DEFINING WILDERNESS QUALITY AT BACKCOUNTRY CAMPSITES IN THE HEIGHT-OF-THE-ROCKIES WILDERNESS AREA

by

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B.Sc., Simon Fraser University, 1991

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

in

THE FACULTY OF GRADUATE STUDIES

(Faculty of Forestry)

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

March 1996

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ABSTRACT

Human use is a component of the B.C. Forest Service wilderness mandate; however, recreation impacts inevitably threaten both the integrity of the natural environment and the quality of the experience. Current planning processes strive to protect the wilderness concept by defining appropriate conditions and developing specific standards that clearly outline desired social and resource settings. In order to address campsite quality in the Height-of-the-Rockies Wilderness Area, the Limits to Acceptable Change framework was chosen as a means to develop appropriate standards.

A mailback survey of wilderness users during the summer of 1994 was conducted to determine which indicators of campsite conditions best represented quality wilderness experiences. Although the development of specific standards was not justified in light of the non-representative nature of the survey sample, the results provided valuable baseline characteristics of the summer users. The data imply that visitors had a high degree of concern for most campsite impacts; overall, social parameters had a greater influence on the quality of backcountry experiences than biophysical disturbances. In addition, visitor standards of preferred and maximum acceptable conditions were restrictive in nature. Over 50% of respondents preferred no change from the pristine with respect to social and biophysical campsite impacts. Although visitor standards of acceptable conditions varied more than corresponding preferred values, the former also delineated near-pristine environments; accepted medians represented semi-primitive non-motorized wilderness settings. The available data suggest that an overall campsite index rating, in conjunction with the total number of campsites, would provide suitable indicators for future monitoring.

Examination of the results revealed both methodological and theoretical concerns with respect to the application of the acquired data. Certain discrepancies evident in reported standards, for example, questions the validity of the survey design. The

observed variation in visitor standards also raises the philosophical issue as to whether social norms exist. The above concerns do not refute the importance of visitor feedback in defining wilderness quality; however, the foundations of decision making should also be based upon ecological principles. Implications for future management and research are discussed.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENTS

First, I would like to thank my supervisory committee members which included Dr. P. J. Dooling, Dr. P. Wright, and Dr. D. Tindall. In particular, I want to especially thank Dr. Pam Wright for giving much needed guidance and direction. Second, it is necessary to acknowledge all those who contributed to this project: Dr. Peter Dooling for his useful criticisms; Dr. Ron Rutledge for initiating the project; Sarah Bunce, my summer helper and friend; Dr. J. W. Roggenbuck for his interest; and Kreg Sky and his staff for their assistance. Lastly and most importantly, I want to thank my partner, Alan Martin, for his unrelentless editing abilities and his continued support.

CHAPTER ONE

INTRODUCTION

Wilderness areas are a composite resource made up of complex, interrelated ecosystem components, such as the vegetation, soil, water, air, wildlife, and geology. In addition to the obvious benefits wilderness provides to help maintain the earth's biodiversity, the inherent naturalness of wilderness offers multiple anthropogenic values. These values include recreational, spiritual, cultural, therapeutic, aesthetic, ecological, scientific, intellectual, economic, and moral and ethical qualities (Manning 1992).

Recreation represents the most prevalent and widely recognized form of human involvement in wilderness areas. Recreational use, however, poses a threat to both the natural setting, and, if levels of visitor encounters diminish solitude or cause conflicts amongst visitor groups, use also serves as a threat to the wilderness recreational experience (Lucas 1990a). Understandably, the management of wilderness recreation is multi-dimensional and complex. Impacts to the biological and physical resources caused by recreational use, for example, affect visitor experiences; therefore, reducing these impacts should improve the wilderness experience. Yet, management strategies designed to alleviate impacts to the natural settings may negatively affect the visitor experience. Wilderness recreation management is the subject of much internal conflict, as concessions must be made between the overall wilderness experience, and ultimately the well-being of the environment.

1.1 Wilderness Recreational Experience

A wilderness recreation experience is defined as an opportunity for solitude or a primitive and unconfined type of recreational activity (Lucas 1990b). Visitors'

wilderness experiences are very personal and can be affected by a multitude of factors. The two main wilderness conditions that influence the recreational experience are the natural and social settings (Lucas 1990b).

Human impacts to the environment caused by general recreational use include those to the vegetation, soils, water, and wildlife; however, many of these impacts are inevitable, as any amount of human use will result in some degree of change to the natural environment. For example, backcountry campsites that receive low levels of use may exhibit substantial levels of alteration with respect to vegetative and soil characteristics (Cole 1982). Yet, some environmental impacts that occur are preventable; these result from specific adverse visitor behaviors, and include litter, tree damage, and the pollution of water bodies from human waste. Kuss *et al.* (1990) proposed three aspects to visitors' perceptions of resource impacts: 1) the simple recognition of environmental impacts, 2) the perceived importance of impacts relative to other aspects of the recreational setting, and 3) the evaluation of a given impact as desirable or undesirable. A few studies have examined visitors' perceptions of ecological impacts to the wilderness resource (Shelby and Shindler 1992, Shindler and Shelby 1992, Watson *et al.* 1992, Martin *et al.* 1989, Shelby *et al.* 1988a). Generally, it has been found that environmental impacts that clearly indicate the presence of other visitors (i.e.. litter, human-made structures, etc.) are of more concern to wilderness visitors than more serious environmental site impacts, such as vegetation loss and soil erosion.

Similarly, the wilderness experience is affected by a broad spectrum of human interactions that together contribute to the social setting. Solitude, visitor inter-group conflict, and visitor behavior are social conditions that may influence visitors' experiences (Lucas 1990b). Perceived crowding is the negative evaluation of certain user density levels; these judgments are influenced by characteristics of the individual visitors, of those they encounter, and of the situation or location in which encounters occur (Manning 1986, Manning 1985). Conflicts occur when the characteristics of other groups

encountered affect visitors recreational experience. There are many forms of conflict which may result from too many encounters, encounters between different recreational groups, encounters with large parties, or encounters among recreational and non-recreational groups. Visitor behavior affects recreational experiences directly or indirectly through environmental impacts. Direct behaviors that may be a problem include loud and discourteous conduct, camping too close to other parties, failing to yield to others on trails, and failing to control either packstock or dogs. Generally, it has been found that social conditions affect the wilderness recreation experience more than impacts to the natural environment (Roggenbuck *et al.* 1993, Shindler and Shelby 1992, Watson *et al.* 1992, Lucas 1990b).

Managerial conditions within wilderness areas can also have negative or positive effects on visitors' recreational experiences. For example, actions implemented to solve certain problems may negatively influence visitor experiences. Indirect management strategies, however, usually have less adverse effects on users' wilderness experiences than direct approaches, such as regulation and use restrictions (Lucas 1990b).

In summary, it is apparent that visitors' wilderness experiences are affected by a inter-related set of impacts that occur due to recreational use. Recreational use leads to changes in the natural environment, social conditions, and management actions. However, the nature and degree of impacts may vary considerably between areas. Visitors' experiences will be shaped by how they perceive and react to the variety of natural, social, and managerial conditions encountered within each wilderness area. From a management perspective, it is important to be aware of the various ecological and social impacts that occur within a wilderness area, so that quality recreational experiences can be maintained.

1.2 Wilderness Recreation Management

Wilderness recreation management is a complex topic, as management principles are aimed at preserving natural conditions while maintaining high quality recreational experiences. Since as early as the mid-1930's, there has been concern and recognition among wilderness managers that the effects of recreational overuse could jeopardize an area's wilderness qualities. In response to concerns of overuse, the carrying capacity concept was adopted from range and wildlife management to help guide recreation management in wilderness areas (Stankey *et al.* 1990). In the early 1960's, Wagar (1964) defined recreational carrying capacity as "the level of use an area can withstand while providing quality recreational experiences"; implicit in this definition was the recognition of two critical elements, quality natural environments and quality recreational experiences. Therefore, the recreational carrying capacity concept involved determination of both an ecological or biophysical capacity and a social capacity.

Research over the past thirty years has failed to develop a satisfactory procedure for applying the carrying capacity concept to wilderness recreation management. The main reason for this failure is that there is not a simple cause and effect relationship between the amount of use an area receives and subsequent impacts to the environment and visitor experience (Kuss *et al.* 1990). With respect to ecological impacts, most of the total impacts occur from light recreational use, and the season of use, frequency of use, type of users, behavior of users, and the environmental conditions are more important factors that influence total impacts than the amount of use (Cole 1990, Cole 1987). Studies of visitor satisfaction and perceived crowding models have failed to confirm the correlation between increasing density levels and negative visitor experiences (Kuss *et al.* 1990, Graefe *et al.* 1984, Manning and Ciali 1980). Wilderness recreational users employ various psychological and behavioral coping strategies, such as product shift and visitor displacement to deal with increasing use levels, and therefore, maintain quality

experiences (Shindler and Shelby 1995, Kuss *et al.* 1990, Shelby and Heberlein 1986). In addition, visitor experiences are also influenced more by the type of groups encountered, perceived biophysical impacts, timing and location of encounters, and the behavior of groups met than simply the amount of use (Kuss *et al.* 1990).

In consideration of the difficulties involved in determining recreational carrying capacities, recent frameworks such as Limits of Acceptable Change (Stankey *et al.* 1985), the Carrying Capacity Assessment Process (Shelby and Heberlein 1986), and Visitor Impact Management (Graefe *et al.* 1990) have been developed to maintain both the quality of natural settings and visitor experiences within wilderness areas. These three planning processes all rely upon defining desired wilderness conditions rather than establishing limits on use.

1.3 Limits of Acceptable Change Management Framework

The basic premise of the Limits of Acceptable Change (LAC) concept states that both ecological and social changes are natural and inevitable consequences of recreational use (Stankey *et al.* 1985). Instead of managing recreational use by limiting the number of users, which outlines the traditional recreational carrying capacity solution, the LAC approach focuses on determining how much change to the wilderness setting is acceptable. This shifts the emphasis from "how much use is too much" to "how much change is acceptable"; thereby, management focuses on appropriate or desired conditions rather than use levels (Stankey and McCool 1984).

The LAC methodology involves two separate processes: a descriptive and evaluative component. The descriptive component illustrates the relationships between specific conditions of use (i.e., type, timing, location, and environmental site conditions) and the associated ecological and social impacts that occur within a wilderness area; in other words, it describes how the recreation system works. The evaluative component is

a subjective value judgment concerning the appropriate levels of impact to the natural and social settings, and therefore, defines wilderness quality (Shelby and Heberlein 1986).

More specifically, the LAC planning framework for wilderness recreation management is based on: 1) the identification of management objectives regarding desired recreation opportunities, 2) the selection of measurable indicators which reflect ecological and social conditions important to quality wilderness experiences and natural environments, and 3) the establishment of indicator standards which define the amount of change in conditions that is acceptable (Stankey *et al.* 1985). Differences between existing indicator conditions and established standards identify whether management actions are required to uphold wilderness quality.

An important step of the LAC process is to select indicators that represent resource and social conditions. Indicators are specific impact variables that singly or in combination are selected to depict the overall condition of the area (Whittaker 1992); they define what conditions will be monitored. Numerous variables can be used to represent the wilderness setting; however, monitoring all measurable parameters is economically infeasible and unnecessary. Instead, the LAC process suggests monitoring a small number of the most important wilderness quality indicators (Watson *et al.* 1992). Choosing appropriate indicators is a difficult task, as few guidelines exist with respect to indicator selection. However, it has been recognized that desirable indicators are specific, quantifiable, sensitive to changes in resource and social conditions, integrate well with other impacts, correlate with and respond to management actions, and are of significance to wilderness users (Whittaker and Shelby 1992).

Standards represent the range of conditions for each indicator considered appropriate and acceptable for a particular wilderness area (Stankey *et al.* 1985), and therefore, define wilderness quality. Whittaker and Shelby (1992) suggest four important reasons for establishing standards: 1) to focus attention on future conditions and allow managers to be proactive; 2) to focus the managers' attention to the natural and social

conditions which create experiences, the "product" of recreation management; 3) to help articulate the management objective for the wilderness experience(s) being provided in an area; and 4) to increase the professionalism of planning efforts and help direct further management efforts. As in the case for indicators, there is little information on how standards should be developed. Whittaker and Shelby (1992) suggest that standards should be based upon consideration of managers' professional judgment, scientific research, and visitor or population surveys.

1.4 Defining Wilderness Quality- The Importance of User Surveys

Central to the issue of providing quality wilderness recreation experiences is determining how visitor-caused social and ecological impacts influence visitor satisfaction, as satisfaction is not directly related to overall use levels (Kuss *et al.* 1990). Numerous studies have shown that social and resource conditions significantly affect visitors' wilderness experiences (Roggenbuck *et al.* 1993, Shelby and Shindler 1992, Shindler and Shelby 1992, Watson *et al.* 1992, Shelby *et al.* 1988a, Whittaker and Shelby 1988); therefore, the opinions of visitors with respect to variables that influence recreational experiences are an important source of information to wilderness managers. In addition, it has been found that the views of wilderness managers are not congruent with visitors' views with respect to factors that affect the recreational experience (Martin *et al.* 1989). For example, wilderness managers tend to perceive environmental site impacts, such as vegetation loss and soil compaction as being more important than social impacts, which are of more concern to wilderness visitors. To promote visitor satisfaction, the product of the wilderness experience, managers need to investigate visitors' perceptions of resource and social conditions and how they influence experience quality.

Knowledge of impacts that influence visitors' experiences aids wilderness managers in the selection of suitable indicators. To define wilderness quality, managers need to establish appropriate levels of impact to ecological and social conditions. Research can help establish standards by identifying visitor preferences towards the acceptability or unacceptability of given impact indicators (Shelby and Shindler 1992).

Problems associated with implementation of the LAC process include the lack of information about the level of concern users have for various aspects of the wilderness setting and what conditions visitors consider acceptable (Roggenbuck *et al.* 1993). Recreation user surveys, designed to query visitor preferences, present one critical source of information used to develop indicators and indicator standards, and define wilderness quality. The selection of indicators and indicator standards, however, should not be based solely upon the premise of providing quality recreation experiences. Wilderness management should also focus upon preserving ecological integrity and natural environments. Consequently, wilderness quality should be defined to not only include dimensions of the visitor experience but also those integral to the perpetuity of ecosystem processes.

Visitor surveys are also instrumental in maintaining wilderness quality. In order to manage resource and social impacts, it is important to collect information on wilderness use and users (Roggenbuck and Lucas 1987). Knowledge of use and user characteristics can help identify causes and solutions to social and ecological impacts. As use intensity is often a poor predictor of total impact, impacts are determined more by use and user characteristics, such as group type, visitor behavior, travel methods, length of stay, use concentration, travel patterns, party size, and season and location of use than the amount of use. Once probable causes of impacts have been identified, appropriate management actions can be implemented (Kuss *et al.* 1990).

1.5 Importance of Backcountry Campsites to the Wilderness Recreation Experience

Backcountry campsites are the focus of much recreational use, and therefore, are sites where localized resource and social impacts occur. The most prevalent ecological impacts at campsites include vegetation loss, mineral soil exposure, loss of organic litter horizon, and soil compaction (Cole 1990). Litter, tree damage, camping too close to another group, campfire rings, and the presence of human or packstock waste are widespread social impacts (Lucas 1990b). Impacts resulting from recreational use at campsites spatially comprise a small percentage of the total wilderness area (usually less that 1 %), and generally do not threaten the ecological integrity of the wilderness. However, they significantly affect the quality of visitors' wilderness experiences (Martin *et al.* 1989), as visitors tend to spend more time at campsites than anywhere else in wilderness areas. Roggenbuck *et al.* (1993) examined the relative influence of various social and biophysical impacts on visitors' wilderness experiences. They found that site impacts at campsites most influenced visitors' perceptions of wilderness quality. An important aspect of wilderness recreation management, therefore, is the condition of backcountry campsites, and how site impacts affect visitors' recreational experiences.

1.6 Rationale for Height-of-the-Rockies User Study

The Height-of-the-Rockies (HOR) was designated as the British Columbia Forest Service's first wilderness area in 1989; such areas are defined as regions of land greater than 1,000 hectares that predominantly retain their natural character and in which human impact is transitory, minor, and in the long run unnoticeable (Ministry of Forests 1989). One of the management goals of this wilderness area is to provide visitors with the opportunity for wilderness experiences (Ministry of Forests 1993). As previously

mentioned, a mandate that permits recreational opportunities may pose a threat to the quality of wilderness experiences and the integrity of the natural environment.

The wilderness management plan drafted for the HOR in 1993 (Ministry of Forests 1993) identified the need to implement formal recreation management actions. The Limits to Acceptable Change (LAC) process was the wilderness planning framework chosen to guide visitor management in the area, as it provides tools to protect both the natural environment and the wilderness experience. As mentioned previously, the primary purpose of the LAC process is to determine acceptable wilderness conditions, define wilderness quality, and prescribe management actions to achieve or maintain these conditions (Stankey *et al.* 1985).

The visitor study was designed and conducted in the fall of 1994 to solicit information on visitors' perceptions, attitudes, and preferences of existing biophysical and social conditions found at backcountry campsites in the HOR. This information on visitor preferences presents one potential source for selecting indicators and developing indicator standards. In addition, the visitor survey also collected descriptive facts on recreational use in the wilderness area. This information helps to identify possible causes to ecological and social impacts that may occur within the HOR, and therefore, allows appropriate management actions to be recommended. Most importantly, the study provides a basis for future comparisons of visitor characteristics and preferences.

1.7 Study Objectives

This study focuses upon a small but significant component of the wilderness experience, the campsite condition. Two research questions are examined in this paper with respect to backcountry campsites. One problem associated with the LAC process involves selecting indicators, as there are numerous variables that could be chosen. To alleviate this issue, a few of the most salient impact indicators should be chosen to represent ecological and social conditions. The issue of indicator selection is addressed by the following research question: "What is the relative importance of specific impacts on ecological and social conditions at backcountry campsites among wilderness visitors?". Another difficulty encountered with the LAC process entails developing indicator standards. There is doubt as to whether wilderness visitors can articulate acceptable levels for indicator standards. The establishment of standards is examined by the second research question: "What are the amounts for specific impacts wilderness visitors are willing to accept at backcountry campsites before their experiences would be changed?".

