a discussion of the results described in the previous chapter focusing on implications for forest management and land use planning. Finally, suggestions are made for future research both for expansion on the findings of this study and for the application of the method to other recreation activities.

5.1 Model Validity

One drawback associated with a stated preference survey technique is that the results are difficult to validate. One method of testing the validity of a DCE model is to include a 'holdout' set (or sets) in the survey that is common across all versions of the survey, and not part of the regular orthogonal design. Out of concern for the burden on respondents, no holdout set was included in this survey. Validity, however, was assessed using other methods. First, most parameters in the model were consistent with initial expectations (face validity), and were reconcilable with the results of the scenic beauty analysis in both this study and past studies (Haider and Hunt, 2002; Hunt and Haider, 2004) (convergent validity).

In addition to face validity and convergent validity, predictive ability was also examined. While no hold out sets were included in the survey, Latent Gold Choice 3.0.6 (Vermund and Magidson, 2003) provides a tool for assessing the predictive validity of the model based on the choicesets used in the design. A prediction table allows direct comparison between model predictions for each choice set and the observed outcomes. Overall, the nested model correctly predicted 61.1% of route selection choices made by respondents for a prediction error rate of 0.389 (See Table 5.1). Because this model has been applied to all respondents, it ignores the potential for heterogeneity in the canoeing population. Unfortunately, because respondents were limited to only two choice sets, an inadequate sample of responses was collected to perform the segmentations required to adequately address this issue. As a result, the management implications of this study should be treated cautiously. Recommendations presented in the later sections are to be taken as general guidelines and not a replacement for stakeholder consultation.

Table 5.1 Prediction statistics for the route choice model.

Error Type	Model	$R^2(0)$	R^2
Squared Error	0.502	0.247	0.1069
Minus Log-likelihood	0.833	0.2417	0.0845
Absolute Error	1.0067	0.245	0.1046
Prediction Error	0.389	0.4166	0.1711

5.2 Study Limitations

While this study was successful in achieving its goals and objectives, caution must be applied when ascribing its results to the overall canoeing population. Sampling biases associated with the internet notwithstanding, the sample was drawn from two particular subsets of the canoeing community, ORCA and CCR members. As a result, it is advisable that results be used in conjunction with dialogue in stakeholder consultation processes, rather than as its replacement.

Despite the complexity of the model developed, the attributes contained therein do not encompass the full suite of factors affecting canoeists' experiences on a canoe trip. Interaction effects between attributes external to the model, and those included may result in very different preference functions. For example, a fishing outpost camp's presence may be preferred in itself, but not preferred when coupled with several motorboats on the lake.

Furthermore, because of the sequentially nested structure of the route choice model, inefficient standard errors in the campsite utility parameter are also an issue. Nevertheless, because of the inability of commercially available software to accommodate the structure of tasks completed by the respondents, this model form was considered to present a reasonable compromise.

Despite these concerns, the results of the canoe route simulations provide a wealth of useful information for resource managers. Canoeists appear to be highly affected by the scenic quality of the landscapes along waterways. Preferences for land use attributes presented in the campsite DCE have implications for visitor management along canoe routes managed by the province, while preferences derived from the overall route preference DCE have implications for land use planning and forest management.

5.3 Implications for Forest Management

Minimum SBE* emerged as one of the most important drivers of route preference. Because landscape disturbances are most likely to be considered the least attractive scenery available on a route, the implications for timber harvesting practices are considerable. Since timber harvesting, on average, detracts from scenic quality in proportion to its distance from the shoreline, care should be taken to ensure that buffering reserves of sufficient width are maintained along potential canoe routes. Given the standardisation procedure used to calculate SBE*, the regression model suggests that a reserve width of 100m is necessary, on average, to produce the mean SBE* indicative of an undisturbed site. This value is similar to that found previously (Hunt and Haider, 2004), although in the prior study scenic quality improvements were greatest between buffer widths of 30m and 60m.

Other results from the route preference model also have implications for forest management. While the overall size of any individual cut does not appear to be significant for canoeists, the distribution of cut blocks throughout a day of paddling is important. Respondents showed a strong preference for routes on which only one disturbance was encountered in a day. This preference appeared in two attributes: first in the placement of disturbed scenes along the route; and second in their preference for routes containing a mix of reserve widths. This finding suggests that where narrower reserve widths are necessary, timber harvesting activities should be concentrated in a single area, so paddlers do not encounter more than one visible cut per day.

In one respect, canoeists' preferences may be in line with timber harvesting interests. If canoeists are not averse to roadways crossing their route, forestry companies may reduce transportation costs by developing more direct routes between harvested areas and mills.

5.4 Implications for Land Use Planning

The findings presented in the last chapter suggest several implications for land use planning. Based on canoeists' evaluations of shoreline scenes, potential parks may be assessed for their attractiveness for canoeing. With the availability of detailed forest ecosystem classification and other biophysical data available in a geographic information system (GIS), the scenic beauty models may be used to assess the waterways' potential for inclusion in Ontario's system of protected areas. Of particular potential for this type of land use are areas with upland species such as red pine, white pine and jack pine and areas with the exposed rock characteristic of the Canadian Shield. Areas whose forests remain undisturbed by either fire or timber harvesting are also considered more attractive.

In addition to the selection of areas designated for canoeing, the results of the scenic beauty analysis also highlight the importance of maintaining scenic quality around these areas. As the findings indicate, canoeists are more critical of scenic beauty in locations surrounding provincial parks. This suggests that standards for scenic quality in these areas should be more stringent than in areas farther from protected areas. While maintaining buffer zones around protected areas is not a novel concept, this finding does emphasize their importance.

The canoe route preference model also provides some insights of use for land use planning. Currently, one of the criteria for Ontario's Waterway Parks is the exclusion of any water crossings within park boundaries. Findings here suggest that at least in unprotected areas, one through-roads crossing the waterway is preferable to a road stopping at the water's edge. As mentioned earlier, this result may reflect a trade-off between preferences for a wilderness ideal and safety considerations. One limitation in the assessment of this attribute as well as the remote fishing outpost camp, however, is that the frequency of occurrence is not addressed by the model. Before decisions are made into this direction, further investigations should be made, because it is most likely a controversial management issue.

5.5 Suggestions for Future Research

Multi-day wilderness trips are not limited to a single activity. This study has examined aspects related to two activities associated with a multi-day canoe trip, i.e. paddling and camping; however, additional activities may also be considered important components of this experience. Some of these activities include portaging, fishing and day hikes. Using the methods of this study as a starting point, an interesting model integrating these other aspects of a canoe trip could be developed. Additionally, descriptions of the paddling environment in this study were limited to the shoreline. Another possible direction would be to include aspects differentiating river and lake paddling, as these two environments may have a considerable effect on individuals' choice of routes.

The canoe route model was also limited by the time frame of the simulation. Each simulated route only presented a single day. While this scale was necessary for a detailed examination of forest scenery along the route, it is not the typical time frame by which canoeists typically choose a route. Additional insights may be gained by adapting a similar simulation based approach to a multi-day context.

Two of the variables, road access and fishing outpost camps, appeared to present trade-offs between safety concerns and wilderness character of the landscape. This trade-off, if it exists, may provide recreation managers with important information on the risk tolerance of wilderness canoeists and acceptable means by which risk can be managed. As such, further research into this aspect would be beneficial.

Because of the apparent interaction between scenic beauty and landscape disturbances, another interesting direction of research would be to target those attributes from this model, that have shown to be of primary importance for a more detailed discrete choice experiment. By so limiting the focus, an experimental design capable of allowing interaction effects to be modelled may allow further insights to be gained.

Reserve width, cut size and distribution are not the only variables controlled by forest management. It would be interesting to examine a wider spectrum of forest practices including variable retention, as well as the effects these practices throughout the subsequent process of forest regrowth.