In addition to the two research questions, the visitor study was designed to determine whether impact indicators and indicator standards varied between the three different management zones found within the HOR. Martin *et al.* (1989) indicated that visitors may hold different preferences for social and ecological impacts based upon location and recreation opportunities provided.

Furthermore, the visitor study also provided descriptive information on recreational use within the HOR. Specifically, data was collected on overall use, visitor, visit, and travel characteristics.

CHAPTER TWO

STUDY AREA

The HOR is located along the continental divide in the Rocky Mountains of southeastern British Columbia (Figure 1); it is situated approximately 70 kilometres east of Invermere. At the time of the study, the area was legally designated as wilderness under Section 5.1 of the *B.C. Forest Act*. The British Columbia Forest Service was responsible for the management of the area, while the operational duties were shared by both the Cranbrook and Invermere Forest Districts. Today, the HOR is a provincial park; it received this new designation in July of 1995.

With an area of 68 000 hectares, the HOR is very diverse in terms of its biophysical features. The elevation range, extending from 1300 metres above sea level in the valley bottoms to over 3000 metre summits, supports abundant alpine areas, forested tracts, river valleys, and permanent ice caps. Transitional sub-alpine meadows mixed with intermittent forests comprise just over half of the wilderness area; thirty-five per cent is closed canopy forest, while ten per cent is rock and snow. Alpine tundra, Engelmann spruce-subalpine fir, and montane spruce biogeoclimatic zones are found in the HOR. In addition, successional forests of lodgepole pine, Douglas-fir, and trembling aspen are common due to past wildfires.

Although there are no accurate estimates of backcountry use levels for the HOR, it has been suggested that the wilderness area receives approximately four hundred recreation visitors per year with most visits occurring from June to November (Kreg Sky, pers. comm.). There are ten trailheads that provide access into the area (Figure 2); however, not all of these are marked. The primary means of travel within the HOR are by foot and horse; the use of motor-vehicles is prohibited. The main recreational activities are presently hiking, hunting, fishing, horseback riding, wildlife viewing, and

mountaineering. Recreational use is concentrated along river corridors and certain alpine lakes in the area where the trails and backcountry campsites are located (Palliser and Middle White Rivers; and Ralph, Queen Mary and Connor Lakes) (Figure 2).

As part of the management plan drafted in 1993 (Ministry of Forests 1993), the HOR was subdivided into three management zones based upon the spectrum of recreation opportunities, zone I being the most primitive (Figure 3). Zone II and III provide semi-primitive non-motorized recreational settings, with the latter being less restrictive with respect to campsite and trail development.

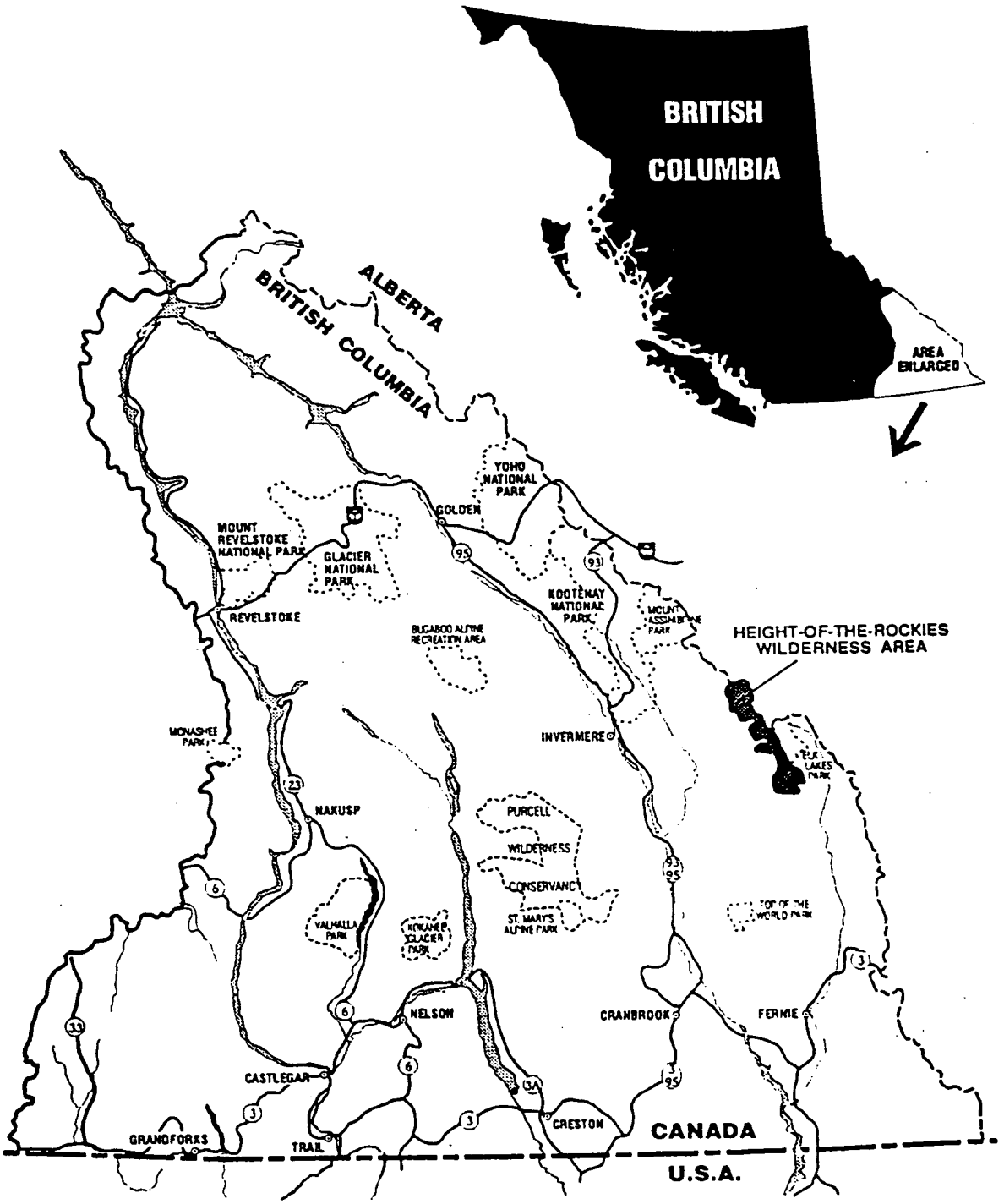

Figure 1. Location of Height-of-the-Rockies Wilderness Area (Ministry of Forests 1993).

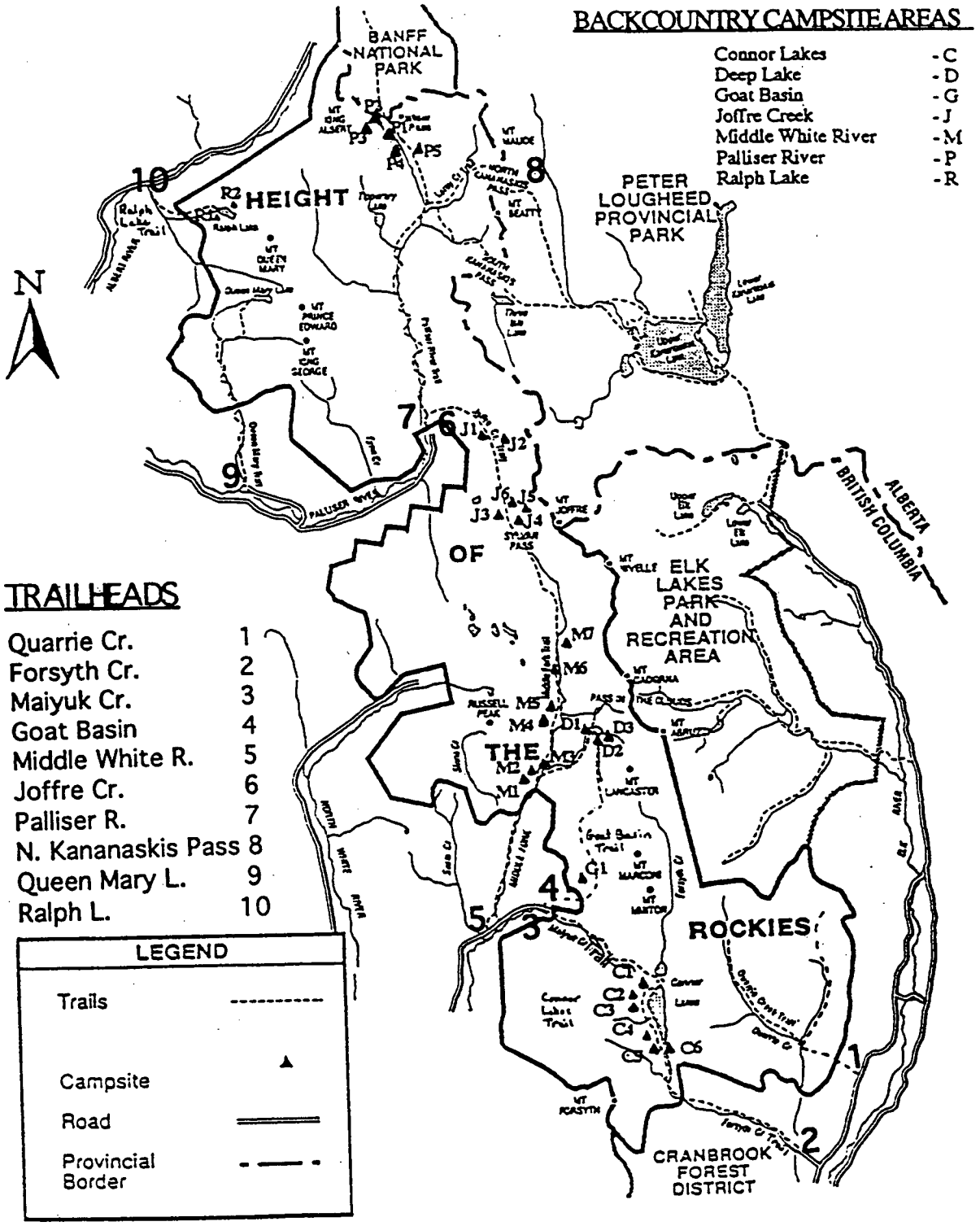

Figure 2. Recreational features of the Height-of-the-Rockies Wilderness Area (Ministry of Forests 1993).

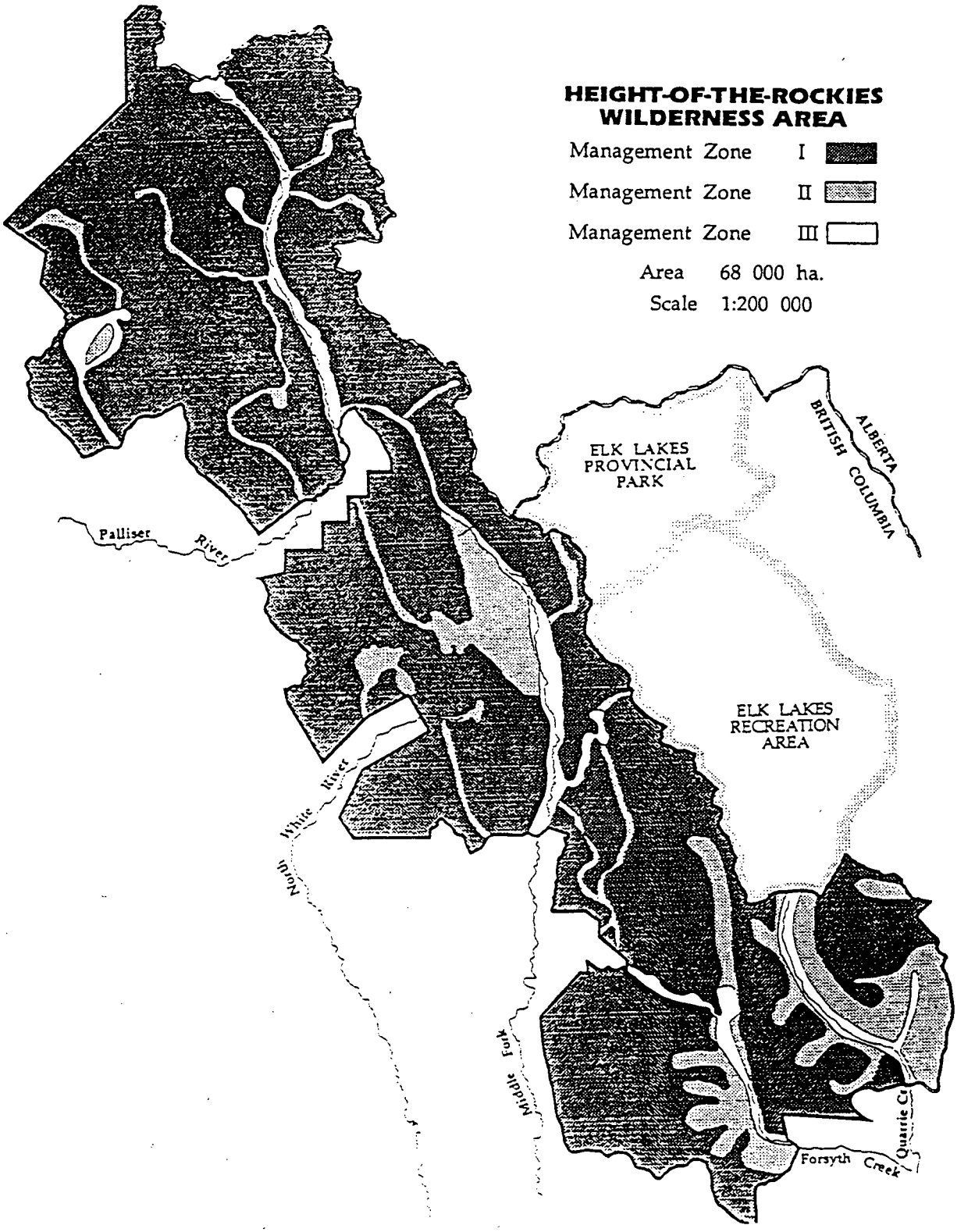

Figure 3. Management zones found within the Height-of-the-Rockies Wilderness Area (Ministry of Forests 1993).

CHAPTER THREE

SURVEY METHODOLOGY

3.1 Introduction

To help define wilderness quality within the HOR, data were collected from a survey of visitors to the area during the summer of 1994. People were queried about their perceptions of current backcountry campsite conditions, preferred social and biophysical conditions, acceptability of certain impact levels, and concern for various social and biophysical impacts at campsites. In addition, visitors were asked questions with regard to demographic, trip, and travel characteristics. The visitor survey design, administration, and analysis procedures are presented below.

3.2 Survey Population

The survey population of recreationists included adults, 18 years and older, that visited the HOR during the period of July 6 to September 30, 1994. An estimated total visitor population for this sampling period is approximately 300 users; however, the absolute numbers of various user groups to the area, and thus, their respective proportions are unknown.

3.3 Source of Survey Sample

Prior to this study, no information on previous use levels or proportions of various recreation user groups to the HOR had been gathered. Therefore, the characteristics of

the survey population were unknown, and consequently, an initial sampling design protocol could not be predetermined for the survey population.

Voluntary registration boxes were set up at the seven major trailheads leading into the wilderness area (Figure 4) after the first weekend in July of 1994 to provide information on overall recreational use, the sub-populations of user groups, and their relative proportions in the area; further, the boxes were intended to provide a source of names and addresses from which a representative survey sample was to be drawn. On each box, a sign was posted that explained the nature of the study and asked each member of the party over the age of 18 to register (see Appendix I and II).

Hiker and horse parties are the primary user groups to the HOR during the summer months. Although few parties were viewed entering the area, several registration forms were collected from the registration boxes indicating groups were visiting the area. In total, seventy-seven names and addresses were obtained from the seven registration boxes during the summer months.

The fall period was characterized by very low use levels of predominantly hunting parties. Of the few hunter groups to visit during this period during the month of September, only two names and addresses were collected from the registration stations.

Registration information was also gathered from parties met during field trips into the wilderness area during the summer and fall seasons. An additional twenty-two addresses were gathered from this source, twelve during the summer months and ten during the fall.

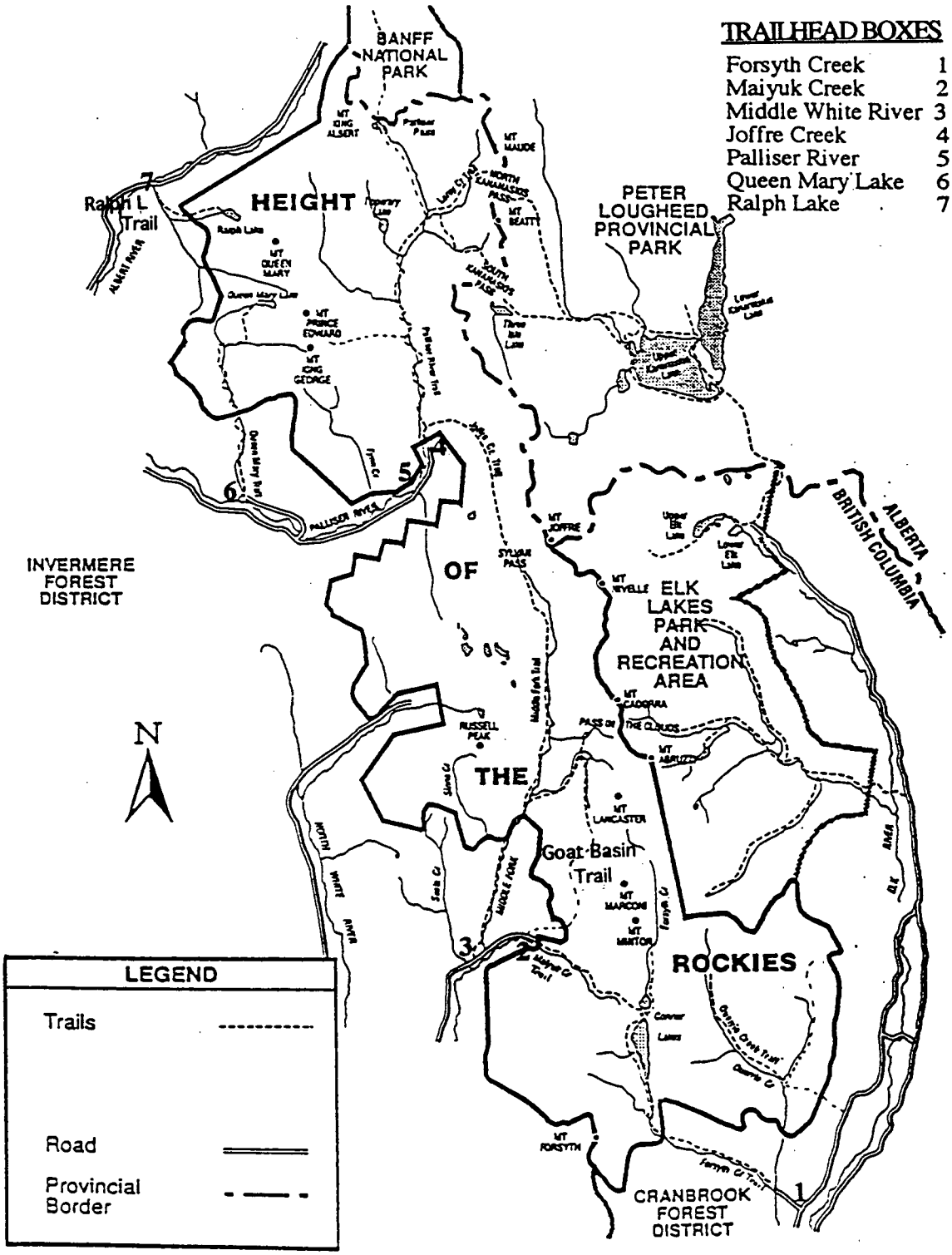

Figure 4. Location of trailhead self-registration boxes within the Height-of-the-Rockies Wilderness Area (Ministry of Forests 1993).