Each of these suggested research directions seeks to expand on the results of this project in order to gain deeper insights into canoeists' perceptions of and preferences for aspects of northern Ontario's boreal landscape. Additional research applying the techniques used here to other topics would also be beneficial. In the field of recreation research, these methods may be applied in any context in which individuals move across the landscape, e.g. along hiking or biking trails.

5.6 Final Remarks

This study has demonstrated some of the advantages of using the internet as a survey medium, including its ability to convey complex visual and textual information in an engaging manner. As a result, trade off behaviour of a more complex nature than is typical of a traditional paper survey was able to be assessed. Furthermore, this project resulted in a great deal of information on how canoeists perceive various features of the northern Ontario landscape. In meeting the study's research objectives, insight was gained into the effect of several naturally occurring biophysical characteristics as well as that of timber harvesting reserves on canoeist's perceptions. These attitudinal values were then brought into a more general model to predict preferences for canoe routes differing in several other characteristics, allowing scenic beauty preferences to be traded off among other attributes affecting site choice. Furthermore, using a sequentially nested model, campsite attributes were nested into an overall route choice model, providing an indication of the importance of the camping aspect of canoe tripping. Beyond the specific application of the information developed in this study to land use planning in general and forest management in particular, this project also provides some insights into the trade-offs in scenery, camping, land-use sharing, and travel costs that canoeists are willing to make in order to achieve the best possible

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APPENDICES

Appendix A: Survey Cover Letter

To All Ontario Recreational Canoeing Association Members:

The ORCA Executive has authorized this message to you because its results may have long-term benefits for us as organisations, Instructors, paddlers and government decision makers. The author writes an introduction below and you can access the questionnaire from this email. Thank you for your participation.

Sincerely,
Gordon Haggert, ORCA President

While few would disagree that canoeing is an important activity in northern Ontario, the reality is that resource managers have little information about paddlers. As a long-time paddler currently doing my graduate studies at Simon Fraser University's School of Resource and Environmental Management, I'm inviting you to participate in an online survey in order to address this problem.

This study will inform decision makers about the preferences and experiences of current and potential northern Ontario paddlers. In particular, it focuses on paddlers' preferences for several natural features and human uses of the Boreal landscape.

We want to hear from you whether you are an instructor or a student, an avid paddler or a casual one. The questionnaire takes 20 to 30 minutes to complete and requires no special knowledge. You do not need to reveal your identity, and your answers will be treated confidentially in accordance with Simon Fraser University's Research Ethics Policy.

As an added incentive, if you complete the survey, you will be eligible to win one of the following prizes:
- **a $50 gift certificate to Mountain Equipment Co-op** (2 Prizes Available)
- **a free stay at Wabakimi Wilderness Eco-Lodge and B&B** (5 Prizes Available)

The survey can be reached at: **http://www.sfu.ca/~abb/canoesurvey.htm**

Your response to the survey is very important to us. Because paddlers are highly dispersed, we are unable to contact most of them directly. As a result, our sample size is quite small and your opinion really matters.

I hope that you will participate in this study. If you have any **additional comments** or **questions,** please do not hesitate to contact me or the my supervisor, Dr. Wolfgang Haider.

This research is being conducted by the School of Resource and Environmental Management at Simon Fraser University with support from the Ontario Ministry of Natural Resources, the Canadian Recreational Canoe Association and the Ontario Recreational Canoe Association. It is hoped that this information will be used to better include paddlers' perspectives when decision makers and stakeholders develop land use and forest management plans.

Happy paddling,

Ben Beardmore
School of Resource and Environmental Management

Appendix B: Survey Reminder Letter

To All Ontario Recreational Canoeing Association Members:

Thank you for your tremendous support with my study. Over 300 ORCA members have taken the survey so far, and several have also offered to circulate the link within their local clubs and to clients.

If you haven't had a chance to take the survey yet, you still have the opportunity to do so. The survey can be found at:

http://www.sfu.ca/~abb/canoesurvey.htm

The site will be active until the end of July.

Several of you have expressed interest in the results. Unfortunately, I am unable to respond to these requests, because I cannot match personal information with survey data. ORCA will receive a hardcopy of my report, and I will place a '.pdf ' copy on my department's website: http://www.rem.sfu.ca. It will be available no later than May, 2005.

If you would like to be notified when the results are posted, or if you have any **comments** or **questions** about the survey, please do not hesitate to contact me or the project's supervisor, Dr. Wolfgang Haider.

Many thanks,

Ben Beardmore
School of Resource and Environmental Management
Simon Fraser University
8888 University Drive
Burnaby, BC V5A1S6

Appendix C: The Survey Instrument

Because the survey instrument was never designed to be in print format, it has been made available digitally in two formats.

CD-ROM

The accompanying CD-ROM contains a demonstration version of the survey. Because the original survey depended on server side scripts to customize the experience to the respondent, this functionality has been omitted from the demonstration version. To view the survey from the CD-ROM requires only a web browser (Netscape 4.0+, Internet Explorer 4.0+, or similar).

Simply open the following file on the CD-ROM: **CanoeSurvey.htm**

To navigate the survey, click the button marked “Continue” at the bottom of each page.

INTERNET

The survey has also been archived at the following internet address:

http://www.canoe.rem.sfu.ca

This version of the survey is fully functional; however, it does not store any data once a session has been ended.

Appendix D: Respondents' Comments

At the end of the survey, respondents were given the opportunity to comment on the survey. These comments are presented here in alphabetical order.

All the questions on route selection and cost do not apply. We go somewhere new so we have no idea what it looks like and after spending days and $$$ just travelling to the north another $20 is absolutely immaterial.as a minimum in this section there should be another choice of "either" along side "neither".

All the scenery was attractive, i felt tempted to judge based on quality of photo, lighting and cropping rather than actual content.

Although i haven't done much tripping in the north i am planning on it in the near future especially the french river.

Are we putting a price on forests?

As with most surveys, i found it hard to make selections and felt i was contradicting myself at times, but whole-heartedly support this research. I feel there are too many motorized vehicles and cottages destroying our natural landscape which impacts not only on our sanity, but our water supply, air purity and weather patterns.

Camp sites were hard to assess - i like rocky outcrops and grassy or hard dirt for my camp site. My favourite activities while camping are swimming & playing in white-water which were not mentioned.

Campsite that are appealing to me are flat and open and easy access to water. i dont seek pristine sites in honor of leave no trace. Rocks and open areas and areas with more than one visual feature are most appealing to me.while i dont use a guide its nice to have services available as i usually stay after the trip anyway in a facility with a shower and a restaurant. Supporting the local economy is important. If logging is the economy (as it is here) so be it. Not anti logging or anti road if its keeping a family fed.

Did not canoe in the last three years due to having children

Don't know what the purpose of the survey..... But my opinion is leave crown land alone ie. Stop turning them into parks and waterways. Stringently force tree harvesting operations to do selective cutting, and to clean up and replant after they are finished with any area. Close logging roads once they are finished with them. Nothing worse then being in the middle of nowhere and hear those f$#$$% atvs.

Evaluating shore lines from these pictures i found difficult. What i really prefer you never showed white-water with fall colours. So i found it difficult to know what my referrence point was. Besides even though the scenery is important to me it is not the main reason that i go canoeing. What i most enjoy is being where few people have ever been before developing my skills in handling white-water with a fully loaded open canoe and testing my abilities to not just survice but to enjoy the wilderness with minimal equipment and supplies.

Every year it seems that there is less and less "wilderness". I take my kids with me but fear that they may have nowhere to take their kids when the time comes and that'll be a shame. Forests need to be left alone. What little we have left. The lands of ontario have been shamelessly raped by the logging industry for decades. This still continues. Now the lodge/cottage industry wants to civilize it all so they can get everyone to show up of course they can still get a manicure while they up at the lodge. Maybe the "wilderness" isn't for everyone. People should be less concerned about making the "wilderness" ready for people and be more concerned with making people ready for the "wilderness". More roads are bad. They bring more destruction to the forest. And rivers/lakes. Lets not forget them. Btw the "wilderness" is in quotes because that's what scared city folks call it. But the fact is there is little if any wilderness left. Rant off. Thanx for the opportunity to vent on this subject.