3.4 Survey Sample

A mailing list of 101 names and addresses was collected from the above two sources during the sample period. As a result of the small sample size, and the lack of reliable information with respect to the proportion of different user groups, all the names collected were included in the survey sample. The representativeness of the survey sample of visitors to the HOR, however, warrants close scrutiny, as registration data collected from voluntary trailhead boxes tends to provide a biased estimate of the visitor population. It has been well documented that horse and hiker groups register at substantially lower rates than hikers (Roggenbuck and Lucas 1987). There is also a propensity for only certain and not all members of each group to register. Furthermore, the composition of the visitor population could not be accurately estimated, as too few parties were observed to determine compliance rates for the different user groups. Consequently, including all registration information undoubtedly introduces significant bias into the survey sample. The limitations of the survey sample are further explored in the discussion.

3.5 Survey Instrument

The survey instrument used in this study was a mail-back questionnaire. The visitor survey was pre-tested on groups met in the wilderness area and was reviewed by several recreation survey specialists. No significant revisions were made to the questionnaire as a result of the above two examinations.

The questionnaire was designed to solicit information on visit and visitor characteristics, and preferences of campsite conditions. It consisted of four parts: part I contained ten questions on the visitors' most recent recreation visit to the HOR; part II concerned their respective travel routes; part III assessed visitors' perceptions and

preferences of existing conditions and acceptable levels of biophysical and social impacts at backcountry campsites; and part IV contained questions with regard to visitor demography. An example of the visitor survey is presented in Appendix III.

For all items included in the 1994 HOR recreation questionnaire, a sample of survey questions was reviewed and previous questions were adopted when deemed appropriate. Although there may have been differences between the original and the survey questions with regard to the wording or response format, the conceptual frameworks were the same.

The questions in part I, II, and IV were developed to gather information on visit, travel, and visitor characteristics. As a result, the format of these questions was adopted from previous studies, so that the database on existing knowledge of use and user characteristics could be expanded. As above, the questions that assessed visitors' perceptions of existing conditions in part III were copied from former surveys. Few studies (Roggenbuck *et al.* 1993, Whittaker 1992), however, have addressed the selection of indicators through visitor surveys. In addition, these studies have used different question formats. As a result, the structure used for this question in part III was similar to those used in these previous studies except for the wording. It asked respondents how important each of 13 campsite indicators were in determining the quality of their wilderness experience. Conversely, numerous studies (Roggenbuck *et al.* 1993, Shelby and Shindler 1992, Roggenbuck *et al.* 1991, Whittaker and Shelby 1988, Shelby *et al.* 1988, Shelby 1981) have attempted to measure standards for backcountry settings, and as a result, alternative formats have been developed. The question pertaining to normative evaluations in the survey was similar to that used by Roggenbuck *et al.* (1993) except for differences in question wording and response format.

3.6 Survey Administration

The Total Design Method, developed by Dillman (1978), was used to administer the user survey. The initial mailing, consisting of an introductory letter (Appendix IV), the questionnaire (Appendix III), and a stamped self-addressed return envelope, was conducted October 3, 1994. The first mailing was followed one week later with a reminder letter (Appendix V) thanking those who had returned the survey and encouraging those who had not, to do so. Four and six weeks after the initial mailing, two follow-up mailings were sent to people who had not yet responded (Appendix VI); these included a second cover letter, questionnaire, and a stamped self-addressed return envelope. Of the 101 surveys mailed to HOR visitors, four were not deliverable. A total of eighty-three usable questionnaires were returned, resulting in an overall response rate of 86.5 %. Seventy-three of the eighty-nine summer survey sample (82.0 %), and ten of the twelve fall survey sample (83.3 %) returned the visitor questionnaire. Because the response rates exceeded 80 %, checking for a potential non-response bias was not required (McCool *et al.* 1990).

3.7 Data Analysis

The returned questionnaires were coded and the resulting data entered into a database, which was translated into a statistical package for analysis (SYSTAT, Version 5.2). Analyses were performed separately for the summer and fall user groups. However, since no reliable information was gathered on the respective sub-populations and their relative proportions for either season, calculations were performed on the group as a whole for both the fall and summer survey samples. These two groups are characterized primarily by their principal recreation activity. The fall was represented by a predominantly hunter-based group. Conversely, hikers and horse parties dominated the

summer survey sample, as restrictions in effect during this period precluded hunting activities. Descriptive statistics were performed on the data gathered from the fall and summer respondents; however, due to the very low sample number for fall visitors and the lack of representativeness, only the results for the summer survey sample are presented in the next chapter.

3.8 Backcountry Campsite Monitoring

In addition to the survey of wilderness users to the HOR, the current conditions of backcountry campsites were also assessed in the summer of 1994. This information is included, as comparisons are made in the discussion between visitors' perceptions of biophysical parameters at campsites and actual ecological conditions.

The Rapid Estimation Procedure (REP) developed by Cole (1989) was used to estimate impact on the ecological condition of campsites as a result of backcountry recreational use. The method utilizes both numerical estimates and measurements in the assessment of the respective impact parameters. For example, vegetation loss and mineral soil exposure were estimated from qualitative measurements, while numbers of damaged trees were counted. Each impact parameter was assigned an ordinal ranking (a rating of 1, 2, or 3) depending on the degree of impact. The ordinal rankings for the respective impact parameters were then weighted according to their relative importance, their products summed, and the total used to assign an overall ranking of campsite impact. In addition, a comparison site was identified for each campsite monitored. Differences between the campsite and its comparison site with respect to the various impact parameters provided information on how much change to the natural condition had occurred. The results of the backcountry campsite monitoring are presented in Appendix VII.

CHAPTER FOUR

SURVEY RESULTS

4.1 Introduction

This chapter presents the results from the 1994 HOR visitor survey. Visitor and visit characteristics are discussed; however, emphasis is given to the survey findings that attempt to select ecological and social impact indicators and to develop associated indicator standards for wilderness campsites. Results are only displayed for the summer survey sample.

4.2 Visitor and Visit Characteristics of the Summer Survey Sample

This section examines characteristics of visitors, their motivations for visiting the area, and characteristics of their trips into the HOR.

4.2.1 Visitor Characteristics

The visitor characteristics presented in this section include the gender, age, education level, origin, and place of residence for the summer respondents, as well as, their motivations for visiting the HOR.

4.2.1.1 Gender

In accordance with previous visitor studies (Roggenbuck and Lucas 1987), the majority of summer users to the HOR were male. Males represented 78 % of summer users, while 22 % were female.

4.2.1.2 Age

The age group distribution of visitors is shown in Table 1. Ages ranged from 18 to 72 years, and the largest proportions of respondents were between 36 - 45 years (33 %) and 46 - 55 (23 %) years of age. The mean age was 41. The composition of ages found in the HOR is older than trends determined from wilderness areas in the United States (Roggenbuck and Lucas 1987).

Table 1: Age groups and mean age of Height-of-the-Rockies summer respondents, 1994.

Age Groups (years)	Percent (n=73) *
18 - 25	11.0
26 - 35	19.2
36 - 45	32.9
46 - 55	23.3
Over 55	13.7

* Column does not add to 100 % due to rounding errors.

Mean Age (years) (n=73)	Standard Deviation	Range
41.6	12.5	18.0 - 72.0

4.2.1.3 Education Level

Visitors to the area exhibited relatively higher education levels (Table 2) than the general population. Over 78 % had completed high school, 61 % had completed a university, technical, or college program, and 15 % of visitors held post-graduate degrees. This characteristic of a high schooling level is consistent with other wilderness area user studies (Watson *et al.* 1992).

Table 2: Level of education for Height-of-the-Rockies summer respondents, 1994.

Highest Level of Education	**Percent (n=72[1])**
Grade school (1 - 7)	2.8
High school (8 - 13)	19.4
Some college / university	16.7
College / technical school diploma	25.0
Completed university	20.8
Post-graduate	15.3

1 One respondent did not answer the question.

4.2.1.4 Origin

British Columbia residents were the predominant visitor group to the area (75 %); the remaining 25 % were primarily from Alberta (Table 3). Seventy-eight percent of the summer respondents lived within a 200 km radius of the HOR (Table 4), while 14 % lived more than 500 km away from the area.

Table 3: Origin of Height-of-the-Rockies summer respondents, 1994.

Place of Origin	**Percent (n=73) ***
British Columbia	75.3
Alberta	20.5
United States	2.7
Ontario	1.4

* Column does not add to 100 % due to rounding errors.

Table 4: Distance from summer respondents' present place of residence to Height-of-the-Rockies Wilderness Area, 1994.

Distance (km)	Percent (n=73)
< 100	35.6
100 - 200	42.5
201 - 500	8.2
> 500	13.7

4.2.1.5 Residence

Twenty-three percent of the summer visitor sample were from rural areas; the other 77 % were urban visitors (Table 5). Roggenbuck and Lucas (1987) demonstrated in their review of visitor studies, that most wilderness users are urbanites; however, they attribute this to the consequence of a predominantly urban population. The majority of urban visitors to the HOR (57 %) were from a town with a population between 1,000 to 9,999 people. Of city dwellers, most visitors lived in a city with a population greater than 250,000 residents (primarily Calgary, Alberta).

Table 5: Type and size of present residence of Height-of-the-Rockies summer respondents, 1994.

Present Residence	Percent (n=73)
Farm	11.0
Rural non-farm	12.3
Town (< 1 000)	2.7
Town (1 000 - 9 999)	43.8
City (10 000 - 99 999)	9.6
City (100 000 - 249 999)	1.4
City (> 250 000)	19.2

4.2.1.6 Previous Visitation

Previous visitation to the HOR by the summer respondents is shown in Table 6. In 1994, 30 % of the summer visitor sample reported that this was their first visit to the area. Of respondents that had already been to the area, nearly half (43 %) had done so less than five years ago. The results, however, also indicate a record of historical repeated use, as the median number of previous visits was five and several first time visits (27 %) had occurred over fifteen years ago.

Table 6: Previous experience of Height-of-the-Rockies summer respondents, 1994.

Experience Level	Percent (n=73) *
First visit to Height-of-the-Rockies	30.1
Previous visits to Height-of-the-Rockies	69.9
Year of first visit: (n=49[1])	
Before 1970	8.2
1970 - 1979	18.4
1980 - 1989	30.6
1990 - 1994	42.9

* Column does not add to 100 % due to rounding errors.
1 Two respondents did not indicate the number of previous visits.

Median Number of Previous Visits (n=49)	Minimum Number of Previous Visits	Maximum Number of Previous Visits
5.0	1.0	250.0

4.2.1.7 Reasons for Visiting the Height-of-the-Rockies

Respondents were asked to indicate the importance of eighteen listed items to their visit to the area. Visitors selected one of six possible answers ranging from "Not at all Important" to "Extremely Important"; the results are presented in Table 7. The items listed were hypothesized to be important to wilderness visitors. Understanding what motivates people to visit an area helps managers to protect the wilderness values that attract visitors (McCool *et al.* 1990).

The four most important reasons for visiting the HOR were to view scenery, to be in the wilderness, to be close to nature, and to get away from people. Other motives that were of extreme importance to over fifty percent of the visitors were to take a break, to observe wildlife, for solitude, and for adventure. The three least important reasons reported were to meet new people, to hunt, and to see cultural sites. The absence of hunter responses in the summer survey sample and the lack of available information on

cultural features to visitors explains the low importance given to these two items. The reasons respondents stated for visiting the HOR reflects values that are associated with wilderness, however, these can also be provided by other non-wilderness recreational settings.

Table 7: Reasons for visiting the backcountry by Height-of-the-Rockies summer respondents, 1994.

Reasons[1]	**Extremely to Very Important** % *	**Moderately to Slightly Important** % *	**Not at all Important** % *
To view scenery (n=70)	85.7	14.3	0.0
To be in wilderness (n=70)	81.4	17.1	1.4
To be close to nature (n=69)	78.3	21.7	0.0
To get away from people (n=70)	64.3	25.7	10.0
To take a break (n=68)	58.8	23.5	17.6
For solitude (n=69)	55.1	27.5	17.4
To observe wildlife (n=70)	51.4	40.0	8.6
For adventure (n=71)	50.7	42.3	7.0
For excitement (n=68)	44.1	44.1	11.8

* Rows may not add to 100 % due to rounding errors.

1 For a reason, (73 -n) indicates the number of respondents that did not answer the question.

Table 7: Continued.

Reasons	Extremely to Very Important % *	Moderately to Slightly Important % *	Not at all Important % *
To be physically challenged (n=69)	42.0	46.4	11.6
To be with friends (n=68)	35.3	32.4	32.4
To be with family (n=66)	33.3	19.7	47.0
To fish (n=70)	27.1	44.3	28.6
To learn about nature (n=70)	20.0	60.0	20.0
To develop outdoor skills (n=67)	19.4	61.2	19.4
To hunt (n=65)	9.2	4.6	86.1
To see cultural sites (n=68)	8.8	39.7	51.5
To meet new people (n=69)	0.0	14.5	85.5

* Rows may not add to 100 % due to rounding errors.

1 For a reason, (73 -n) indicates the number of respondents that did not answer the question.

4.2.2 Visit Characteristics

This section examines the timing, length, group size, group type, activities participated in, and the primary mode of transportation of the sample of summer visits to the HOR.

4.2.2.1 Timing of Visit

Of summer visits to the HOR (Table 8), most (66 %) took place in August due to hazardous water levels in the area during early summer months.

Table 8: Date of most recent visit by Height-of-the-Rockies summer respondents, 1994.

Month of Visit	Percent (n=71[1]) *
June	1.9
July	32.0
August	66.0

* Column does not add to 100 % due to rounding errors.
1 Two respondents did not answer the question.

4.2.2.2 Length of Visit

The length of visit to the area for the summer respondents ranged from a day trip to a nine day trip; the average length was three days (Table 9). Twenty-two percent were day users, 51 % stayed 2 or 3 days, 20 % stayed 4 or 5 days, and 7 % stayed more than six days. The predominance of overnight visits is contrary to findings from past studies of wilderness areas conducted in the United States (Roggenbuck and Lucas 1987); they found that day trips formed the majority.

Table 9: Length of most recent visit by Height-of-the-Rockies summer respondents, 1994.

Length of Visit (days)	Percent (n=73) *
One, not overnight	21.7
Two or Three	50.7
Four or Five	20.3
Six or Seven	4.3
Eight to Ten	2.9

* Column does not add to 100 % due to rounding errors.

Median Length of Visit (n=73) (days)	Minimum Length of Visit (days)	Maximum Length of Visit (days)
3.0	1.0	9.0

4.2.2.3 Group Type

Summer visitors to the HOR primarily (36 %) took trips with their friends (Table 10). There was also a high proportion of family groups (29 %), and family and friend groups (15 %). A small number (8 %) made solo trips into the area. The findings are similar to a wilderness user trend study conducted by Roggenbuck *et al.* (1987).

Table 10: Group type of Height-of-the-Rockies summer respondents, 1994.

Group Type	Percent (n=72[1])
Alone	8.3
Friends	36.1
Family	29.2
Family and friends	15.3
Club or organized group	6.9
Work / Research	4.2

[1] One respondent did not answer the question.

4.2.2.4 Group Size

The average group size of summer visitors to the area was three people with values ranging from 1 to 10 persons (Table 11). Ten percent reported one, 36 % reported two, 19 % reported three, 11 % reported four or five, 21 % reported six or seven, and 3 % reported greater than a seven person party. The prevalence of small groups in the summer sample coincides with past studies (Roggenbuck and Lucas 1987); however, there were several occurrences of larger group sizes.

Table 11: Group size of Height-of-the-Rockies summer respondents, 1994.

Group Size (number of persons)	Percent (n=72[1]) *
One	9.7
Two	36.1
Three	19.4
Four or Five	11.1
Six or Seven	20.8
> Seven	2.8

* Column does not add to 100 % due to rounding errors.
1 One respondent did not answer the question.

Median Group Size (n=72)	Minimum Group Size	Maximum Group Size
3.0	1.0	10.0

4.2.2.5 Method of Travel

The primary method of travel by the summer respondents is shown in Table 12. Seventy-six percent travelled by foot, 18 % by horse, and 4 % by mountain bike. As in wilderness areas in the United States, hiking was the most common travel method (Roggenbuck and Lucas 1987).

Table 12: Primary method of travel while in the backcountry by Height-of-the-Rockies summer respondents, 1994.

Method of Travel	Percent (n=72[1]) *
Foot	76.4
Horse	18.1
Bike	4.2
ATV	1.4

* Column does not add to 100 % due to rounding errors.
1 One respondent did not answer the question.

4.2.2.6 Activities

Recreation activity participation for the summer survey sample is shown in Table 13. The recreation activity that most of the summer sample participated in was hiking (84 %). Fishing, photography, and wildlife viewing also had participation rates greater than or near fifty percent. Consistent with past studies (Roggenbuck and Lucas 1987), hiking followed by fishing, and photography were the most common activities in the area. Mountaineering activity is usually rare in most wilderness areas (Roggenbuck and Lucas 1987); however, the HOR contains and provides access to many challenging and well-known climbs.

Table 13: Rate of participation in outdoor activities by Height-of-the-Rockies summer respondents, 1994 .

Activity	Percent (n=73)*
Hiking	83.6
Fishing	61.6
Photography	61.6
Wildlife Viewing	47.9
Horseback Riding	19.2
Mountaineering	17.8
Nature Study	15.1
Work	5.5
Mountain Biking	2.7
Landform Identification / Geology	2.7

* Percentages add to more than 100 % because of respondents' participation in multiple activities.

4.3 Travel Characteristics

This section explores the travel destinations of summer respondents during their visit to the HOR. More specifically, the trailheads used to enter and exit the area, campsites occupied, and trails traversed are further examined.

4.3.1 Access and Exit Points

Trailheads used by visitors to enter the HOR are shown in Table 14. The most frequently used access points were Forsyth Creek (24 %), Ralph Lake (22 %), Middle White River (18 %), and Maiyuk Creek (13 %). Forsyth and Maiyuk Creek trails both

lead to Connor Lakes, a popular destination area. The Middle White River is used primarily by hunters during the fall months, while Ralph Lake is a popular fishing spot in the summer months. It is important to note that since the survey sample was not representative of all visitors to the wilderness area, the results do not reflect the overall travel pattern of users within the area. For example, since fall users were not included, the access figures for Forsyth, Quarrie, and Joffre Creeks; and the Middle White and Palliser River are under-represented in the results. In addition, there were no trailhead registration boxes set up at the entrances into North Kananaskis Pass, Goat Basin, or Quarrie Creek, and therefore, more people may use these points of access than indicated.

Of the most frequently used access points, Forsyth Creek (24 %), Ralph Lake (21 %), Middle White River (16 %), and Maiyuk Creek (13 %) were primarily used to exit the wilderness area (Table 15). The results, however, are not generalizable to HOR visitors for reasons mentioned in the previous paragraph. One point of interest to note is that people have accessed the area from both Banff National Park and Kananaskis Provincial Park in Alberta, and have used the HOR to travel between these two protected areas.

Table 14: Trailheads used by summer respondents to enter the Height-of-the-Rockies, 1994.

Trailhead	Percent (n=67[1]) *
Forsyth Creek	23.9
Ralph Lake	22.4
Middle White River	17.9
Maiyuk Creek	13.4
Palliser River	9.0
Queen Mary Lake	7.5
Joffre Creek	1.5
Quarrie Creek	1.5
North White River	1.5
North Kananaskis Pass	1.5

* Column does not add to 100 % due to rounding errors.
1 Six respondents did not answer the question.

Table 15: Trailheads used by summer respondents to exit the Height-of-the-Rockies Wilderness Area, 1994.

Trailhead	Percent (n=67[1]) *
Forsyth Creek	23.9
Ralph Lake	20.9
Middle White River	16.4
Maiyuk Creek	13.4
Queen Mary Lake	9.0
Palliser River	9.0
Palliser Pass	3.0
Joffre Creek	1.5
Quarrie Creek	1.5
North White River	1.5

* Column does not add to 100 % due to rounding errors.
1 Six respondents did not answer the question.

4.3.2 Use Distribution of Backcountry Campsites

The use distribution of backcountry campsites by summer respondents is presented in Table 16. As mentioned in the previous section, not all visitors in the sample camped overnight in the wilderness area. Of 73 respondents, 58 camped at least one night within the HOR. Visitors primarily camped at Connor Lakes (33 %) and Ralph Lake (24 %). As for the previous section, the results do not necessarily reflect the overall distribution of campsite use. For example, no individuals reported camping along the Joffre Creek Trail or in Sylvan Pass, where there are established campsites that have most certainly received use in the past. The campsite areas that were most frequently occupied by respondents within the HOR, however, do reflect the more popular summer destination areas identified by Kreg Sky (pers. comm.).

Table 16: Destination areas that summer respondents camped within the Height-of-the-Rockies, 1994.

Destination Area	**Percent (n=58) ***
Connor Lakes	32.8
Ralph Lake	24.1
Middle White River	12.1
Queen Mary Lake	10.3
Palliser River	10.3
Deep Lake	8.6
Limestone Lakes	1.7

* Column does not add to 100 % due to rounding errors.

4.3.3 Distribution of Trail Use

Information on trail use in the area was ascertained from all survey respondents regardless of whether they had stayed overnight; six respondents did not indicate which trails they had used while travelling in the area (Table 17). Trails frequently used included the Forsyth Creek (25 %), Ralph Lake (22 %), Middle White River (18 %), Maiyuk Creek (13 %), Deep Lake (12 %), and Palliser River (12 %) trails. As stated previously, trail use results presented do not necessarily encompass the distribution of overall trail use. For example, fall use tends to include use of trails (Quarrie Creek and Palliser River) that are not frequently used during the summer months.

Examinations of trail use for single day visitors and of campsite area for overnight visitors to the area indicated that nearly 80 % of summer respondents' trips occurred within management zone III (Table 18). Most of the trails and readily accessible areas reside in this zone except for Goat Basin and Ralph Lake (zone II).

Table 17: Trails used by summer respondents within the Height-of-the-Rockies, 1994.

Trail	**Percent (n=67) ***
Forsyth Creek	25.4
Ralph Lake	22.4
Middle White River	17.9
Maiyuk Creek	13.4
Deep Lake	11.9
Palliser River	11.9
Leroy Creek	10.4
Queen Mary Lake	9.0
Joffre Creek	4.5
Quarrie Creek	1.5
North White River	1.5

* Percentages add to more than 100 % because respondents may have used more than one trail during their trip to the Height-of-the-Rockies.

Table 18: Management zones visited by Height-of-the-Rockies summer respondents, 1994.

Management Zone	Percent (n=67 [1])
Zone II	20.9
Zone III	79.1

[1] Six respondents did not indicate where they had travelled within the area.

4.4 Visitor Perceptions and Attitudes Towards Biophysical Conditions at Backcountry Campsites

Visitor perceptions and attitudes toward biophysical conditions provide resource managers with valuable information to help protect the wilderness recreational experience. The ways in which visitors perceive the biophysical environment help identity existing problems and monitor wilderness quality (McCool *et al.* 1990). Knowledge of visitors' attitudes towards aspects of the resource setting considered important to recreation experiences is one source of information used to select biophysical indicators (Roggenbuck *et al.* 1993). Moreover, understanding visitors' acceptability of impacts on biophysical conditions can help wilderness managers estimate upper limits of acceptable human impacts, and therefore, establish specific resource standards.

This section examines the importance of biophysical conditions to visitors' experiences, visitors' perceptions of biophysical conditions, and the preferred and acceptable levels of biophysical impacts at backcountry campsites. The results for this section were analyzed only for respondents that camped overnight within the wilderness area; therefore, the effective survey sample size comprised 58 persons.

4.4.1 Importance of Biophysical Conditions on Experiences

Biophysical impacts at campsites comprise changes in the physical and biological parameters of the natural environment due to recreational use. Most notable impacts at campsites occur to the local soil and vegetation (Cole 1987). This information helps wilderness managers to select biophysical impact indicators. Visitors were asked to indicate how important certain impacts at campsites were in determining the quality of their experience while recreating in the HOR (Table 19).

As with past studies (Lee 1975, Stankey 1973), litter presented the most important biophysical parameter at campsites in determining the quality of the recreation experience for 83 % of the summer respondents. Other biophysical conditions that were rated as extremely to very important to over 50 % of visitors included the number of human-made structures, the number of damaged trees, and the amount of bare ground or vegetation loss. Evidence of prior use was included as a parameter, as a previous study (Shelby and Harris 1986) showed that some visitors prefer to camp at impacted sites in order to prevent further impacts to natural areas. If visitors indicate that they prefer to camp at sites that have already been impacted, managers can minimize expenditures and efforts to eliminate evidence of campsites. Evidence of prior use was very important to only 38 % of visitors; therefore, established campsites may be an important factor in areas that receive regular use. Availability of natural feed for packstock at campsites was not an important condition for 64 % of summer respondents, as the majority were hikers.

Table 19: The importance of biophysical conditions at backcountry campsites in determining the quality of recreation experiences to Height-of-the-Rockies summer respondents, 1994.

Biophysical Conditions[1]	Extremely to Very Important % *	Slightly to Moderately Important % *	Not at all Important % *
Amount of litter (n=52)	82.7	7.7	9.6
Number of human-made structures (n=52)	65.4	17.3	17.3
Number of trees damaged by people (n=53)	54.7	28.3	17.0
Amount of vegetation loss and bare ground (n=53)	50.9	30.2	18.9
Number of campfire rings (n=53)	43.3	37.7	18.9
Evidence of prior use (n=53)	37.7	43.4	18.9
Availability of natural feed for packstock (n=52)	23.1	13.5	63.5

* Rows may not add to 100 % due to rounding errors.

1 Only respondents who camped overnight (n=58) answered the question.

4.4.2 Perception of Existing Biophysical Conditions

Respondents were asked to indicate whether they felt existing biophysical conditions at backcountry campsites were "Not a Problem", "Slight Problem", "Moderate Problem", or "Serious Problem" (Figure 5).

For all items surveyed, few of the summer respondents (< 6 %) indicated that there was a serious problem at backcountry campsites with respect to the level of

biophysical impacts; most respondents exhibited minimal concern. For example, 90 % felt that the present number of campfire rings at campsites was not a problem. A notable portion of visitors felt that the amount of litter (32 %), tree damage (27 %), vegetation loss (26 %), and human-made structures (25 %) at campsites were at a slight to serious problem.

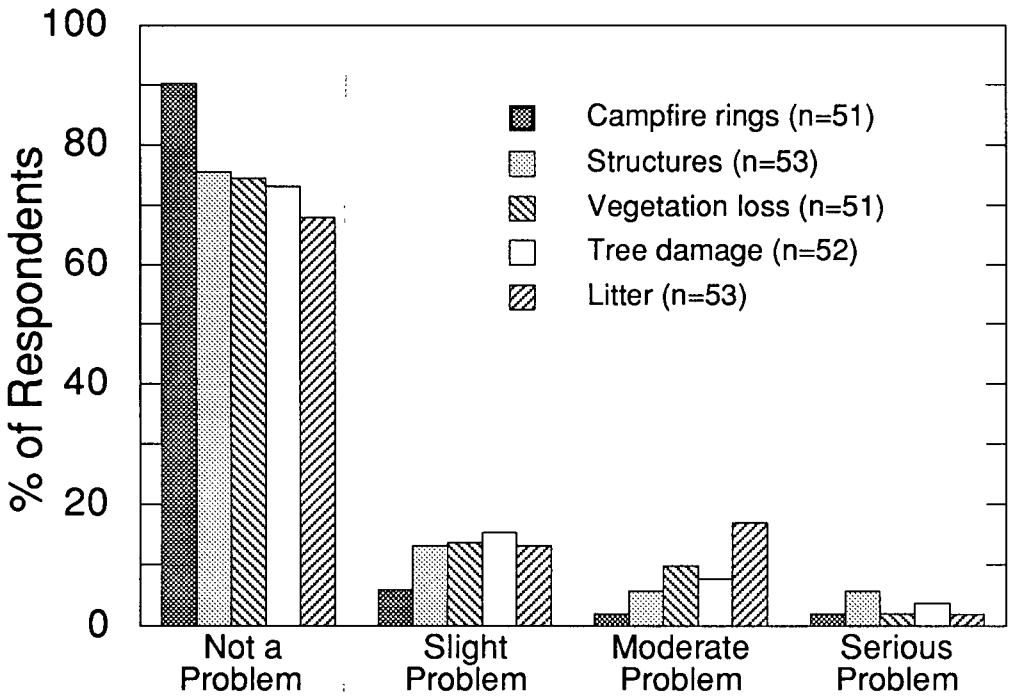

Figure 5: Bar graph illustrating how Height-of-the-Rockies summer respondents felt about existing biophysical conditions at backcountry campsites, 1994.

4.4.3 Acceptability of Impacts on Biophysical Conditions

Visitors to backcountry campsites in the HOR were asked to indicate: 1) the biophysical conditions they preferred, 2) the maximum amount of impact to biophysical conditions they would accept before their wilderness experience would be negatively affected, and 3) the level of impact to biophysical conditions that they would not accept. An open-ended question was used to reduce the probability of respondents guessing and choosing a given response. In addition, respondents were asked to leave the question blank if they could not give a number or if the condition did not matter to them.

Table 20 presents the average (median) and range of preferred biophysical conditions at backcountry campsites given by summer respondents. The median represents the level of impact from the pristine (zero impact), either side of which, one half of the respondents would prefer more and the other would prefer less. Although it is intuitive that the listed impacts affect visitors' experiences negatively, this can be verified by ensuring that the maximum acceptable conditions were greater than the preferred; indeed, none of the preferred values given exceeded acceptable limits (see Tables 20 -22). The range of preferred conditions is portrayed by the level of preferred impact of the first and third quartiles of respondents, and therefore, 50 % of responses fell within the range of values around the median. The number of respondents that reported acceptable levels of impacts (response rate) is also presented to indicate the extent to which the results represent the views of the summer survey sample.

Table 20 demonstrates that, with the exception of campfire rings, the median preferred levels of impact for all parameters represented pristine biophysical conditions. However, between 50 % and 75 % of the summer sample preferred at least one or more campfire rings, as they are a desirable campsite attribute to most wilderness users (Shelby and Shindler 1992). Examination of the median and range revealed that at least 50 % of respondents preferred no vegetation loss or human-made structures and a minimum of

75 % preferred no tree damage or litter at backcountry campsites. With respect to the other respondents, there was close agreement among preferred biophysical conditions. The response rate for preferred biophysical conditions was above 50 % for each parameter listed.

Tables 21 and 22 present the median and range for the maximum acceptable and unacceptable impact levels. The median value represents the level of impact from the pristine above which 50 % or less of the respondents would be willing to accept greater impact. Conversely, 50 % or less of the respondents would find values below the median unacceptable. For unacceptable and maximum acceptable conditions it is assumed that their respective median values were acceptable to those respondents that indicated they were willing to accept higher impact levels than the median. In other words, it is presumed that since these respondents were willing to accept higher impact levels they would also accept the lower level represented by the median. Therefore, the median values in Tables 21 and 22 represent the levels of impact that are acceptable and not acceptable to at least 50 % of respondents. Within the context of this study, values between the first and third quartiles were chosen to represent appropriate ranges of acceptable impacts; similar range designations have been adopted by Roggenbuck *et al.* (1993, 1991). It is suggested that the first quartile could also be assumed to represent the level of impact that 75 % of respondents would or would not accept.

Roggenbuck *et al.* (1993) feel that managers should focus on more than 50 % of users, and consequently, they reported both the first quartile and second quartiles to represent the levels of impact that 50 % and 75 % of respondents would accept. In addition, they state that the size difference between the 50 % and 75 % levels measures the extent of agreement amongst respondents; i.e., the greater the difference between the two levels, the less the agreement.

The median acceptable conditions or highest levels of impact 50 % of summer respondents will accept before their experience would be negatively affected are

presented in Table 21. At least 50 % of respondents would not accept any camp litter. There was less agreement amongst respondents with respect to maximum acceptable levels of biophysical impacts compared to preferred conditions. The difference in values between the first and third quartiles represented appreciable differences with respect to the nature of the campsite setting. For campfire rings, tree damage, camp litter, and human-made structures, managers would have to reduce the acceptable level of impacts to zero to please 75 % instead of 50 % of visitors. Management goals that reflect biophysical settings acceptable to 75 % of respondents are unrealistic, as low levels of recreation use result in notable impacts to biophysical conditions (Cole 1985). Response rates for the impact items ranged from 41 to 55 %.

Table 22 shows the median levels and ranges of impact that the summer respondents would not accept at backcountry campsites. For the listed biophysical impacts, there was less agreement with respect to unacceptable conditions amongst visitors than compared to preferred conditions. The only agreement among unacceptable impact levels was for camp litter; at least 50 % were not willing to accept even one piece of litter. The range of unacceptable impact levels portray significant visual differences in campsite conditions. For example, the unacceptable values for vegetation loss ranged from 11 to 51 %. Response rates for unacceptable levels ranged from 43 to 50 %.

Overall, most HOR summer survey respondents exhibited relatively restrictive standards toward acceptable impact levels for biophysical conditions at backcountry campsites. For example, the median values for preferred impact levels represented pristine biophysical campsite conditions. For 50 and 75 % of respondents, zero or low impact levels were the maximum amount of biophysical impacts that would be accepted. Consequently, the reported levels of preferred and maximum acceptable impacts do not necessarily provide managers with achievable campsite standards, as any human use of an area results in evident impacts to the resource setting. Furthermore, the results on the acceptability of biophysical impacts at campsites should be interpreted carefully due to

low response rates of the summer sample. Low response rates may indicate either that respondents did not care about biophysical impacts at campsites, they did care but were unable to quantify acceptable impact levels, or that they did not understand the question. It is most probable that visitors cared but were not able to give a number, as most (> 50 %) respondents rated all biophysical conditions except for campfire rings as being extremely to very important in determining the quality of their experiences at backcountry campsites (Table 19). The author recognizes the limitations of using the visitor information presented in Tables 20 - 22 to establish impact standards for campsites in the HOR. Furthermore, the opinions of all visitors to the HOR with respect to the acceptability of resource impacts are not reflected by the 1994 HOR Recreation User Study.

Table 20: Preferred impact levels for biophysical conditions at backcountry campsites: average and range of conditions that Height-of-the-Rockies summer respondents most prefer, 1994.