Excellent survey. Very easy to complete.

Forests are essential for everyone's health ..whether they visit the forest or not. Destroy forests and you destroy the human soul!

Found it confusing in the questions whether or not "benefits to humans" included the concept of environmental services (ecosystem functions). I suspect my preference of certain shorelines wwas affected by the scale of the photos. I thought the photos of the campsites/landings weren't very helpful i wasn't sure to what extent to rely on the photos vs. The text description. In the route comparisons the summaries did not include access or conflicts with other users. For example i chose route d for the preferred scenery but the presence of motorboats or road sounds should have been included in the summary info.

Fyi...i have not been on many "trips" per se. I have a camp on a lake very close to quetico provincial park, where i do most of my canoeing. I'm ususally by myself, and go out for a day or less. However, the plan is to do much more than this in the future - alone and with friends - in the park and in other locations in ontario. My canoe was a gift - in more than one way!

Good luck with your work! This type of work is needed :) i had a hard time picking a number for how attractive i thought a scene was. There were very few i didn't enjoy. As a trip leader for young people i feel compelled to add another comment. Some of your questions asked about how forests can add to the quality of human life. I agree strongly with this for myself personally. But additionally i have witnessed many teenagers who have become more respectful to the environment their tripmates and to themselves while on paddling trips. There is no doubt that forests have added to the quality of these people's lives.

Good survey! Glad you guys did it!

Good survey. Covered a lot of info. Didn't take too long to do and had great graphics.

Great project

Great survey im glad i took part in it...

Great survey. Please don't hesitate to contact me for more info. Sfu is my alma mater :-)

Hope this is helpful. I remember those shorelines well from many a trip with outward bound in wabakimi!

I am primarily a whitewater paddler. I would not be inclined to choose any of the trips described above.

I believe that emphasis should also be brought to bear regarding the quality of the water in our rivers and how effective are the environmental regulations as it pertains to industrial developement where water used eventually ends up in lakes and rivers that we all use.

I enjoy canoeing as an opportunity to spend quality time with my children to access pristine areas for high quality fishing and to escape for a period of solitude and contemplation. The remoteness lack of easy access by motorized vehicles and quality of the fishing forests and water is very important to me and i am willing to drive farther portage more and spend more to achieve these objectives.

I found judging the scenic pictures difficult because there were too small and somewhat divorced from context (i.e. work it took to get there- weather- sounds) my trip planning involved some things possibly not captured by survey (importance of feeling of remoteness) i think you are drawing a false dichotomy between humans and nature in some of the environmental ethics questions. Humans are a part of nature have a role in managing nature and we depend upon healthy ecosystem processes. I believe the discussion on "rights" presents a false picture of humans being completely divorced from helping to manage natural ecosystems.in some of the questions i was unsure if i was to discuss the past 3 years or my entire canoe tripping experience.i was also unsure how to count weekend whitewater paddling trips on the madawaska ottawa river etc.

I found out about it from ccr (canadian canoe routes) website. Very nicely done survey; good use of the web to measure wtp. I answered "unsure" on whether i paddle Boreal forest because i think la verendrye is just on the edge of the shaded area on your map.

I found the ratings section of the routes difficult to complete. There seemed to be very little variation between the pictures. Some were slightly more overgrown or looked marshy but it was hard to tell. Also the questions about camping were not detailed enough. For example the campsite itself is just one part of the decision making process. How late is it? What's the weather? How far have we paddled? How hungry is everyone? There are many many more but these give you an indication of what i'm talking about. Realize also that the days are much longer the farther north you go so late is relative.hope this helps.

I gladly pay to trip in algonquin back country than trip for free and put up oil leaking noisy littering uncaring motorboats.

I grew up in the bush - not "forest" - of northern ontario, and i spend much time there still. Unfortunately, the pictures on your pages are not representative of the northern ontario i know - very few bits of exposed shield, little wide open shoreline, no wind-scoured white pines. If this was my only exposure to a landscape i consider one of the very nicest in canada, i wouldn't be inclined to visit. Buggy rivers are one type of wilderness experience. Sea kayaking or near-north shield canoeing quite another.

I have been tripping in nw ontario since 1988 and am spoiled for anywhere else ! After growing up in southern ontario it takes time to develop a relationship with the boreal skyline but it is worth it ! I appreciate your efforts to raise awareness and support for this important part of canada. We need to partner with the communities in the area.

I have canoed all of my early life 14-41 but once i was lent a kayak by a grad student i haven't been in a canoe since. Kayak touring fits my lifestyle and physical abilities ie., i am now in my leisurely mode of outdoor activities - i like the creature comforts now much more than tenting. Also being very allergic to bug bites keeps me paddling in late summer, fall, winter and early spring. I have paddled extensively on both the east and west coasts of canada and in the gulf of mexico. Since i took up kayaking 21 years ago the sport has taken off. Unfortunately long trips involving portaging are more difficult with large touring singles and tandems than are canoes - thus we tend to paddle more open areas ie., east coast of georgian bay, the bruce peninsula and the thousand islands rather than the alognquin park area. However with the development of outdoor equipment many thousands more people are taking to the "wilderness" and planning is a must.

I have done mostly river travel throughout ontario and i found that many of the sample scenery and campsite pictures were more representative of lake travel. My favourite scenery and campsites are really more river oriented (i.e. a campsite by a waterfall paddling through a gorge etc). So i found myself thinking that most of the sample photos were "average" to me...

I have paddle and portaged the full length of this country, literaly inch by inch. I have seen the differences in landscape, and i have seen the similarities in the lack of environmental awarness. From quebec to bc, rivers have open pipes emptying to them, and campsites are littered. Economics seems to dictate and well represent a grave reluctancy to rectify. I am not impressed with industry, nor am i very impressed with the consideration of most northern wilderness vacationers. Good luck with this!

I hope this survey will help people see that we need gods contry to survive and live.

I kept expecting to see some pictures with hills in the background and more rock. Flat country depicted is mostly in hudson bay lowlands

I look forward to hearing about the outcome of the survey & where the info will be used!

I love ontarios lakes and forests. They are responsible for who i am today and i hope by taking this survey it help for future generations to feel the same way. I have canoed all over the country and there is no place like ontarios wilderness.

I love to paddle the great lakes and larger bodies of water so feel my answers may not be appropriate to the questions above re the canoe routes. As a sea kayaker i enjoy the scenery of rocks cliffs beaches and woods along these waters. As well i find these areas less crowded & more peaceful than some of the canoe paddling destinations.

I spent 30+ years employed with mnr in fire management so have seen a good share on ont. Forests. Now retired i spend most of my canoe & kayak time east and north of sault ... Lake superior park & north channel.

I think it's great that research is being done about the paddling population! One area that could be added to the survey in the future is portage trails, their quality and accessibility.

I think that forests are an important natural resource, however, i also believe that they need to be used in a more sustainable manner. I also think that there are many groups, such as outward bound that try to instill an appreciation for nature but do not follow sustainable practices. For example when i worked at lake superior provincial park (which is where most of my canoe experience comes from) outwardbound would regularly go over the capacity for campsites both in numbers of tents and people. Another comment...going paddling and being in the forest is not necessarily going to instill an appreciation for nature. Many people go on canoe trips and then go back to their consumptive urban lifestyles and fail to make the connection to resource degredation and urban demand for forest products. Another issue you might want to consider is that the opportuinity to go paddling only presents itself to a limited number of people in ontario. This mainly has to do with class location. To be able to afford the equipment for a canoe trip whether renting or not is rather costly. To have the leisure time to go canoeing as well as having access to a vehicle to get to a paddling location is also a luxury that not all ontarians share. It is important that paddling in pristine wilderness and the appreciation for nature that usually accompanies it be made accessable to all in a sustainable manner. Good luck with your work.