Impact Item[1]	**Median Preferred Condition**	**Range of Preferred Conditions (Q1-Q3)***	**% Response**
Percent of vegetation loss or bare ground (n=32)	0.0	0.0 - 5.0	55.2
Number of campfire rings per site (n=36)	1.0	0.0 - 2.0	62.1
Number of trees damaged by people per site (n=32)	0.0	0.0 - 0.0	55.2
Number of pieces of litter seen at a site (n=35)	0.0	0.0 - 0.0	60.3
Number of human-made structures per site (n=32)	0.0	0.0 - 1.0	55.2

[1] Only respondents who camped overnight (n=58) answered the question.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 21: Maximum acceptable impact levels for biophysical conditions at backcountry campsites: average and range of conditions that Height-of-the-Rockies summer respondents will accept, 1994.

Impact Item [1]	**Median Acceptable Condition**	**Range of Acceptable Conditions (Q1-Q3)***	% **Response**
Percent of vegetation loss or bare ground per site (n=27)	10.0	5.0 - 25.0	46.6
Number of campfire rings per site (n=32)	2.0	0.0 - 3.0	55.2
Number of trees damaged by people per site (n=24)	2.0	0.0 - 4.0	41.4
Number of pieces of litter per site (n=28)	0.0	0.0 - 3.0	48.3
Number of human-made structures per site (n=30)	1.0	0.0 - 2.0	51.7

[1] Only respondents who camped overnight (n=58) answered the question.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 22: Unacceptable impact levels for biophysical conditions at backcountry campsites: average and range of conditions that Height-of-the-Rockies summer respondents will not accept, 1994.

Impact Item [1]	**Median Unacceptable Condition**	**Range of Unacceptable Conditions (Q1-Q3)***	% **Response**
Percent of vegetation loss or bare ground per site (n=25)	30.0	10.5 - 51.0	43.1
Number of campfire rings per site (n=29)	3.0	2.5 - 4.0	50.0
Number of trees damaged by people per site (n=20)	3.0	1.0 - 5.0	34.5
Number of pieces of litter at a site (n=26)	1.0	1.0 - 5.0	44.8
Number of human-made structures per site (n=26)	2.0	1.0 - 3.0	44.8

[1] Only respondents who camped overnight (n=58) answered the question.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

4.5 Visitor Perceptions and Attitudes Toward Social Conditions at Backcountry Campsites

This section examines the importance of social conditions on visitors' experiences, visitors' perceptions of social conditions, and preferred and acceptable levels of social impacts at backcountry campsites. Social conditions in this study refer to the number, size, and type of encounters with other visitors at backcountry campsites. Social conditions at campsites can influence user conflicts, trip satisfaction, and visitors' feelings of solitude (McCool *et al.* 1990).

Respondents were asked several questions with respect to social conditions at backcountry campsites; the results are presented below. The results for this section were analyzed only for the portion of the summer survey sample that camped overnight within the wilderness area (n=58).

4.5.1 Importance of Social Conditions on Experiences

Respondents were asked to rate the importance of various social impacts in determining the quality of their experience at campsites while recreating in HOR. This information helps wilderness managers determine which social conditions (indicators) should be monitored to help maintain high quality wilderness experiences. The relative importance of social conditions at backcountry campsites to the summer sample is presented in Table 23.

The behavior of other groups was the most important factor to summer respondents in determining the quality of the recreation experience at backcountry campsites. Other social conditions that were rated by more than half of visitors as extremely to very important included the number of hiker groups and horse groups, and the size of other groups camped nearby. The results indicate that hikers may be less

tolerant towards horse group encounters at campsites than hiker groups, as hikers formed the majority (76 %) of respondents. The low importance given to the presence of packstock at campsites reflects that most visitors to the area travelled by foot. For social conditions that were rated as being important, it is assumed that these conditions had a negative effect on visitors' experiences, as acceptable impact levels given by respondents were greater than preferred conditions (see Tables 27 - 29).

On average, summer respondents to the HOR were more concerned about the social environment than the biophysical conditions at backcountry campsites. Presence of litter, group behavior, and group encounters had the greatest affect on visitors' wilderness experiences. These findings are consistent with past recreation surveys (Lucas 1979).

Table 23: The importance of social conditions at backcountry campsites in determining the quality of recreation experiences to Height-of-the-Rockies summer respondents, 1994.

Social Conditions[1]	**Extremely to Very Important** %	**Slightly to Moderately Important** %	**Not at all Important** %
Behavior of others not in my group (n=52)	75.0	11.5	13.5
Number of horse groups camped within sight or sound of my site (n=50)	64.0	18.0	18.0
Size of other groups camped within sight or sound of my site (n=52)	61.5	21.2	17.3
Number of hiker groups camped within sight or sound of my site (n=51)	54.9	25.5	19.6
Presence of packstock (n=50)	24.0	30.0	46.0

[1] Only respondents who camped overnight (n=58) answered the question.

4.5.2 Perceptions of Existing Social Conditions

Table 24 shows the number of hiker and horse groups that respondents encountered at their campsite during their visit to the HOR. Encounters were defined as other groups that camped within sight and sound of the respondents. Most of the summer visitors did not meet either horse or hiker groups when camping within the area. Since the majority of users were hikers, respondents reported more camp encounters with hiker than horse groups. Of the campsite encounters that occurred, most overnighters camped beside only one or two other parties.

Table 24: The number of other groups that camped within sight or sound of Height-of-the-Rockies summer respondents, 1994.

Number of Other Groups Camped Nearby [1]	**Percent** *
Horse Groups (n=44)	
None	95.5
One or two	4.5
Three to five	0.0
Over Five	0.0
Hiker Groups (n=49)	
None	77.6
One or two	18.4
Three to five	4.1
Over Five	0.0

* Column does not add to 100 % due to rounding errors.

1 Only respondents who camped overnight (n=58) answered the question.

Table 25 presents how summer respondents felt about the number of other horse and hiker groups camped within sight or sound. For each party type, the majority of visitors felt that the number of other groups encountered was about right. A small amount (5%) indicated that they had too many encounters, while others had too few.

Around 20 % of respondents indicated that encounters with other groups, regardless of the type, did not matter to them one way or the other.

Table 25: How Height-of-the-Rockies summer respondents felt about the number of other groups camped within sight or sound, 1994.

Numbers of Other Groups Camped Nearby[1]	**Percent** *
Hiker Groups (n=45)	
Too few	4.4
Somewhat too few	6.7
About right	64.4
Somewhat too many	2.2
Too many	4.4
Did not matter	17.8
Horse Groups (n=40)	
Too few	5.0
Somewhat too few	5.0
About right	60.0
Somewhat too many	7.5
Too many	2.5
Did not matter	20.0

* Column does not add to 100 % due to rounding errors.
1 Only respondents who camped overnight (n=58) answered the question.

Table 26 shows the actual size of other groups that camped within sight or sound of the summer respondents. As indicated above, the majority of visitors to the area did not encounter any other groups when camping. Of other hiker and horse groups that camped within sight or sound of respondents, most parties were comprised of either 1 or 2 people, or 3 or 4 people; the largest group size reported consisted of 5 to 7 persons. As stated previously, the summer sample reported more encounters with hiker than horse groups.

Table 26: The size of other groups that camped within sight or sound of Height-of-the-Rockies summer respondents, 1994.

Size of Other Groups Camped Nearby[1]	**Percent**
Horse Users (n=40)	
No other groups camped nearby	92.5
One or two people	5.0
Three or four people	0.0
Five to seven people	2.5
> Seven people	0.0
Hikers (n=45)	
No other groups camped nearby	73.3
One or two people	15.6
Three or four people	6.7
Five to seven people	4.4
> Seven people	0.0

[1] Only respondents who camped overnight (n=58) answered the question.

Respondents were also asked to indicate whether they felt existing social conditions at backcountry campsites were "Not a Problem", "Slight Problem", "Moderate Problem" or "Serious Problem". Results are shown in Figure 6. Over 90 % of the summer survey sample felt there was not a problem in the HOR with respect to all social conditions listed.

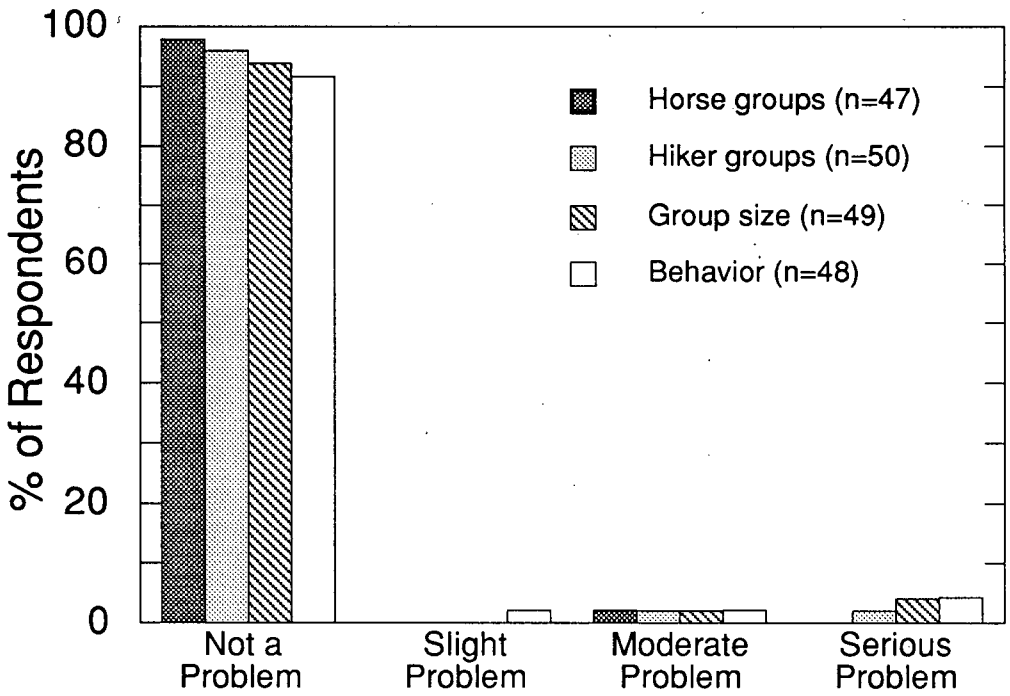

Figure 6: Bar graph illustrating how Height-of-the-Rockies summer respondents felt about existing social conditions at backcountry campsites, 1994.

4.5.3 Acceptability of Impacts on Social Conditions

Visitors to backcountry campsites in the HOR were asked to indicate: 1) social conditions they prefer, 2) the maximum amount of impact to social conditions they would accept before their experiences would be negatively affected and, 3) the level of impact to social conditions they would not accept. The results are presented in Tables 27 - 29.

Table 27 shows the median and range of preferred impact levels for social conditions at campsites. Over 50 % of respondents indicated that they would prefer no amount of social impact. At least 75 % of respondents preferred no horse group encounters or occurrences of discourteous behavior at backcountry campsites, while a minimum of 50 % preferred no encounters with either hiker groups or packstock animals. Examination of the data revealed that 100 % of the summer sample preferred no occurrences of discourteous behavior. The response rate was over 60 % for each impact item except for the number of packstock animals seen; this may indicate that this item was not important to summer respondents. Indeed, almost 50 % reported that the presence of packstock was not important in determining the quality of their experiences (see Table 23). A probable explanation for the low importance rating given to this item is that almost all respondents (96 %) did not encounter any horse groups during their stay at backcountry campsites.

Table 28 presents the median and range of acceptable impact levels for social impacts. As stated previously, the median values can be interpreted as the highest level of impact 50 % of the summer sample will accept at campsites. At least 50 % of respondents reported that they would not accept any occurrences of discourteous behavior by other groups. Summer visitors indicated that they were willing to tolerate more encounters with hiker groups than horse groups. There was less agreement between respondents with respect to the limits of acceptability; however, except for packstock, the acceptable impact levels ranged by only one or two values. For each social condition

except the presence of packstock, approximately 53 % of visitors were able to denote a maximum acceptable amount of impact.

The median and range of unacceptable impact levels for social conditions are shown in Table 29. Again, there was little concurrence amongst respondents with regard to unacceptable levels of social impacts. As above, visitors indicated that they would accept more hiker groups camped within sight or sound than horse groups. The response rate was approximately 46 %.

For most respondents, social conditions encountered during their stay at backcountry campsites coincided with conditions they most preferred or were willing to accept. Most respondents indicated that they desired no campsite encounters; however, they were willing to accept one or two before their experiences would be negatively affected. As most of the respondents consisted of hikers, the results may indicate that hikers may not favour encounters with horse groups. Although response rates for the acceptability of social conditions were higher than those for biophysical conditions, they still only represent the views of the summer sample. The results, therefore, are not generalizable and do not represent the view of all users to the area. Furthermore, few respondents had experienced occurrences of discourteous behavior or encounters with hikers, horse groups, or packstock at backcountry campsites. Therefore, this raises the question as to whether the summer sample was a useful source of information for determining acceptable social condition at backcountry campsites. The author acknowledges the above limitations associated with using the visitor information presented in Tables 27 - 29 to establish impact standards for campsites in the HOR.

Table 27: Preferred impacts levels for social conditions at backcountry campsites: average and range of conditions that Height-of-the-Rockies summer respondents most prefer, 1994.

Impact Items[1]	Median Preferred Condition	Range of Preferred Conditions (Q1-Q3)*	% Response
Number of hiker groups camped within sight or sound (n=43)	0.0	0.0 - 1.0	74.1
Number of horse groups camped within sight or sound (n=36)	0.0	0.0 - 0.0	62.1
Occurrences of discourteous behavior by others not in my group (n=35)	0.0	0.0 - 0.0	60.3
Number of packstock animals at the site (n=28)	0.0	0.0 - 1.0	48.3

[1] Only respondents who camped overnight (n=58) answered the question.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 28: Maximum acceptable impact levels for social conditions at backcountry campsites: average and range of conditions that Height-of-the-Rockies summer respondents will accept, 1994.

Impact Item[1]	Median Acceptable Condition	Range of Acceptable Conditions (Q1-Q3)*	% Response
Number of hiker groups camped within sight or sound (n=31)	2.0	1.0 - 3.0	53.4
Number of horse groups camped within sight or sound (n=34)	1.0	0.0 - 2.0	58.6
Occurrences of discourteous behavior by others not in my group (n=32)	0.0	0.0 - 1.0	55.2
Number of packstock animals at the site (n=27)	2.0	0.0 - 4.0	46.6

[1] Only respondents who camped overnight (n=58) answered the question.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 29: Unacceptable impact levels for social conditions at backcountry campsites: average and range of conditions that Height-of-the-Rockies summer respondents will not accept, 1994.

Impact Item[1]	**Median Unacceptable Condition**	**Range of Unacceptable Conditions (Q1-Q3)***	*%* **Response**
Number of hiker groups camped within sight or sound (n=26)	3.0	2.0 - 5.0	44.8
Number of horse groups camped within sight or sound (n=28)	2.0	1.0 - 2.0	48.3
Occurrences of discourteous behavior by others not in my group (n=28)	1.0	0.0 - 2.0	48.3
Number of packstock animals at the site (n=25)	4.0	1.0 - 7.0	43.1

1 Only respondents who camped (n=58) answered the question.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

4.6 Comparison of Visitors' Campsite Evaluations According to Different Management Zones Visited

This section examines whether respondents that camped in one management zone held different attitudes towards biophysical and social conditions than those that camped in the other two zones of the HOR. Research (Martin *et al.* 1989) has shown that campsite evaluations by visitors vary according to the location of sites within a wilderness area. Furthermore, Stokes (1990) and Stankey *et al.* (1985) suggest that each of the zones within a single wilderness area may need distinct indicators and standards, if the recreation opportunities provided are diverse. As a result, the importance of conditions on visitors' experiences and the preferred and acceptable levels of impacts at backcountry campsites were compared between respondents that camped in the various management zones. Although there are three management zones in the HOR, no campsites were found in zone I; therefore, results are only presented for zones II and III. Furthermore, results are only displayed for respondents that stayed overnight in the HOR (n=58). Of those respondents that camped, fourteen and forty-four indicated that they stayed in management zones II and III respectively. An examination of all overnight campers indicated that no respondents registered twice, and hence each person was only surveyed regarding campsite conditions for one management zone; therefore, the respondents for zones II and III represent independent samples.

4.6.1 Importance of Biophysical and Social Conditions on Experiences

Overall, visitors that camped within management zone II demonstrated more concern for all impact items (except for the availability of natural feed for packstock) than respondents that stayed at sites within zone III (Table 30). The presence of litter was the most important attribute to respondents at both zones in determining the quality of

recreational experiences. In addition, social impacts were generally of more importance to visitors than biophysical conditions regardless of the management zone.

Over 50 % of the respondents that camped within management zone II indicated that 10 of the 12 impact items were very to extremely important to the quality of their recreational experience. Litter, the number of horse groups camped nearby, and the behavior of others were the three most important conditions. Visitors to this zone also exhibited high concern for group size, the number of hiker groups camped nearby, tree damage, vegetation loss, the presence of human-made structures, and campfire rings. The presence of packstock or the availability of natural feed at campsites were not important conditions for summer respondents, as all visitors to zone II were hikers.

Litter, the behavior of others camped nearby, the presence of human-made structures, the size of other groups, and the number of horse groups camped nearby were very to extreme importantly to over 50 % of respondents that camped within management zone III. Moreover, just under 50 % exhibited high concern for tree damage, hiker group encounters at campsites, and vegetation loss. Visitors to zone III primarily consisted of hikers, although there were some horse groups. The varied composition of visitors to zone III, therefore, may explain the higher concern exhibited for the availability of natural feed at campsites.

Table 30: The importance of biophysical and social conditions at backcountry campsites to Height-of-the-Rockies summer respondents that visited management zones II and III, 1994.

Biophysical and Social Conditions[1]	**Extremely to Very Important** % *	**Slightly to Moderately Important** % *	**Not at all Important** % *
Amount of litter (n=14, n=38)	II 92.9 III 78.9	II 0.0 III 10.5	II 7.1 III 10.5
Behavior of others not in my group (n=14, n=38)	II 78.6 III 73.7	II 14.3 III 10.5	II 7.1 III 15.8
Number of horse groups camped within sight or sound of my site (n=14, n=36)	II 85.7 III 55.6	II 7.1 III 22.2	II 7.1 III 22.2
Number of human-made structures (n=14, n=38)	II 71.4 III 63.2	II 14.3 III 18.4	II 14.3 III 18.4
Size of other groups camped within sight or sound of my site (n=14, n=38)	II 71.4 III 57.9	II 21.4 III 21.1	II 7.1 III 21.1
Number of trees damaged by people (n=14, n=39)	II 71.4 III 48.7	II 21.4 III 30.8	II 7.1 III 20.5
Number of hiker groups camped within sight or sound of my site (n=14, n=37)	II 71.4 III 48.6	II 14.3 III 29.7	II 14.3 III 21.6
Amount of vegetation loss and bare ground (n=14, n=39)	II 71.4 III 43.6	II 21.4 III 33.3	II 7.1 III 23.1
Number of campfire rings (n=14, n=39)	II 64.3 III 35.9	II 21.4 III 43.6	II 14.3 III 20.5
Evidence of prior use (n=14, n=39)	II 50.0 III 33.3	II 35.7 III 46.2	II 14.3 III 20.5
Presence of packstock (n=13, n=37)	II 38.5 III 18.9	II 15.4 III 35.1	II 46.2 III 45.9
Availability of natural feed for packstock (n=13, n=39)	II 7.7 III 28.2	II 0.0 III 17.9	II 92.3 III 53.8

* Rows may not add to 100 % due to rounding errors.

1 Fourteen and 44 respondents camped in management zones II and III respectively.

4.6.2 Acceptability of Impacts on Biophysical and Social Conditions

In this section, differences in respondents' attitudes towards campsite conditions based upon the management zone they visited are presented for: 1) biophysical and social conditions most preferred, 2) the highest levels of impact to biophysical and social conditions that respondents would accept before their experiences would be negatively affected, and 3) the levels of impact to biophysical and social conditions that respondents would not accept at backcountry campsites (see Tables 31 - 36).

There were similar results between and within the two management zones with regard to most preferred biophysical and social conditions at backcountry campsites (Tables 31 and 32). For example, at least 50 % of respondents from each management unit shared the same opinions regarding desired social and biophysical conditions. In addition, over 50 % of respondents within each management zone agreed upon preferred conditions at campsites. An exception to each above case was the preferred number of campfire rings per site. Excluding vegetation loss and the number of packstock, the range of preferred campsite conditions were also similar between the zones. Lastly, respondents that camped in zone II exhibited considerably higher response rates than those in zone III.

For the maximum acceptable level of biophysical and social impacts, there was considerable agreement among management zones II and III (Tables 33 and 34). Respondents to the two zones exhibited similar tolerances (medians and ranges) towards the number of campfire rings per site, the amount of litter per site, the number of human-made structures, the number of horse and hiker groups camped nearby, the number of packstock, and the occurrences of discourteous behavior by others not in their group. There was a substantial difference between the two zones with regard to the range of acceptable vegetation loss even though the median values were identical. Although respondents that camped within zone II did not encounter horse groups, visitors to both

zones indicated that they would be willing to accept more encounters with hikers at campsites than horse groups. The response rates between the two zones were more similar; however, the rate tended to be higher for zone II.

There was less agreement between the two management zones with respect to the levels of impact to biophysical and social conditions that were not acceptable (Tables 35 and 36) compared to preferred and acceptable conditions. For example, median values for the amount of unacceptable vegetation loss and camp litter were larger in zone III, whereas in zone II, these values were larger for the number of campfire rings, hiker groups camped nearby, and packstock animals seen per site. The numbers presented for each management zone, nevertheless, are similar and usually (except for vegetation loss and camp litter) do not differ by more than one or two values. As above, zone II exhibited higher response rates for all impact items.

Overall, the results for preferred, maximum acceptable, and unacceptable conditions at backcountry campsites were considerably similar between the two management zones. Except for campfire rings, at least 50 % of respondents from each zone preferred no change from the pristine with respect to the listed biophysical and social conditions. Although there was agreement amongst the two zones with regard to maximum acceptable and unacceptable conditions, impact levels did not usually vary by more than one to five values. The results also suggest that hikers are less tolerant toward encounters with horse groups at campsites than hikers.

Table 31: Preferred biophysical conditions at backcountry campsites for summer respondents that visited management zones II and III: average and range of preferred conditions, 1994.

Impact Item[1]	Median Preferred Condition	Range of Preferred Conditions (Q1-Q3)*	% Response
Percent of vegetation loss or bare ground per site (n=12, n=20)	II 0.0 III 0.0	II 0.0 - 1.0 III 0.0 - 15.0	II 85.7 III 45.5
Number of campfire rings per site (n=12, n=24))	II 1.0 III 1.0	II 0.0 - 2.0 III 1.0 - 2.0	II 85.7 III 54.5
Number of trees damaged by people per site (n=12, n=20)	II 0.0 III 0.0	II 0.0 - 0.0 III 0.0 - 0.0	II 85.7 II 45.5
Number of pieces of litter at a site (n=11, n=24)	II 0.0 III 0.0	II 0.0 - 0.0 III 0.0 - 0.0	II 78.6 III 54.5
Number of human-made structures per site (n=10, n=22)	II 0.0 III 0.0	II 0.0 - 1.0 III 0.0 - 1.0	II 71.4 III 50.0

[1] Fourteen and 44 respondents camped in management zones II and III respectively.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 32: Preferred social conditions at backcountry campsites for summer respondents that visited management zones II and III: average and range of preferred conditions, 1994.

Impact Items[1]	Median Preferred Conditions	Range of Preferred Conditions (Q1-Q3)*	% Response
Number of hiker groups camped within sight or sound (n=11, n=26)	II 0.0 III 0.0	II 0.0 - 0.0 III 0.0 - 1.0	II 78.6 III 59.1
Number of horse groups camped within sight or sound (n=12, n=24)	II 0.0 III 0.0	II 0.0 - 0.0 III 0.0 - 0.0	II 85.7 III 54.5
Occurrences of discourteous behavior by others not in my group(n=12, n=23)	II 0.0 III 0.0	II 0.0 - 0.0 III 0.0 - 0.0	II 85.7 III 52.3
Number of packstock animals at the site (n=10, n=18)	II 0.0 III 0.0	II 0.0 - 4.0 III 0.0 - 1.0	II 71.4 III 40.9

[1] Fourteen and 44 respondents camped in management zones II and III respectively.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 33: Maximum acceptable biophysical conditions at backcountry campsites for summer respondents that visited management zones II and III: average and range of acceptable conditions, 1994.

Impact Item [1]	Median Acceptable Condition	Range of Acceptable Conditions (Q1-Q3)*	% Response
Percent of vegetation loss or bare ground per site(n=8, n=19)	II 10.0 III 10.0	II 6.3 - 14.8 III 5.0 - 50.0	II 57.1 III 43.2
Number of campfire rings per site (n=9, n=23)	II 3.0 III 2.0	II 1.0 - 4.0 III 1.0 - 3.0	II 64.3 III 52.3
Number of trees damaged by people per site (n=7, n=17)	II 0.0 III 2.0	II 0.0 - 3.0 III 0.0 - 4.0	II 50.0 III 38.6
Number of pieces of litter at a site (n=9, n=19)	II 0.0 III 1.0	II 0.0 - 3.0 III 0.0 - 3.0	II 64.3 III 43.2
Number of human-made structures per site (n=10, n=20)	II 1.0 III 1.0	II 0.0 - 2.0 III 1.0 - 2.0	II 71.4 III 45.5

[1] Fourteen and 44 respondents camped in management zones II and III respectively.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 34: Maximum acceptable social conditions at backcountry campsites for summer respondents that visited management zones II and III: average and range of acceptable conditions, 1994.

Impact Item [1]	Median Acceptable Condition	Range of Acceptable Conditions (Q1-Q3)*	% Response
Number of hiker groups camped within sight or sound (n=8, n=23)	II 2.0 III 2.0	II 1.0 - 3.0 III 1.0 - 3.0	II 50.0 III 52.3
Number of horse groups camped within sight or sound (n=10, n=24)	II 1.0 III 1.0	II 0.0 - 1.0 III 0.0 - 2.0	II 71.4 III 54.5
Occurrences of discourteous behavior by others not in my group (n=11, n=21)	II 0.0 III 0.0	II 0.0 - 1.0 III 0.0 - 1.0	II 78.6 III 47.7
Number of packstock animals at the site (n=9, n=18)	II 3.0 III 2.0	II 0.0 - 6.0 III 0.0 - 4.0	II 64.3 III 40.9

[1] Fourteen and 44 respondents camped in management zones II and III respectively.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 35: Unacceptable biophysical conditions at backcountry campsites for summer respondents that visited management zones II and III: average and range of unacceptable conditions, 1994.

Impact Item [1]	Median Unacceptable Condition	Range of Unacceptable Conditions (Q1-Q3)*	% Response
Percent of vegetation loss or bare ground per site (n=8, n=17)	II 23.0 III 50.0	II 10.3 - 30.0 III 10.5 - 51.0	II 57.1 III 38.6
Number of campfire rings per site(n=9, n=20)	II 3.0 III 3.0	II 2.0 - 5.0 III 2.0 - 4.0	II 64.3 III 45.5
Number of trees damaged by people per site (n=7, n=13)	II 3.0 III 3.0	II 1.0 - 4.0 III 1.0 - 5.0	II 50.0 III 29.5
Number of pieces of litter per site (n=9, n=17)	II 1.0 III 1.0	II 1.0 - 9.0 III 0.0 - 5.0	II 64.3 III 38.6
Number of human-made structures per site (n=9, n=17)	II 1.0 III 2.0	II 1.0 - 3.0 III 1.5 - 4.0	II 64.3 III 38.6

[1] Fourteen and 44 respondents camped in management zones II and III respectively.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

Table 36: Unacceptable social conditions at backcountry campsites for summer respondents that visited management zones II and III: average and range of unacceptable conditions, 1994.

Impact Item [1]	Median Unacceptable Condition	Range of Unacceptable Conditions (Q1-Q3)*	% Response
Number of hiker groups camped within sight or sound (n=7, n=19)	II 3.0 III 2.0	II 2.0 - 5.0 III 2.0 - 5.0	II 50.0 III 43.2
Number of horse groups camped within sight or sound (n=8, n=20)	II 2.0 III 2.0	II 1.0 - 2.0 III 1.0 - 3.0	II 57.1 III 45.5
Occurrences of discourteous behavior by others not in my group (n=9, n=19)	II 1.0 III 1.0	II 1.0 - 2.0 III 0.0 - 2.0	II 64.3 III 43.2
Number of packstock animals at the site (n=9, n=16)	II 4.0 III 3.0	II 1.0 - 8.0 III 0.0 - 5.0	II 64.3 III 36.4

[1] Fourteen and 44 respondents camped in management zones II and III respectively.
* Q1 and Q3 refer to the values given by the first and third quartile of respondents.

4.7 Summary of Results

Important findings from the HOR 1994 summer user study are summarized in this final section. More specifically, pertinent results for visitor and visit characteristics, and visitor preferences are displayed in Table 37.

Table 37: Summary of visitor and visit characteristics, travel patterns, and visitor preferences for the Height-of-the-Rockies 1994 summer user study.

Survey Item	**Result**
Visitor Characteristics	Predominantly male population with median age of 41. Primarily local residents from surrounding urban areas that had previously visited the area. Overall users had particularly high education levels. Most important reasons for visiting were to view scenery, to be in the wilderness, to be close to nature, to get away from people, to take a break, to observe wildlife, for solitude, and for adventure. Most users were hikers (3 of 4), but there was also horse and mountain bike use. Long history of horse and hunting use in the area. Currently two outfitters operate in the area.
Visit Characteristics	Use occurred mainly in August due to high water levels prevalent in spring and early summer. Median trip length was 3 days with many day trips and longer length visits. Three-person groups were the most common and consisted primarily of friends, family, or both. Activities users primarily participated in included hiking, fishing, photography, and wildlife viewing. There was also a considerable amount of mountaineering use (18 % participation rate). Most visitors (78 %) were able to camp with no other groups within sight or sound of them. Of group encounters at campsite, 1 or 2 person groups were the most common.

Travel Patterns	Most heavily used trailheads were Forsyth Creek, Ralph Lake, Middle White River, and Maiyuk Creek. Popular camping areas included Connor Lakes, Ralph Lake, Middle White River, Queen Mary Lake, and Palliser River. 80% of summer use occurred primarily in management zone III.
Visitor Preferences	Litter was the most important impact parameter in determining the quality of experiences. The behavior of other groups, the number of horse and hiker groups camped nearby, the presence of human-made structures, group size, the amount of tree damage, and the amount of vegetation loss were all rated as being very to extremely important to over 50% of respondents. The majority felt that there was not a problem with existing biophysical and social conditions at wilderness campsites. At least 50 % of respondents preferred no change from the pristine with respect to social and biophysical impacts at campsites. Although there was less shared agreement towards maximum acceptable and unacceptable impact levels, visitors exhibited restrictive campsite standards. The range of acceptable conditions reflected primitive and semi-primitive non-motorized opportunity settings.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

In this chapter, the results of the visitor survey are discussed with respect to management implications. In particular, two phases of the Limits of Acceptable Change (LAC) process are examined within the context of backcountry recreation management. More specifically, the issue of indicator selection is addressed by examining the relative influence of specific biophysical and social impacts on wilderness visitors' experiences at backcountry campsites. The development of standards is assessed by investigating the degree of impact wilderness visitors are willing to accept before their experiences would be negatively affected. Furthermore, the discussion examines whether indicators and standards vary between the three different management zones in the HOR. Only results from the summer survey sample are used in the ensuing discussion. Although the following sections briefly allude to future research and management options, more detailed accounts of these topics are presented in chapter six.

5.2 Study Limitations

Before the results of the visitor survey are discussed with respect to the selection of impact indicators and the setting of indicator standards, it is important to examine the constraints associated with the study. An exploration of the problems encountered helps to determine whether the research objectives were wholly or partially attained. The limitations are examined for the following aspects: the survey sample, the survey design, the use of a mailback questionnaire, and the change in the designation status for the HOR.

5.2.1 Survey Sample

The objective of the research was to conduct a mailback survey of visitors to the HOR during the summer and fall seasons of 1994. Lucas and Oltman (1971), however, state that the major weaknesses of such surveys are the dearth of valid information on visitor populations and inadequate sources of names and addresses from which to draw representative samples. Indeed, the major shortcoming of the HOR research was the non-representativeness of the survey sample. Factors that contributed to the inadequacy of the sample included the use of a mailback survey instrument, the lack of previous knowledge on the visitor population, low use levels, and the dearth of registrants for certain user groups.

Information was to be solicited from recreational visitors that had gone to the HOR for the purpose of engaging in any outdoor activity. Roggenbuck *et al.* (1987), however, point out the limitations of conducting research solely on current wilderness users to a particular area. Surveys based upon present-day visitors fail to include the opinions of former users; therefore, visitor displacement and their associated motives for leaving cannot be ascertained. Furthermore, surveys based on current visitors fail to include potential wilderness visitors. These recreation management issues cannot be addressed by studies focused on present-day users; only household surveys include these two sub-populations. Household surveys, however, can be more problematic, because wilderness users usually form a very small minority in most general populations. Due to time, economic, and logistical constraints associated with household sampling, only current visitors to the HOR were included in the survey population.

Previous information on visitor populations (i.e., use levels, user types, and trail use) is crucial in the design of effective survey sampling strategies. For example, if the number of visitors and the relative proportion and travel characteristics of various user groups are known, then a valid sampling system can be designed to obtain representatives

from each of the sub-populations. However, as no prior use data was available for the HOR, it was not possible to predetermine an adequate survey sampling protocol. In order to assess the representativeness of the acquired sample, it was necessary to determine the size and characteristics of the visitor population to the area for both summer and fall seasons.

Measuring recreational use in wilderness areas is problematic. A number of characteristics of wilderness recreation contribute to this difficulty. They include: 1. the light and highly dispersed nature of wilderness use; 2. wilderness areas tend to have multiple access points that further spread visitors; and 3. recreation activity can be highly variable with respect to weather, vacation time, holidays, and the time of year (Roggenbuck and Lucas 1987). Therefore, gathering data on wilderness use and users is not only troublesome, but costly if reliable estimates are to be obtained. Hollenhorst *et al.* (1992) suggest that defining clear study objectives with regards to use estimations can help determine the unit of measure and the appropriate level of sampling detail.

For visitor surveys, census counts present the ideal level of sampling detail, as valid data can be gathered on use density and diversity, and the distribution of the visitor population. However, such methodology was unrealistic in terms of resources and costs for the present study, and therefore, sample counts of the visitor population were employed. More specifically, voluntary self-registration at trailhead registers was chosen, as it provides more complete information than simple use counters. Registration cards were designed to solicit information on method of travel, date of entry, name and address, group size, primary activity, and length of stay. In addition to generating a mailing list, these specifics were acquired to identify the types of user groups, and to help determine the effect of non-response bias for the mailback survey.

Inherent to the use of voluntary registration are problems concerning erratic compliance rates among visitors. Registration data are inclined to not only underestimate use levels, but also foster biased appraisals of its composition, as some user groups tend

not to register (Lucas 1990c). A review of self-registration behavior from compliance studies compiled from fifteen wilderness areas in the United States found that hikers register at substantially higher rates than horse users and hunters (Roggenbuck and Lucas 1987). Since fall users to the HOR are predominantly hunters travelling with horses, fall registration rates were expected to be lower than summer rates. Furthermore, there is the propensity for only one member of an entire group to register, which can introduce group leader bias into the mailing list. In other words, the person who registers for a group is not generally a random representative member. In family groups, for example, the husband usually registers, while in non-family parties, there is likely to be an informal leader that may differ from others with respect to experience, skill level, or additional factors (Lucas and Oltman 1971).

In order to reliably estimate overall use for a wilderness area and compensate for the high variability of registration rates among different user groups and group members, visitor registration compliance must be determined. The compliance rate for visitor registration is used to estimate absolute numbers of total visitors; total use is calculated by taking the total number of registrants and dividing by the registration compliance rate (Lucas 1983). Furthermore, the compliance rate cannot apply to registration as a whole, as different user groups typically exhibit varying registration rates (Roggenbuck and Lucas 1987). Therefore, several separate compliance factors must be measured for particular types of users such as hikers, horse users, and hunters. In addition, compliance rates should be ascertained for each trail register, unless similar use characteristics are found at different locales (Leonard *et al.* 1980).