I think that i reacted to some of the scenery because of the nature of the photograph rather than the nature of the shoreline. For example i think i liked the long scenery views better than the close up pictures.

I think you reused some pictures there guys. I wonder if i rated them the same. Probably not because rating scenerey is entirely subjective and is probably affected by the pictures before and after.

I thought you should have included more questions about the enjoyment of fauna and flora. Much of the survey was focused on passing over the waters and camping little about learning about the environment.

I understand we need to harvest some of our forests for industry. I also believe that we need to keep them for nothing more than a place where we can go to enjoy their natural beauty and just because the ones we protect for their natural beauty (old growth) become more valuable to harvest for industry we should not switch them about. The province should also keep ownership of the access points to keep it affordable and available for everyone.

I work in the recreational trail sector and i would be keenly interest in the applicability of this survey to the land based world. Any further information about how this survey was started and the scope beyond wabikimi provincial park would be greatly appreciated.

I would be interested in hearing of your results. You can get in touch with me via email if you wish: [email address deleted] very interesting!

I'm a resource rec student at unbc some of your questions have a bias that will create false anwsers take a research meathods course!

I'm by no means a 'tree hugger' but i do believe that we should invest in our forests and take pride in what we are lucky to still have. Having lived in europe the thing i missed the most about home (n. Ontario) was the bush. The real bush.

In eastern ontario, the type of canoe experience is extremely variable -- one can enjoy pristine trips on crown land along the madawaska river or crowded, noisy trips at provincial parks in peak season. My canoe experience is dictated primarily by what i find time and money for... I would love to paddle northern ontario's boreal forest, but that trip will have to wait until i can manage sufficient time off work and save enough money to cover the travel costs. Until then, i slip off here and there overnight to wherever i can get to locally.

In seeing the pictures of the shoreline i realized how much i love seeing big rocks and rocky points. It makes me rethink going on a canoe trip into the north.

In the photo evaluation section i found the term attractive difficult -- the scenery may or may not appear attractive to me depending on what i was looking for at the time -- a campsite ? Birds or wildlife ?

It is about time something like this was done. Look forward to seeing the results. Please forward this survey to all canoe and like clubs.

It is becoming harder to find a river to paddle that is not being dammed polluted or sev. Logged!

It is hard to imagine the purpose of the photos as so many of them were similar. For those "trips" people would not choose using the cost as a measure. Still hard to imagine the purpose of those choices.

It is important to recognize the importance of the old growth forests and in particular the temagami old growth forests. This region is a perfect canoe/camp destination and forest management in the form of clearcutting should be stopped immediatley and there should be an almagamation of the existing provincial parks and conservation reserves and add the gaps inbetween to form a world class canoe destination.

It was fun! I hope i win the trip!

It's really hard to judge the quality of a campsite from the shore. I'm amazed so many of your campsites showed evidence of bear activity. I've never actually come acrsoss this although we did shorten one trip because of bear activity at campsites where we would have to camp.i don't think many of us risk camping with bears.

Keep up the good work

Let's end the irrational cutting of our forests !

My husband and i are beginning canoeists having camped and hiked in the boreal and elsewhere in alberta for many years. We find that now we are living in ontario (more populous) canoeing helps us get to the kind of quiet semi-wilderness and wilderness campsites we enjoy most. As we become more confident in our abilites i have no doubt we will be making more and more trips into northern ontario and quebec in order to experience the wilderness areas there.

My interpretation of forests being used to meet human needs does not pertain solely to the harvesting of concrete products but as importantly the meeting of esthetic interests. However i recognize the need for forest products but feel strongly the need for sustaining forests for the future through careful management.

My number of hours paddled per day was entered incorrectly. It should be 18 although family trips average less - 12 km

Nice questionnaire.

Old growth forests are disappearing so there should be a moratorium on logging old growth forests. If properly managed logging should only be in previously logged locations.

On some aspects i would rather have chosen general ambivalence (i.e. fishing don't do it so it doesn't apply to me - however the environment that provides for good fishing is often favourable.

One element that adds beauty to a landscape is 'variety' ... In waterfalls current islands shoreline vegetation wildlife ... And historical 'ghost' towns. Costs incurred relate only to day trips .. Access fees meals gas camping fun survey

Over the course of many canoe trips usually to the most remote places i can get to it is surprising to note that the largest source of litter and debris seems to come from hunters and fishermen. They seem to have different values about the wilderness than wilderness trippers. Seems a pity...

Please understand that lake superior is the largest lake in northern ontario and the largest freshwater lake in the world (by surface area). It is also boardered by the boreal and great lakes st lawrence forest types and is part of ontario's great lakes heritage coast initiative... Designated as a signature site for world class wilderness tourism.

Route selection photos are a bit subjective could go either way on some.

Save our forests!!!! The logging in algonquin (and elsewhere) makes me wanna puke!!!! Humans are a plague to our natural ecosystem please protect our planet!!!

Saving canada's boreal forests is the most important thing our government can do and may the most important issue for canadians this decade.

Scenery selections seemed mundane. One route had slim advantages over the other re scenery. One might rate scenics differently knowing the full range on routes beforehand. I am curious as to what all this proves how universal the conclusions can be etc.

Some pictures were difficult to see clearly. The pictures taken closer appealed to me more. But all in all, i have encountered similar shorelines and have enjoyed them.

Sounds great - many of these questions need to be placed into context as there are always trade-offs. Hard to knock the lumber industry when we live in wooden houses etc. Etc. Good luck and please let us know the results when you get them.

Thank you for getting the pictures to load so quickly.

Thanks for the interest!

Thanks for this opportunity and good luck!

Thanks! Where will the results be published?

The entire exercise of rating the routes was too subjective in questions - certainly with the intent of being objective / rating in presenting results. Maybe my value system is different but many of those criteria are not used by me in making decisions on appeal of shoreline or campsites. Sorry but i would not rely heavily on the results from this section of the survey i would however find some results interesting - i.e. Where people paddle and for how long in what areas

The few remaining 'old growth' areas are fast disappearing. These must be preserved and not sacrificed to the logging companies. Logging access roads = atvs = broken beer bottles and aluminum chairs. The forest never gets a chance to rejuvinate. Large area clear-cutting is worse!

The maps in the survey were to vague (no contour) a 1/50 depiction would be better plus wheather conditions (wind direction) would influence my camp site locations more than any other factors

The pictures seemed to look much like wabakimi where we have canoe tripped for the last couple of years. We enjoy it because of the low usage. Algonquin where we regularly tripped on weekends over 15 years ago has become very crowded and used.

The questions about how appealing a shoreline is to me were lacking in specificity... Was unsure whether this was purely an aesthetic question, whether i was looking at the shorelines from the angle of someone hoping to camp there, or with safety and access routes in mind, or how much attention i was to pay to the overall scene. Some pictures looked as though they had a healthy shoreline, but were clearcut behind, which affected my answers. A little more detail in describing what one is to base opinions on might help for more specific responses.

The survey has no appreciation for travel conditions- there is nothing about trails wind weather up and down stream travel communications relations with natives fire storms light conditions- the whole gamut of experience.

There are many areas which were not addressed here e.g. difficulty of route remoteness time of year nuber of people in party

This is an interesting master's project. I am concerned that there is too much variation between the quality of the photographs to compare decisions made about the landscapes shown. I am also concerned with the use of the word "pristine" - what does it mean? I'm sure you've thought of these things...good luck ben!

This survey was a great way to realize how people really look at this natural land. Its scary to know that if it falls into the wrong managment how delicate it really is.

Thought it was interesting you didn't ask about areas/rivers paddled...good luck!

Unusual survey - good luck quantifying such subjective experiences. Overall i generally see much nicer scenery than depicted here. Best of luck.

Use the forest resources wisely. Logging is important and can improve some areas. But perhaps the best use man can put forest to is to leave it alone. Use it for recreation with as minimal impact as possible for now. But an unharvested, natural resource available for future generation's wood products needs is perhaps the highest value it can serve. With so many places to canoe and camp, please keep ontario looking good until i have a chance to get there.

Very difficult to evaluate shore lines on a lap top computer quality of photographs very influential

Visual canoe route section too little tedious.

We used to live in n. Ontario and paddle whitewater almost exclusively now. The protection of forests and rivers goes hand in hand and i think we should be doing far more to protect the existing canoe / hiking routes while having managed sustainable forestry practices in areas lacking these features.

Well done! This survey is very interesting to complete. Sincerly good luck!!

With regards to places to camp, there are many other variables that i consider important in camp site and canoe route selection, and these variables vary with the season. Very early in the seasoon (pre-mosquito and blackfly), i look for sheltered sites, and tend to canoe rivers/moving waters. As the weather warms up and flies emerge, i tend to canoe lakes and select very open, breezy campsites. Also, i typically coonsider travel time to be more of an influencing factor than travel cost, especially since it usually involves car travel.

Wow. Someone spent a lot of time on this. Thanks for the virtual camping trips.

You mention human needs are you sure you don't mean human wants? I think some definitions may be in order for some words eg. 'Management' of forests. Perhaps the word should be caretaking. Forests do not need managing people need managing. You do not seem to recognize other forms of education beyond public schooling and university and college? There are many other forms of education. Just because one does not have a piece of paper does not mean they are uneducated. I do not believe that the shorelines shown on the routes represent all shorelines one comes across in northern ontario. There are many shorelines that have been affected and altered by human means. Many logging activities are very obvious along canoe routesas well as access roads mines and water generation projects. You mentioned in one of the questions about preferring canoe routes along private land. I believe that the land may be private but one cannot deny someone access to water routes unless the water route is landlocked by private land. I think you also miss the point that consumer demand affects the use of the forests therefore the very canoeists who use the canoe routes affect what is being done to the forests by their activities 'back home'.

You seem to stress forest use. I am of the opinion that forest resources are important for human consumption but strict management should be used to keep a buffer between harvest forests and recreational areas or important wildlife areas. Large tracts of forest should be left to their natural cycles and others for human consumption.

Your photographic illustrations of canoe routes are not very representative of the diversity of northern ontario landscapes. The so called campsites did not appear very human friendly-i found that section of the survey repetitive and tedious. It appears that you are concentrating on the boreal forest. Apart from river travel i prefer the great lakes-st. Lawrence forest for canoe tripping.

Your route scenario is doesn't really apply to a "real trip" for me. The pictuers are a bit subjective and of varying quality which could impact one's opinion of the pictures. Also the choice to stay or move to another campsite will depend on more than the factors listed. For example... Are you with a group? How is the group doing? How late is it? I would also usually research campsite prior to the actual trip.

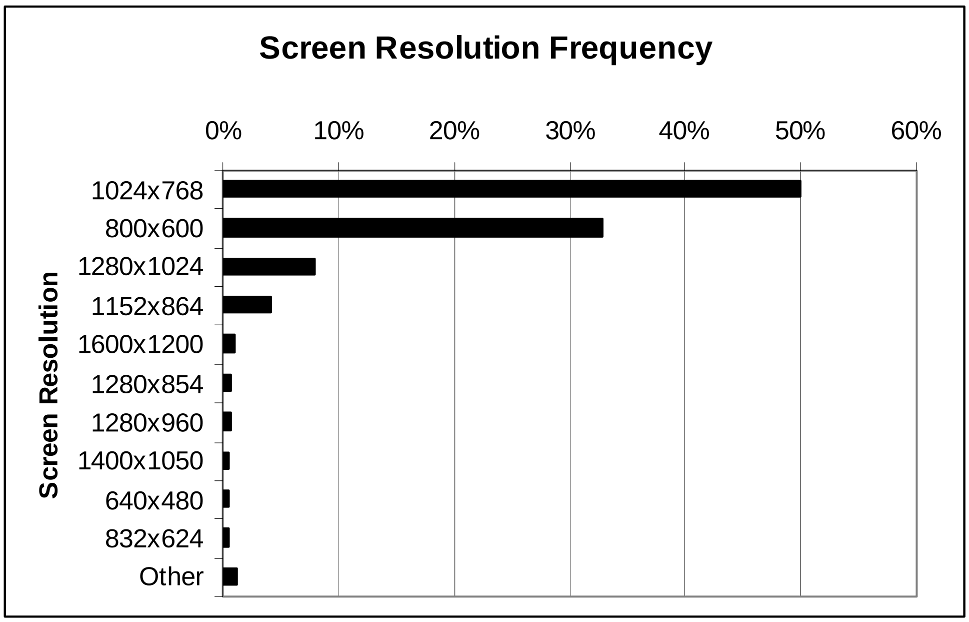
Appendix E: Additional Survey Results

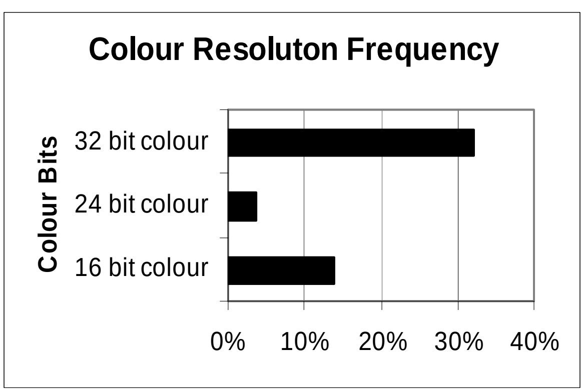
Monitor Information

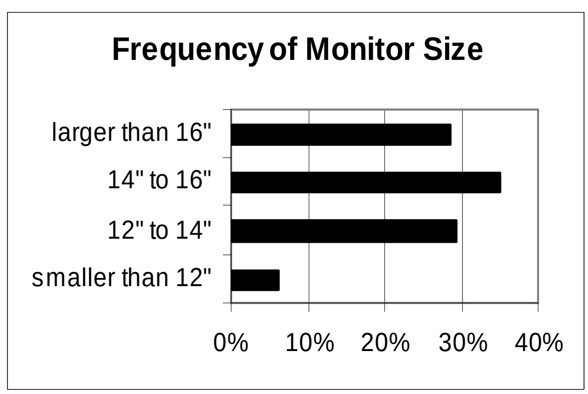
Screen Resolution	Frequency	Percent
1024x768	206	49.9%
800x600	136	32.9%
1280x1024	33	8.0%
1152x864	17	4.1%
1600x1200	4	1.0%
1280x854	3	0.7%
1280x960	3	0.7%
1400x1050	2	0.5%
640x480	2	0.5%
832x624	2	0.5%
Other	5	1.2%

Colour Resolution	Frequency	Percent
16 bit colour	114	13.9%
24 bit colour	30	3.6%
32 bit colour	265	32.2%

Monitor size	Frequency	Percent
smaller than 12"	26	6.3%
12" to 14"	121	29.3%
14" to 16"	145	35.1%
larger than 16"	118	28.6%
Unsure	3	0.7%







Canoeing Experience

Amount of Canoeing in last 3 years	N	Min.	Max.	Mean	Std. Dev.
Total days canoed in last 3 years	408	0	600	67.8	64.4
Ontario days canoed in last 3 years	407	0	400	55.1	55.3
Average distance per day (km)	341	12	32	21.6	10.1

Experience in Ontario	Frequency	Percent
Ontario's Sunset Country (region 1)	29	7.0%
North of Superior (region 2)	75	18.2%
James Bay Frontier (region 3)	66	16.0%
Algoma Country (region 4)	85	20.6%
Rainbow Country (region 5)	200	48.4%
Ontario's Near North (region 6)	266	64.4%
Lakelands (region 7)	162	39.2%
Southwestern Ontario (region 8)	131	31.7%
Eastern Ontario (region 9)	171	41.4%
None	12	2.9%

If None: Other Boreal Paddling Experience	Frequency	Percent
Newfoundland and Labrador	3	25.0%
Nova Scotia	0	0.0%
New Brunswick	4	33.3%
PEI	0	0.0%
Quebec	9	75.0%
Manitoba	0	0.0%
Sascatchewan	1	8.3%
Alberta	4	33.3%
British Columbia	3	25.0%
Yukon	3	25.0%
Northwest Territories	3	25.0%
Nunavut	1	8.3%

Number of Canoe trips in N. Ontario (regions 1-6) in last 3 years

# Trips	Frequency	Percent
1 Trip	40	9.7%
2 Trips	48	11.6%
3 Trips	72	17.4%
4 Trips	46	11.1%
5 Trips	27	6.5%
More than 5 trips	116	28.1%

Length of longest trip

Days	Frequency	Percent
1 day	8	2%
2 to 3 days	47	11%
4 to 10 days	212	51%
longer than 10 days	87	21%

Participated in any guided trips in Ontario?