Registration behavior was not just simply observed; interviews up trail from the station were also performed to obtain names and addresses for those that did not register. Information on the size and characteristics of the visitor population to the HOR was required to ensure a representative survey sample, and therefore, it was necessary that the compliance rates for trail registrations be determined. In recent studies, electric-eye trail

traffic-counters have been used in conjunction with super-8 movie camera systems to determine voluntary registration compliances (Petersen 1985, Lucas 1983, Leatherberry and Lime 1981, Lucas and Kovalicky 1981), thereby, eliminating formal systematic human observation of registration behavior. The huge time expenditures required to obtain accurate information on compliance rates for different user groups in wilderness areas via personal contact tend to be more expensive than electric methods (Roggenbuck and Lucas 1987). However, the use of such technology was not desirable in this study, as names and addresses had to be collected for all user groups and group members that did not register at trailhead boxes.

To determine compliance rates for voluntary self-registration at trailheads, groups must be observed registering. A greater number of parties viewed at registration boxes translates to a higher level of accuracy and confidence in the estimate. The required sample size (i.e., the minimum number of registrants that must be observed) depends on the estimated probability that a party will register, the level of confidence desired, and the desired error in the compliance rate (Leonard *et al.* 1980). Since there was no prior information on use levels for the entire area, a 50 % probability of registration was assumed for all group types. A review of backcountry monitoring methods reported that compliance rates from voluntary registration may vary considerably between different user groups, with values ranging from 89 to 20 % (Hollenhorst *et al.* 1992). An average compliance rate value of 50 % was chosen for the HOR since groups (e.g., hunters) that tend to exhibit low registration rates frequent the area. To determine compliance rates to within 10 % at a confidence level of 95 %, and given a 50 % probability of registration rate, 96 registrants would have to be observed (Leonard *et al.* 1980). The amount of time spent validating use at a trailhead is determined by the amount of use the trail receives. For example, if a low-use trail averages less than one party per day it will take more than 96 days of trailhead registration validation.

Several factors contributed to the difficulty in obtaining estimates of visitor use in the HOR. A main problem was the dearth of prior information on overall use levels, the composition of the visitor population, and the respective use density and diversity for each of the major trails in the area. Knowledge of such parameters is critical in the design of efficient sampling strategies. However, as no information was available with respect to trail use, educated guesses of trail visitation were used to design the sampling protocol at the trail registers for both the fall and summer sessions.

Registration boxes were set up at seven major access points to the HOR. However, a lack of time and resources prevented the determination of compliance rates for each registration station. Consequently, an attempt was made to assess the compliance rate for one trailhead station during the months of July and August, and the rate for a separate trailhead during the fall months of September and October. It was assumed that trail use was similar with respect to user groups and use levels at the chosen trailheads.

Twelve randomly chosen sampling days were scheduled for both the summer and fall periods; of the twelve sampling days that were selected for each season, six were weekdays, while the remaining were weekend days. Sampling days started at 7:00 AM and lasted twelve hours. The trailheads chosen for the summer and fall seasons were based upon predicted use levels for each access point; the two trailheads presumed to receive the most use were selected.

Initially, the Palliser River trailhead was picked to measure use during the summer months; however, only one party was observed entering the area after four sample days. As a result, a different trailhead (Ralph Lake) was chosen for the remaining sample days, as it was determined through field observations to receive more frequent use. However, it was eventually discovered that this travel corridor was not the most heavily used trail; in addition, it also did not receive any horse use. Although it was soon realized that the Ralph Lake trail had the above limitations, a desired alternative trail

register (Forsyth Creek) could not be sampled, as it was located at the southern border of the wilderness area. Logistical constraints that prevented it from being used included remoteness, travel time, and other ongoing field projects. During the remaining eight summer sample days at the Ralph Lake trailhead, only four groups were viewed going into the area. Unfortunately, the total number of parties seen during the sample days was too small to permit accurate determinations of compliance rates.

The trailhead chosen (Middle White River) to validate trail registration compliance rates for the fall visitors to the HOR also suffered from low use levels. Only three hunter parties were observed at the trail register during seven sample days and two groups that had not registered refused to when asked if they would. Of the few hunter groups to visit the area during this period, only two names and addresses were collected from the registration stations. Consequently, the remaining five scheduled sample days were abandoned.

In summary, estimates of user density and diversity could not be accurately determined due to the paucity of observed registrants. Consequently, for both the summer and fall seasons, no reliable information was gathered on the size or the composition of the visitor population, and as a result, a representative sample could not be selected from the mailing list generated.

Another problem encountered with the mailing list generated from the registration boxes was that not all members from each group registered. This was ascertained by examining the registration slips; about one half of the time only one slip was filled out for one group and not one slip for each member of the group. This introduced group leader bias into the survey sample. In addition, the survey sample did not include clientele of the two local outfitters that operated in the area during the fall/hunting season (September - November).

In conclusion, problems encountered with the survey sample for HOR included: unreliable estimates of the total visitor population and the proportion of various user

groups during the summer and fall periods, non registration bias from hunter and horse groups, exclusion of commercial hunters, and group leader bias. Consequently, the survey sample may favour the more interested and committed wilderness visitors.

The non-representativeness of the mailing list raises the question as to whether the visitor survey should have been carried out, considering that study results would not collectively reflect the views of all visitors to the HOR. In particular, the registration list of the fall users was clearly incomplete and biased, because it consisted of only twelve individuals and did not include commercial hunters. As a result, the survey results obtained from the fall sample were omitted.

Even though it was not possible to quantitatively assess the representativeness of the summer survey sample, the composition of the mailing list coincided with best guesses of visitor use in the area. Visitor surveys, therefore, were sent to all names and addresses collected during the summer months. Although the summer sample was not representative of total visitation, the survey results still have value. Recognizing their limitations, the results can be used to help identify problems associated with visitor use and their respective causes, and thereby, guide recreation management actions for the area. Most importantly, however, the results provide baseline information to help guide future research on recreational use in the area.

5.2.2 Survey Design

The second major limitation to the HOR visitor study concerns the reliability and validity of the survey instrument. Reliability refers to the consistency of the measurement instrument and the methods used, whereas validity reflects whether the survey instrument measures the issues being studied. In order to minimize both types of error, parts of the questionnaire were adopted from previous studies designed to measure visitor preferences and norms. In addition, the survey was critically reviewed by several

recognized authorities in the recreation field including Dr. P. J. Dooling (associate professor, University of British Columbia), Dr. J. W. Roggenbuck (associate professor, Virginia Polytechnic Institute), Dr. R. Rutledge (B.C. Ministry of Forests), and Mr. W. Trotter (B.C. Ministry of Forests). Furthermore, the survey was pre-tested on visitors encountered in the area during the summer; however, due to infrequent meetings with recreationists, few field-tests were performed.

The limitation of the survey design reflects whether certain questions measure the desired parameters, including the selection of impact indictors and the evaluation of indicator standards. To identify salient impacts at backcountry campsites, respondents were asked to rate the importance of 13 social and biophysical factors affecting the quality of their wilderness experience on a five-point Likert scale. In general, the list consisted of typical campsite impacts that had been found in the literature to negatively affect visitor experiences. The format adopted from previous visitor studies (Roggenbuck *et al.* 1993, Whittaker 1992) may, however, have resulted in cueing. This describes the condition for which respondents are presented with options that do not necessarily represent the most important or salient conditions (Barro *et al.* 1994). Therefore, visitors to the HOR may have simply reacted to the listed impact items rather than engaging in cognitive thought to determine which factors really affected their recreational experiences at wilderness campsites.

To identify salient impacts a compositional design was used. "In the compositional approach, it is assumed that individuals can directly express the importance of each separate attribute and the relative and the absolute position of each attribute of each alternative" (Haider 1993). Therefore, respondents were required to make evaluative judgments outside of a specific situational context. Past studies on the relative importance of encounters to the recreational experience have demonstrated that the overall effect depends more on situational factors, such as where the encounter took place, and the behavior of groups met, than simply the number of people (Kuss *et al.*

1990). Alternatively, a decompositional approach (Haider 1993) may be a more valid way to identify salient impacts; this method measures visitors' preferences toward hypothetical combinations of various ecological and social backcountry campsite impacts.

To determine impact standards for backcountry campsites in the HOR, an open-ended response format was used. Respondents were asked to indicate their maximum acceptable, unacceptable, and preferred conditions with respect to specific biophysical and social campsite impacts. Normally when researchers ask this type of question in a visitor survey, they have prior knowledge on a number of attributes judged important or salient to area visitors. As mentioned above for indicator selection, this information was not available for the HOR, and consequently, a generic list of campsite impacts identified as being important in past studies was used. Therefore, it is possible that: 1) other impacts that were potentially important to visitors were not evaluated for impact acceptability, 2) respondents did not indicate an acceptable level of impact, because the impact was not important to them, 3) the impact was important to them, but they were not able to quantitatively express acceptable impact levels, or 4) respondents who did answer either guessed, or provided a number to please the researcher. Although the potential for such errors presents a realistic concern, the interpretation must assume that the answers given reflect the survey respondents' standards.

5.2.3 Mailback Questionnaire Method

As mentioned previously, obtaining a representative sample of wilderness visitors is the major weakness of any visitor survey, regardless of whether they are conducted through personal contact or via mail correspondence. Less accurate recall of mail surveys compared to personal on-site interviews (Lucas and Oltman 1971), however, presents a concern. To assess this problem, on-site interviews of HOR visitors were to be

conducted at backcountry campsites to determine whether answers given to survey questions in field interviews were consistent with those gathered in the mail survey. However, no parties were encountered at any of the wilderness campsites during trips into the area for the summer months, and consequently, this query could not be tested. A comparison of interview and mail survey results, however, may not have resolved whether differences were attributed to less accurate recall, as background features such as the quality of the campsite scenery may also influence responses given to personal on-site interviews (Shelby and Harris 1985).

5.2.4 Designation Status

The change in the protected area designation for the HOR presents a major factor which may limit the application of this research. As of the summer of 1995, the area became a class A provincial park, with the B. C. Ministry of Environment, Lands and Parks now responsible for its management. The information gathered from the 1994 visitor study, therefore, may no longer provide baseline data upon which future management actions or research projects can be drawn, as the new designation may change the composition and characteristics of the visitor population. Marking the HOR as a provincial park on the B.C. road map will attract new first time visitors and may displace previous users. Furthermore, a change in the management mandate for the area may exclude some present recreational user groups, such as hunters and horse users.

5.3 Impact Indicators

The fundamental principle of the LAC management framework is to define wilderness quality through the establishment of standards for relevant impact variables, otherwise referred to as indicators (Stankey *et al.* 1985). Indicators are resource and

social parameters that reflect the overall condition of the wilderness and can be viewed as specific elements of the wilderness setting that change as a result of human activity (Merigliano 1989). Indicators are an integral component of the LAC process and serve many purposes; they can be used to present pertinent information to wilderness management in an understandable and easily communicated form, to examine past trends in backcountry conditions, and to predict future wilderness quality with respect to the resource and visitor experience. Furthermore, when compared to defined standards, indicators can signal the need for management actions, and evaluate the effectiveness of implemented management strategies (Merigliano 1989).

Numerous variables can be used to define wilderness quality; however, addressing and monitoring all measurable parameters that might potentially impact the resource or users' experiences is economically and logistically impractical. Wilderness managers, therefore, need to choose a complimentary set of indicators to reflect a comprehensive measure of the overall wilderness condition. The works of Merigliano (1989), Stankey *et al.* (1985), and Whittaker and Shelby (1992) have devised basic criteria for evaluating potential indicators. The best are those that are quantifiable and can be measured reliably, economically, and with reasonable accuracy. In addition, such indicators should be sensitive to small changes in impact levels, responsive to management actions, reflect impacts related to the amount or type of human use, represent several different impact types, and be of significance to wilderness users. Although guidelines for evaluating indicators have been proposed, little empirical research (Roggenbuck *et al.* 1993, Whittaker 1992) has addressed the problem of their selection.

The issue of indicator selection has been examined by exploring the relative influence of potential indicators on the quality of visitor experiences (Roggenbuck *et al.* 1993, Whittaker 1992). The LAC process suggests monitoring a small number of wilderness quality indicators (Watson *et al.* 1992) that include those deemed most significant to user groups. These, of course, should be used to complement those

principal biophysical indicators that have been determined to be sensitive to ecological changes in the natural environment. Visitor surveys provide a useful way to assess the importance of various impacts on wilderness experiences.

Visitors to the HOR were asked to rate the importance of 13 ecological and social impacts at backcountry campsites in determining the quality of their experience. Possible response categories were: not at all, slightly, moderately, very, and extremely important. The format of this question was similar to those used by Roggenbuck (1993) and Whittaker (1992), except that the latter separated responses into: does not matter to, adds to, detracts, and highly detracts from experience. Whittaker's response format may be preferable to the one used in the present study as it can be used to determine whether an impact has a negative or positive influence on experiences. As previously mentioned, the results from the 1994 HOR summer survey do not represent the views of all visitors to the area, and therefore, results with respect to indicator selection should be treated accordingly. However, an examination of the relationship between potential campsite indicators and visitors' experiences may provide some insight into this key LAC component.

The relative influences of the potential campsite indicators on the quality of respondents' experiences in the HOR are shown in Tables 19 and 23. Similar to other studies (Watson *et al.* 1992, Whittaker 1992), the highest rated impact item was the amount of litter seen at wilderness campsites. Of the thirteen presented indicators, nine were rated on average as being very or extremely important in determining wilderness quality at backcountry sites. Roggenbuck *et al.* (1993) also reported the importance of many campsite impacts in a comparative visitor perception survey of four wilderness areas in the southeastern United States. The results of the survey concur with past research (Whittaker 1992, Lucas 1979), in that respondents indicated more concern for social conditions, such as encounters with hunter, hiker and horse groups, party size,

group behaviour, and the presence of human-made structures, than with resource conditions at campsites.

User input is a recognized component of the decision-making process in LAC management, and as a result, chosen indicators should represent the concerns of wilderness visitors. However, given the high degree of concern for most of the campsite impact indicators, debate arises over which ones should be chosen to reflect experience and resource conditions. For example, the listed social and ecological impact items were all quantifiable and could be measured.

The work of Roggenbuck *et al.* (1993) allude to problems that are associated with indicators chosen solely upon visitor input. First, indicators ranked most highly by visitors may not necessarily represent those parameters most suited to maintain the well-being of the environment. In the HOR, for example, the seven highest ranked indicators all represented dimensions of the social setting found at campsites. Although vegetation loss and tree damage were of concern to most visitors, attributes that represented the biophysical condition were relatively unimportant compared to social factors. Second, a large number of the survey items listed may be rated as being important in determining the quality of the wilderness experience. In this study, for example, respondents exhibited at least moderate concern for 11 of the 13 listed parameters. Highly ranked indicators, however, are often inter-correlated and may not all need to be monitored. Such factors such as, the size of groups, the behavior of party members, and the type of user groups camped within sight or sound, for example, all represent specific dimensions of campsite encounters. Finally, not all items rated most important to the quality of wilderness experiences can be easily measured. Occurrences of inappropriate behavior at wilderness campsites were found to be critical to visitor experiences; however, such parameters are hard to quantify and evaluate.

Heeding the difficulties associated with selecting variables to define wilderness quality and the multi-dimensional character of the wilderness experience, indicators

selected should reflect a diversity of conditions that collectively represent the wilderness concept. The results of the HOR study demonstrate that social and resource site conditions greatly influence visitors' experiences at wilderness campsites. Given the high concern respondents exhibited to social and resource indicators, it is recommended that an overall impact index and the number of existing sites be adopted as two indicators to measure and monitor campsite quality. In addition to social factors, impact indices can be derived from various biophysical impact parameters, such as tree damage, root exposure and vegetation loss; these indicators are relatively easy, and inexpensive to monitor. In addition, some social impacts, such as the amount of litter, the presence of human-made structures, and the number of camping sites, are also readily and quickly measured. There are several overall campsite monitoring systems (Cole 1989) available that incorporate various social and ecological indicators; however, they do not address campsite encounters. Encounters at backcountry campsites are more difficult and costly to monitor, as accurate measures require personal observation. In light of the differing reactions respondents exhibited with respect to encounters with varying user groups, party sizes and group behaviors, it is important to differentiate between each encounter type (Watson *et al.* 1992). Horse and hiker encounters, for example, represent two contrasting dimensions of the recreation experience. Information on encounters can also be gathered from visitor studies, however, as discussed previously, it is costly to obtain reliable surveys results.

A recent study by Cole (1995) demonstrated the difficulty in avoiding ecological impacts at campsites even when use levels are minimal and low-impact camping practices are used; campsites that received use frequencies as low as one night per year were subject to observable vegetation loss. Furthermore, the results corroborate with earlier findings that demonstrated that the rate of biophysical impact decreases as use frequency increases (Cole 1990, Cole and Marrion 1988, Cole 1987, Cole and Fichtler 1983). In order to minimize ecological impacts, Cole (1995) suggests confining disturbances to a

small number of sites instead of dispersing impacts among many campsites. Campsite number, therefore, presents an important indicator of ecological impacts, as it provides a measure of the areal extent of these impacts and allows trends to be examined.

Campsites only represent one element of wilderness, and thus, managers must be aware of other attributes that contribute to the complex, multi-dimensional construct of visitors' experiences. Indicators can be selected for other wilderness conditions by examining the attributes that draw people to an area. The visitor survey asked people to rank the importance of eighteen reasons for visiting the HOR. Of those listed, eight were rated as being very or extremely important and primarily reflected the wilderness dimensions of solitude and naturalness. Indicators that define these elements, therefore, should also be monitored to help maintain the overall wilderness experience. These particular dimensions, however, are complex constructs, and warrant future research in order to evaluate how these values should be best represented.

5.4 Indicator Standards

Defining wilderness quality has become an increasingly important component of the LAC management planning framework. Recently, much attention (Roggenbuck *et al.* 1993, Vaske *et al.* 1993, Shelby *et al.* 1992a, Watson *et al.* 1992) has turned towards developing standards for indicators that characterize specific measures of the wilderness setting. Standards define wilderness quality by designating a desired range of natural or social conditions considered to be appropriate and acceptable for selected indicators in a particular wilderness area or management zone (Stankey *et al.* 1985).