	Frequency	Percent
No	271	65.6%
Yes	83	20.1%

If Yes…	Frequency	Percent
client on guided trips in Ontario	22	26.5%
guide on guided trips in Ontario	70	84.3%

Frequency of trips spending time in the following areas

Scale Options: 1=Never, 2=Some trips, 3=Most Trips, 4=All Trips

	N	Mean	Std. Dev.
National Park in Ontario	218	1.44	0.61
Provincial Park in Ontario	328	2.47	0.77
Provincial Waterway Park in Ontario	229	2.03	0.77
Provincial Conservation Area in Ontario	167	1.69	0.65
Crown Land in Ontario	299	2.49	0.78
Private Land in Ontario	177	1.54	0.64

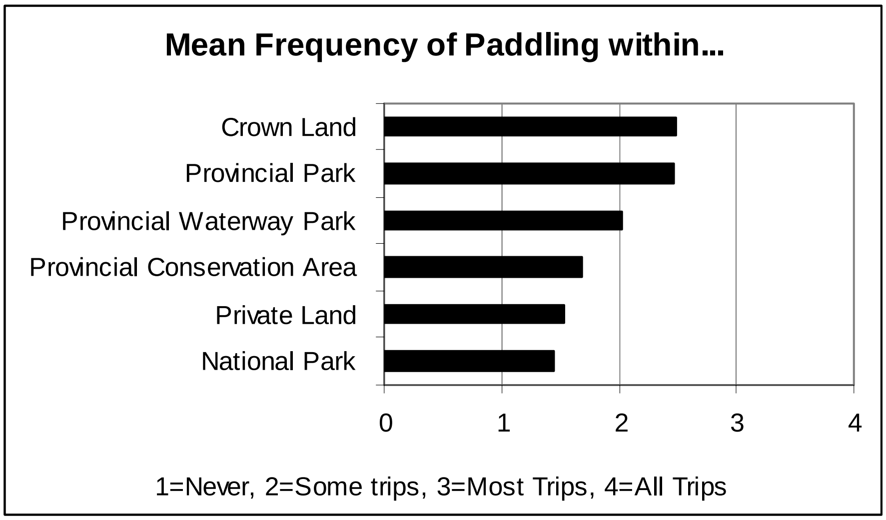
Frequency of trips spending time in the following paddling environments

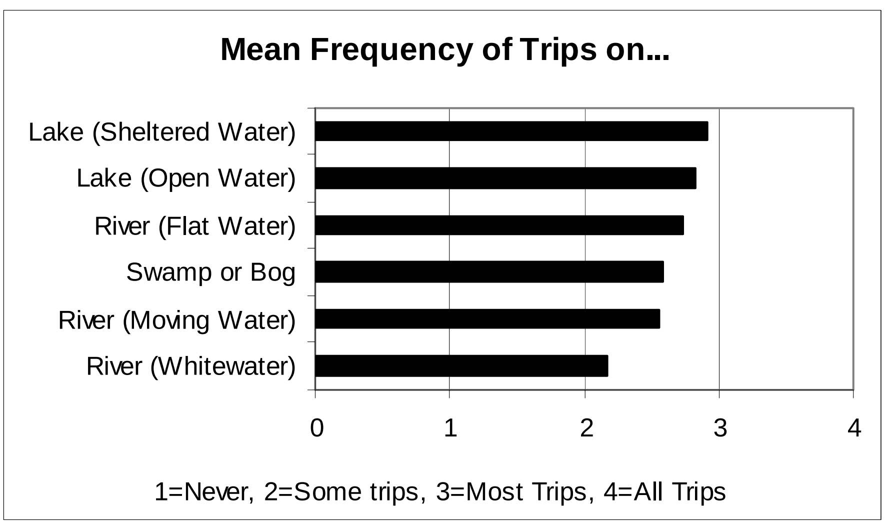
Scale Options: 1=Never, 2=Some trips, 3=Most Trips, 4=All Trips

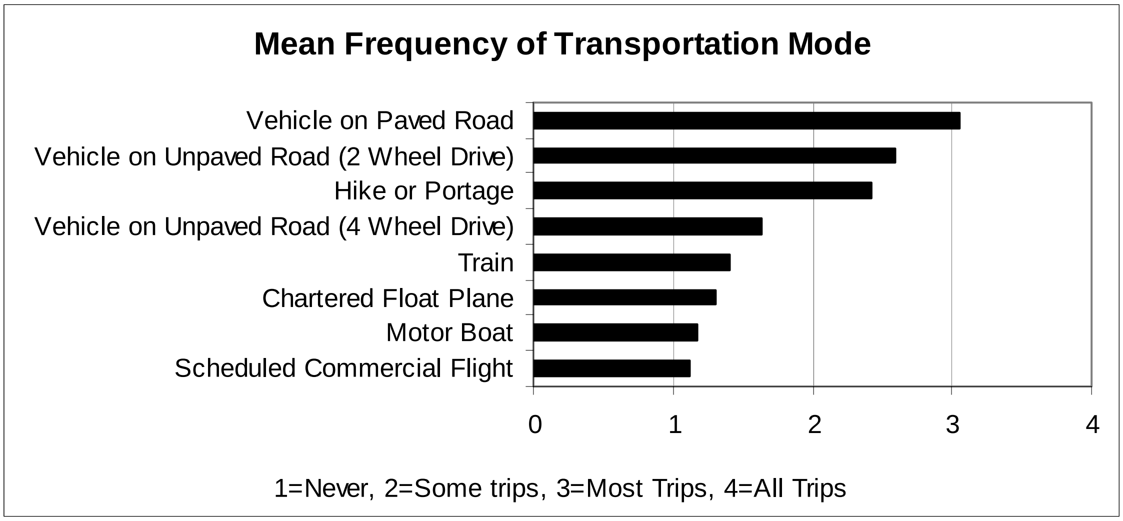
	N	Mean	Std. Dev.
Lake (Sheltered Water)	337	2.91	0.83
Lake (Open Water)	342	2.83	0.80
Swamp or Bog	315	2.58	0.86
River (Flat Water)	337	2.73	0.82
River (Moving Water)	326	2.56	0.83
River (Whitewater)	315	2.17	0.97

Frequency of transportation mode used to access trips
Scale Options: 1=Never, 2=Some trips, 3=Most Trips, 4=All Trips

	N	Mean	Std. Dev.
Scheduled Commercial Flight	243	1.12	0.46
Chartered Float Plane	259	1.31	0.62
Vehicle on Paved Road	330	3.05	0.86
Vehicle on Unpaved Road (2 Wheel Drive)	315	2.60	0.93
Vehicle on Unpaved Road (4 Wheel Drive)	245	1.64	0.83
Motor Boat	238	1.18	0.42
Train	259	1.41	0.62
Hike or Portage	283	2.42	1.08

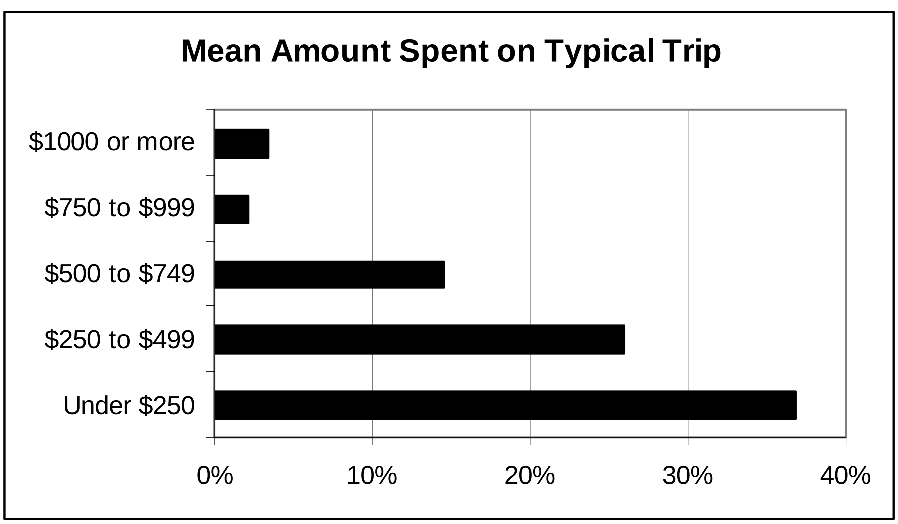






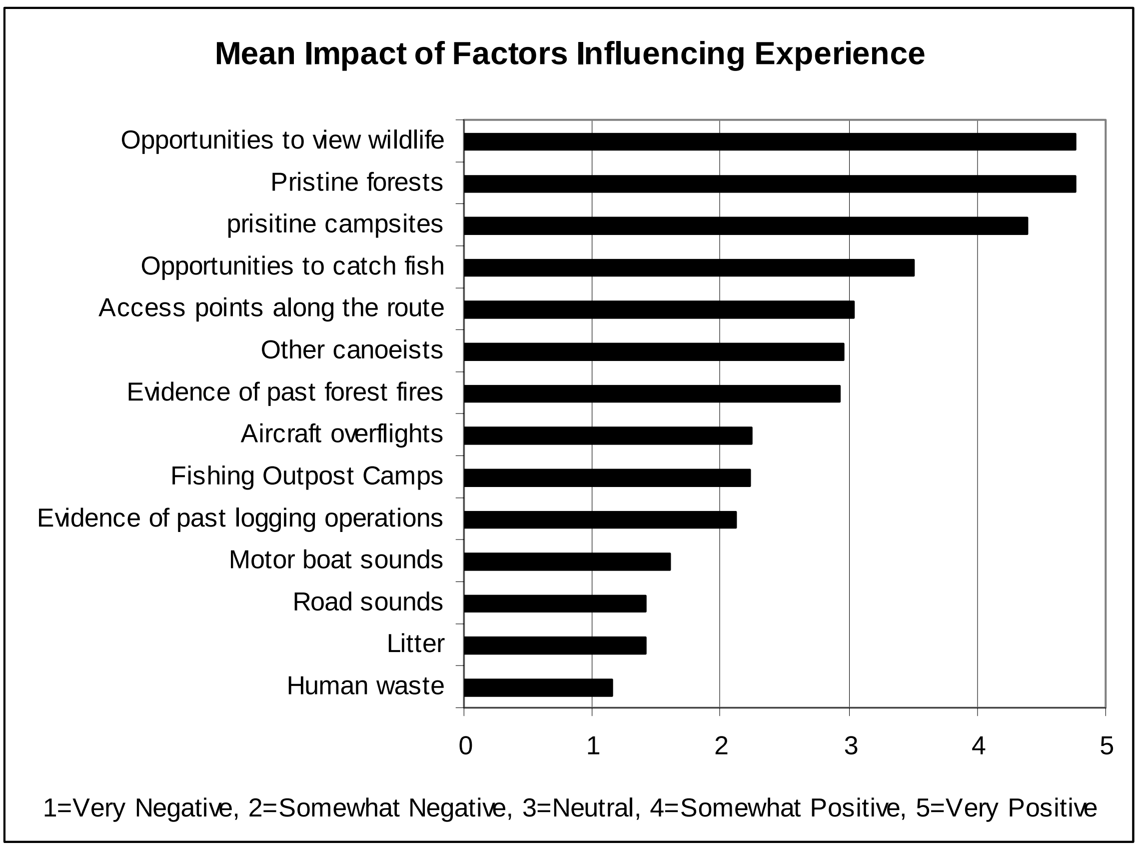
Amount spent to take a typical canoe trip in northern Ontario (per person)

	Frequency	Percent
Under $250	152	36.8%
$250 to $499	107	25.9%
$500 to $749	60	14.5%
$750 to $999	9	2.2%
$1000 or more	14	3.4%
Unsure	10	2.4%



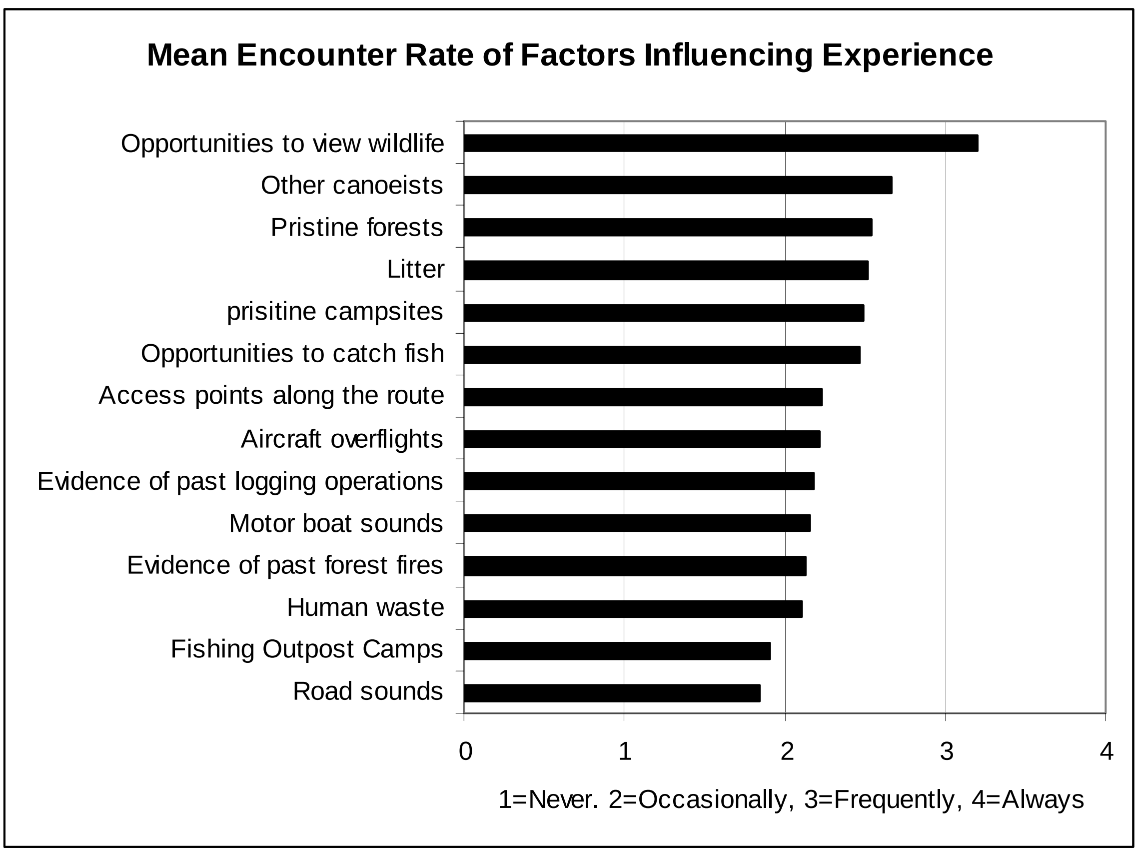
What impact does each of the following factors have on the overall quality of your experience on a canoe trip?
Scale Options: 1=Very Negative, 2=Somewhat Negative, 3=Neutral, 4=Somewhat Positive, 5=Very Positive

	N	Mean	Std. Dev.
Litter	371	1.42	0.65
Opportunities to catch fish	367	3.51	0.84
prisitine campsites	368	4.40	0.78
Motor boat sounds	372	1.60	0.59
Road sounds	368	1.42	0.63
Access points along the route	368	3.04	1.04
Evidence of past logging operations	354	2.12	0.74
Opportunities to view wildlife	371	4.77	0.52
Other canoeists	371	2.96	0.83
Fishing Outpost Camps	366	2.22	0.78
Aircraft overflights	370	2.25	0.73
Evidence of past forest fires	369	2.93	0.78
Human waste	370	1.15	0.39
Pristine forests	360	4.76	0.56



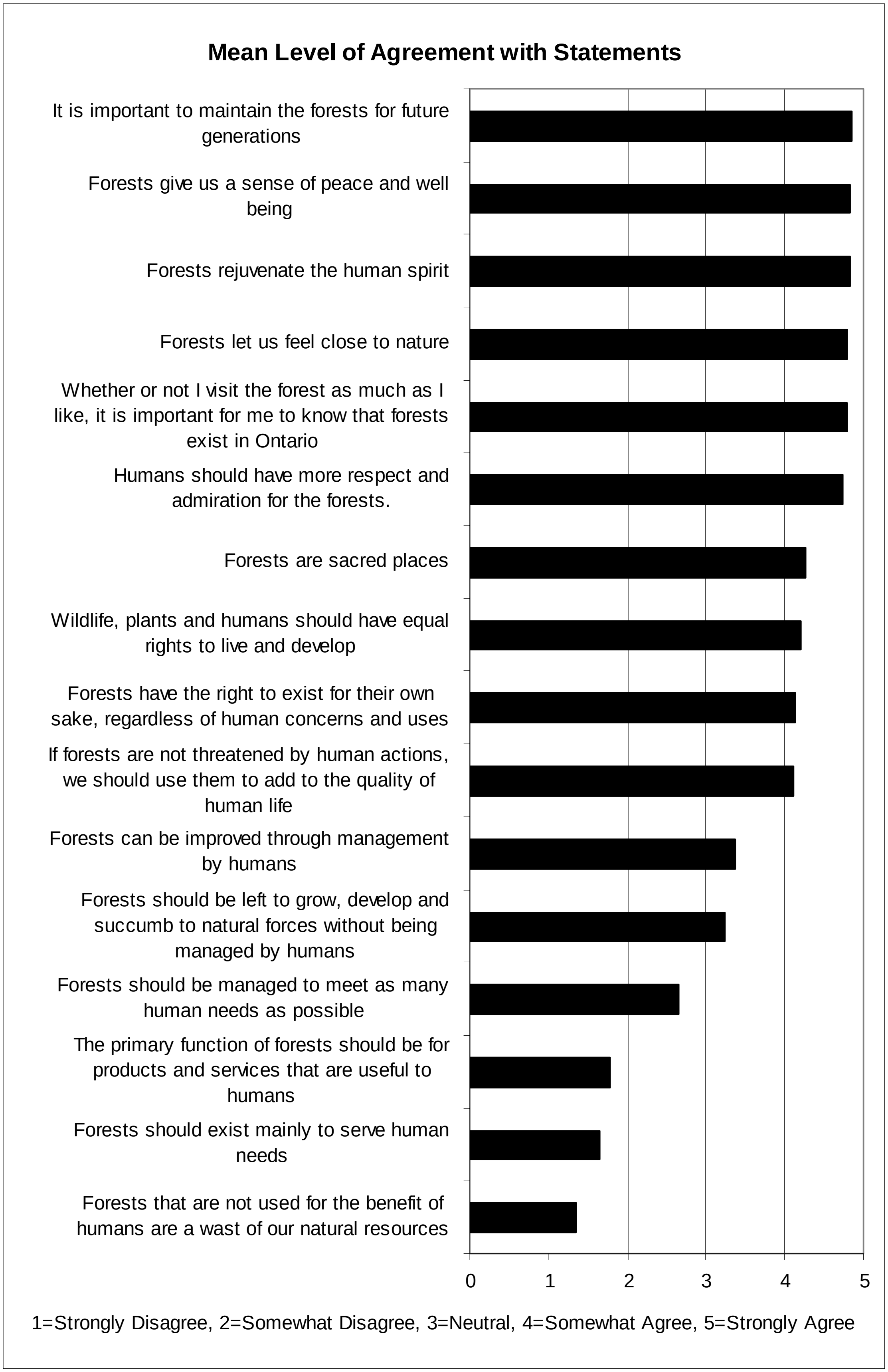
On average, how often do you encounter/experience each of the following factors on a canoe trip?
Scale Options: 1=Never. 2=Occasionally, 3=Frequently, 4=Always

	N	Mean	Std. Dev.
Litter	371	2.52	0.65
Opportunities to catch fish	310	2.47	0.91
prisitine campsites	366	2.49	0.66
Motor boat sounds	371	2.15	0.52
Road sounds	368	1.85	0.56
Access points along the route	362	2.23	0.55
Evidence of past logging operations	365	2.18	0.59
Opportunities to view wildlife	370	3.20	0.69
Other canoeists	371	2.67	0.66
Fishing Outpost Camps	354	1.91	0.59
Aircraft overflights	366	2.22	0.67
Evidence of past forest fires	366	2.13	0.57
Human waste	368	2.10	0.67
Pristine forests	365	2.54	0.74



To what extent do you agree or disagree with the following statements?
Scale Options: 1=Strongly Disagree, 2=Somewhat Disagree, 3=Neutral, 4=Somewhat Agree, 5=Strongly Agree

	N	Mean	Std. Dev.
Forests should be managed to meet as many human needs as possible	364	2.66	1.29
Whether or not I visit the forest as much as I like, it is important for me to know that forests exist in Ontario	368	4.79	0.64
The primary function of forests should be for products and services that are useful to humans	369	1.78	0.99
Forests that are not used for the benefit of humans are a wast of our natural resources	372	1.35	0.82
Forests rejuvenate the human spirit	368	4.83	0.44
Forests give us a sense of peace and well being	370	4.83	0.41
Forests are sacred places	367	4.27	0.95
Forests let us feel close to nature	370	4.8	0.44
Wildlife, plants and humans should have equal rights to live and develop	369	4.2	1.09
Forests should exist mainly to serve human needs	370	1.65	0.91
Forests should be left to grow, develop and succumb to natural forces without being managed by humans	369	3.24	1.13
It is important to maintain the forests for future generations	368	4.85	0.46
If forests are not threatened by human actions, we should use them to add to the quality of human life	353	4.11	1.03
Forests have the right to exist for their own sake, regardless of human concerns and uses	368	4.13	1.1
Forests can be improved through management by humans	362	3.37	1.12
Humans should have more respect and admiration for the forests.	369	4.73	0.56


Mean Level of Agreement with Statements
It is important to maintain the forests for future generations
Forests give us a sense of peace and well being
Forests rejuvenate the human spirit
Forests let us feel close to nature
Whether or not I visit the forest as much as I like, it is important for me to know that forests exist in Ontario
Humans should have more respect and admiration for the forests.
Forests are sacred places
Wildlife, plants and humans should have equal rights to live and develop
Forests have the right to exist for their own sake, regardless of human concerns and uses
If forests are not threatened by human actions, we should use them to add to the quality of human life
Forests can be improved through management by humans
Forests should be left to grow, develop and succumb to natural forces without being managed by humans
Forests should be managed to meet as many human needs as possible
The primary function of forests should be for products and services that are useful to humans
Forests should exist mainly to serve human needs
Forests that are not used for the benefit of humans are a wast of our natural resources
0
1
2
3
4
5
1=Strongly Disagree, 2=Somewhat Disagree, 3=Neutral, 4=Somewhat Agree, 5=Strongly Agree