The value of standards to wilderness management is paramount as they provide a solid basis for management direction by expressing the type of wilderness experience to be provided (Shelby *et al.* 1992b). Most importantly, standards provide a baseline from which the rate of change in wilderness conditions can be identified, measured, and

monitored. In addition, emphasis on desired conditions encourages the use of pro-active management strategies to maintain these settings. Regardless of their importance, however, there is little information available on how appropriate standards should be developed.

Whittaker and Shelby (1992) outlined characteristics that constitute ideal standards, suggesting that they should reflect attainable, quantifiable measures. However, consideration of these attributes represents only one component in the establishment of appropriate standards. Whittaker and Shelby (1992) also identify sources that contribute to their development; they include laws or policy mandates, managers' professional judgment, scientific research, and public involvement. The results from the HOR summer visitor survey, therefore, provide one recognized technique from which indicator standards can be established.

Except for the number of campfire rings, at least 50 % of respondents indicated that they preferred no amount of impact at backcountry campsites in the HOR for the listed social and ecological factors. Similar to other studies (Shelby and Shindler 1992, Shelby *et al.* 1988a), an examination of the data revealed that 75 % of respondents preferred the presence of one or more campfire rings to none. There was less shared agreement, however, toward the highest level of change respondents were willing to accept at backcountry campsites. Nevertheless, the acceptable standards for the listed campsite indicators were similar to those found by Roggenbuck *et al.* (1993). For all impact items except vegetation loss, the boundary for unacceptable impact levels was directly adjacent to the boundary for maximum acceptable levels. For example, the median highest acceptable number of damaged trees was two, and following an intuitive progression, the median unacceptable damage was three trees. However, for vegetation loss, there was an intermediate range between the two limits that was neither acceptable nor unacceptable; the median highest acceptable level was 10 % vegetation loss while the

median unacceptable value was 30 %. Respondents, therefore, may be more tolerant toward a higher range of vegetation loss at wilderness campsites than indicated.

Comparisons of preferred and maximum acceptable amounts of impact help identify the range of conditions that are deemed appropriate by visitors. For the HOR, respondents defined wilderness quality at backcountry campsites as having minimal ecological alterations with respect to vegetation loss, tree damage, campfire rings, and camp litter, and favouring between zero to two hiker and zero to one horse groups camped nearby (see Tables 20-22 and 27-29). These desired campsite conditions are representative of semi-primitive non-motorized and primitive wilderness settings outlined by the Recreation Opportunity Spectrum (ROS) planning framework (Driver *et al.* 1987), the ROS also forms the basis upon which the three management zones for the HOR were delineated (Ministry of Forests 1993).

However, do present conditions at backcountry campsites in the HOR meet the ROS guidelines for primitive and semi-primitive recreation opportunities at campsites? This was determined by comparing the difference between visitor standards and actual ecological and social impact levels, since the former was shown to reflect the character of the two ROS settings. The condition of campsites found within the wilderness area was assessed in the summer of 1994 using the Rapid Estimation Procedure developed by Cole (1989) (see Appendix VII). With respect to measured site impacts, the median values for tree damage, vegetation loss, litter, and human-made structures at backcountry campsites well exceeded the desired range expressed by respondents. The appropriate range of vegetation loss indicated by respondents reflects a low degree of impact; however, due to the curvi-linear relationship between use and impact (Cole 1995, Cole 1990, Cole 1987, Cole and Fichtler 1983), very low use levels would be required to maintain this desired campsite condition. The median number of one campfire ring per site, however, concurred with visitors' standards. For camp encounters, respondents were asked to indicate the number of hiker and horse groups and the occurrences of discourteous

behavior by other groups camped nearby their site. In regard to actual encounter levels, the values given (Table 24) fell within the ranges considered acceptable to respondents; yet, the number of reported incidents of behavioral problems at campsites exceeded visitors' standards. On the whole, average wilderness campsite quality in the HOR does not currently meet visitors' standards for certain ecological and social impacts, including vegetation loss, tree damage, litter, human-made structures, and the occurrence of discourteous behavior. Consequently, primitive or semi-primitive wilderness experiences desired by respondents are not provided at some campsites.

An interesting discrepancy was found upon comparison of respondents acceptable standards with their overall perceptions of campsite conditions. Although visitor standards (see Tables 19-20 and 27-28) indicated a preference for impact levels lower than those observed, most felt that there was no problem when asked about their perception of the respective parameters (see Figures 5 and 6). For impact levels that concurred with visitors' desired range of conditions (i.e., encounters with other groups or the number of campfire rings), over 90 % of respondents did not perceive that there was a problem with respect to these factors. However, although some respondents exhibited some concern with the amount of human-made structures, litter, vegetation loss, tree damage, and occurrences of discourteous behavior, most (at least 68 %) reported no problems with these disturbances even though existing conditions exceeded visitors' standards. Only a few respondents indicated that there was a serious problem with conditions at wilderness campsites.

The discrepancy between respondents' attitudes towards acceptable levels of impact for ecological conditions and their perceptions of the existing condition in terms of these factors at campsites, may suggest that not all wilderness users are able to adequately quantify, and therefore, express acceptable impact levels. More specifically, it is doubtful that respondents were able to declare acceptable amounts of vegetation loss or tree damage because they represented less tangible impacts than litter, number of

human-made structures, or encounter levels. Furthermore, fewer respondents gave an answer for their attitudes towards preferred, acceptable, and unacceptable amounts of vegetation loss and tree damage than other listed items. The low response rate indicates that respondents either cared about the two items but could not quantify these parameters, or simply that they did not care about them. It probably reflects the former, as 75 % of respondents rated both vegetation loss and tree damage as being moderately to extremely important in determining the quality of their experience at the wilderness campsites they visited. Therefore, for evaluating visitor standards for ecological impacts, it may be more useful to utilize a methodology that visually presents a range of predetermined ecological impact conditions to respondents.

The low response rates exhibited by respondents with respect to their attitudes towards acceptable and unacceptable impact levels, and the variability among answers given, may indicate that collective norms do not exist for expected or desired social and ecological conditions at wilderness campsites. As mentioned previously, the task of making numerical judgments regarding preferred or acceptable social and ecological impacts may be too abstract or hypothetical to result in meaningful standards (Williams *et al.* 1992). Alternatively, it may reflect that the campsite impacts listed were not as important to the wilderness experience as other dimensions such as naturalness, freedom, or adventure. Moreover, treating the survey sample as a whole may explain the variability among respondents' attitudes towards appropriate conditions, as the views of different user groups and types were ignored. Horse and hiker groups, for example, may exhibit different campsite standards, or some respondents may have lacked preconceived norms due to a lack of previous wilderness experience. Lastly, collective norms may not exist because each individual's personal level toward preferred or acceptable campsite conditions are influenced by differing expectations and past experiences. Regardless of whether norms exist, it is important to acknowledge the wide range of respondents' opinions toward desired and acceptable conditions at backcountry campsites, as it

provides information on the range of wilderness experiences visitors presently gain or hope to gain from the HOR.

The diversity of standards exhibited by the HOR respondents presents a challenge to the management of the area. However, it is important to remember that visitor studies provide only one source from which standards should be developed (Whittaker and Shelby 1992), and that problems may be encountered if standards are solely based on user involvement. For example, as use levels to an area increase, visitors tend to employ various coping strategies to maintain high satisfaction in the face of worsening ecological and social impact conditions.

Individuals that are dissatisfied with changing environmental and social conditions will tend to be displaced to other areas that provide the wilderness experience they seek; this strategy is recognized as a behavioral adjustment (Shelby *et al.* 1988b, Shelby and Heberlein 1986). Conversely, other visitors will change their wilderness experience expectations in response to increasing use densities (product shift), and consequently, alter their attitudes towards acceptable resource and social settings (Shindler and Shelby 1995, Shelby *et al.* 1988b). Displacement has a much broader research base, whereas until recently, there has been limited empirical evidence of the product shift phenomenon. In 1991, Shindler and Shelby (1995) re-surveyed members from Shelby and Colvin's 1977 study of floaters on the wild section of the Rogue River in the United States (Shelby and Colvin 1979). Since 1977, recreational use has increased in the absence of concomitant shifts in management plans; as a result, social and ecological conditions had deteriorated along the river. Results were analyzed for those who had made subsequent visits to the area since the first study. Examination of the findings indicated that repeat visitors had changed their experience expectations toward a higher density level than in the previous study, and as a result, the number of acceptable river encounters had increased.

Over time, visitors to an area may tend to become more tolerant toward higher impact levels, as previous users with more purist views can be displaced to other areas or can alter previously established evaluative standards to correspond with deteriorating conditions. As a result, standards based solely upon visitor input may become less restrictive over time, since visitors who are willing to accept greater impact levels will form the visitor population, and therefore, dictate desired or appropriate conditions (Shindler (1992) refers to this as the law of diminishing standards).

The diverse views of users can jeopardize the natural resources and ecosystems found within wilderness areas if all become infused into management plans. It is important, therefore, to have clear management objectives that define specific environmental conditions and recreational opportunities to be maintained or achieved. The HOR, for example, is meant to maintain and protect the southern Canadian Rocky Mountain natural environment (Ministry of Forests 1993); consequently, less restrictive attitudes towards impact levels that may endanger any component of this ecosystem should not be adopted. In developing wilderness standards, too much emphasis can be placed upon user preferences at the expense of environmental quality. As wilderness represents a state-of-mind rather than a physical place, visitor involvement helps ensure that standards reflect and provide high quality wilderness experiences. However, relationships between ecosystem processes and recreational use must also be considered in order to preserve the values wilderness areas were designated to protect.

In conclusion, the HOR visitor study examined visitors' opinions of acceptable social and ecological conditions at wilderness campsites. Respondents exhibited a range of appropriate or desired impact levels and defined wilderness campsite quality as being representative of primitive and semi-primitive wilderness settings. Other factors, however, warrant consideration before wilderness standards are formally developed. As stated previously, the views of all users were not included; day users, for example, were not solicited about their attitudes towards campsite environments. Furthermore, other

wilderness conditions that are important to maintaining ecosystems and wilderness experiences, such as solitude, freedom, naturalness, and adventure also need to be monitored.

5.5 Variation of Indicators and Standards between Management Zones

Wilderness areas are usually zoned to provide different experience opportunity classes. These classes define resource, social, and managerial conditions considered desirable and appropriate for each zone (Stankey *et al.* 1990). The management plan for the HOR, for example, aims to maintain primitive and semi-primitive non-motorized recreation opportunities through the designation of three distinct wilderness zones (Ministry of Forests 1993). Management zone I represents primitive conditions that are characterized by unmodified natural environments, very low interaction between users, and minimal evidence of other users. In contrast, permanent trails and campsites are provided in zones II and III; these two reflect semi-primitive non-motorized settings and are predominantly natural, except for the visible evidence of trails, campsites, and other recreational users. In addition, zone II has more restrictive guidelines with regard to the prevalence and extent of resource and social impacts than zone III.

Various recreational experiences and opportunities can be provided within a single wilderness area. Social and resource conditions considered appropriate, however, will differ between the various zones. As a result, Stokes (1990) and Stankey *et al.* (1985) suggest that different indicators and standards are often appropriate for individual zones of a single wilderness area. An objective of this study, therefore, was to compare users' perceptions of indicators and standards across the three management zones in the HOR. Prior to discussion of this matter, however, general information pertaining to this objective is presented.

Before the study was initiated, there was no information available upon the location of most backcountry campsites in the HOR. Areas that received a zone I designation represented steeply contoured landscapes, and as result, it was presumed that most summer visitors would not visit these areas. As expected, no respondents indicated that they had camped within zone I. It was assumed, however, that there would be established sites in both zones II and III. An inventory the area (Appendix VII, see Figure 3) revealed only two campsites in areas designated as zone II (Ralph Lake and Goat Basin); the remaining campsites were located in zone III. However, of the two campsites found in zone II, only one (Ralph Lake) received any use during the summer months. As a result, only fourteen of the fifty-eight respondents (24 %) who stayed overnight in the area camped within this management zone. The small sample size (n=14) makes statistical comparisons between management zones difficult. Moreover, the recreational opportunities found at this campsite in zone II, did not differ significantly from sites in zone III. The former site, however, did not receive any packstock use, and consequently, resource impacts such as vegetation loss and root exposure were not as prevalent compared to other camps in zone III.

5.5.1 Impact Indicators

This section explores differences in respondents' perceptions of impact indicators for backcountry campsites according to the management zone they camped in during their visit to the HOR. Visitors to zone II exhibited more concern for all but one of the biophysical and social impact items than those that stayed overnight in zone III (see Table 30). For example, litter, horse group encounters, vegetation loss, the size of groups encountered, occurrences of discourteous behavior, hiker groups encounters, tree damage, and human-made structures were rated as being extremely important to at least 50 % in determining the quality of recreational experiences for zone II respondents. Conversely,

the presence of litter was the only impact item rated by at least 50 % as being extremely important to experiences of zone III visitors. Occurrences of discourteous behavior, human-made structures, the size of parties met, and horse group encounters while at campsites were rated as being extremely important to only 45, 29, 45, and 33 % of zone III respondents respectively. Indeed, the median ratings for vegetation loss, campfire rings, and tree damage all represented moderate importance ratings.

Overall, the disparity between the two zones may suggest that both social and biophysical conditions affect visitors' experiences in zone II, while visitors' experiences in zone III are only sensitive towards impacts to the social setting. Although zone II respondents indicated concern for biophysical impacts, parameters that reflected social conditions were usually rated as being more important. The results agree well with other studies which have shown that social conditions matter more to visitors than biophysical settings (Whittaker 1992, Lucas 1990b). Of particular interest, in both management zones, was the high importance of horse group encounters compared to hiker groups; respondents seemed to be less tolerant towards horse parties met than hikers at backcountry campsites.

The results may support the notion that different campsite indicators should be chosen for the two management zones. To maintain high quality recreational experiences at backcountry campsites in zone II, both biophysical and social conditions would need to be monitored, and zone III would only require the latter. The LAC process, however, aims to maintain both recreational experiences and natural settings (Stankey *et al.* 1990), and therefore, the campsite indicators for the two zones should represent both biophysical and social conditions. As a result, the recommended campsite indicators (an overall campsite rating index, a measure of campsite encounters, and the number of established sites) should apply to both zones.

The difference in visitor perception of campsite indicators between the management zones, however, may be due to the small sample size of respondents (n=14)

that camped in zone II. The respondents to zone II may have held more purist views with regard to wilderness conditions, and therefore, skewed the results towards a higher level of concern. Nevertheless, with respect to the condition of backcountry campsites, social and biophysical attributes are important to the maintenance of high quality recreational experiences and the well-being of the environment, regardless of the wilderness zone designation. Therefore, for zones II and III that permit established campsites, the same indicators should apply for each. Standards, however, should vary between zones if there are notable difference with respect to the recreational opportunities provided.

5.5.2 Indicator Standards

Visitor attitudes towards preferred conditions and maximum acceptable levels of impact provide one source of information used in the development of standards (Whittaker and Shelby 1992). Wilderness zones represent different recreational opportunities, and therefore, appropriate or desired biophysical, social, and managerial settings may vary between zones (Stankey *et al.* 1990). In consideration of the latter statements, the following section examines whether respondents that visited management zones II and III in the HOR held different views towards desired and acceptable impact levels at backcountry campsites.

On the whole, there was considerable agreement across the two zones with regard to preferred, maximum acceptable, and unacceptable levels of impact to social and biophysical conditions at wilderness campsites (see Tables 31 - 36). Except for campfire rings, there was near consensus with respect to preferred campsite conditions among zone II and III respondents. Furthermore, the observed differences in acceptable impact levels between zones usually only varied by one or two values. These finding are surprising, as the small sample size associated with zone II could have potentially skewed parameter distributions.

In general, respondents that camped in both zones held restrictive views with respect to acceptable social and biophysical impact levels. For example, it can be interpreted that 75 % of visitors would have accepted no more than one campfire ring or one hiker group encounter per site, and no amount of tree damage, litter, human-made structures, horse group encounters, or episodes of discourteous behavior. For both management zones, respondents were more tolerant towards hikers than horse groups at campsites.

The considerable inter-zone similarity exhibited between the respondents' perceptions of standards may suggest that the recreational opportunities between these two management zones do not provide significantly different wilderness recreation experiences. The frequented campsite in zone II (Ralph Lake), for example, was one of the more popular destination areas in the HOR and was readily accessible by a one day hike. Furthermore, this zone II area contrasted greatly from other zones that bear the same designation; most of the other zone II areas do not have established trails or campsites. The Ralph Lake campsite, therefore, may not be representative of other campsites in zone II areas, and consequently, caution should be exercised upon interpretation of the results. In addition, due to the small sample size of zone II respondents, comparisons between zones are also precarious.

CHAPTER SIX

RECOMMENDATIONS AND FUTURE RESEARCH

6.1 Introduction

In this chapter, major findings of the study are summarized and recommendations concerning these aspects are provided. More specifically, management strategies with respect to pattern of use, indicator selection, standard setting, management zone classification, campsite condition, and designation status are discussed. Furthermore, future areas of research are also suggested. It should be noted that this section includes some previously discussed results in order to present a suitable background for various recommendations, and is not meant to be repetitive.

The HOR study was intended to present information on two components of the LAC management process; more specifically, visitor input was solicited to help develop indicators and indicator standards for backcountry campsites. As stated previously, disturbances at wilderness campsites are usually highly concentrated, and as a result, conspicuous evidence of human use may lead to serious visual impacts. Localized social and biophysical impacts, therefore, may potentially affect the quality of the wilderness experience, as visitors tend to spend more time at campsites than anywhere else in wilderness (Cole 1990).

The LAC framework recognizes that both natural and anthropogenically-induced changes to the wilderness condition are inevitable. Consequently, the goal of management is to keep character shifts and the rate of change due to human factors within acceptable levels. To achieve this, LAC advocates defining appropriate and desired wilderness conditions through the selection and setting of indicators and indicator standards. Public involvement has commonly represented one important source of

information used to develop suitable indicators and standards. The HOR visitor survey, thereby, provided one method for backcountry users to participate in the LAC process.

The employed survey made available information on visitors' experiences and perceptions of impacts at backcountry campsites. Although social values are an invaluable component in the LAC planning process for defining wilderness quality, it must be realized that the foundation of backcountry management should ultimately be based upon maintaining natural processes and systems. The development of a backcountry campsite management strategy for the HOR, therefore, should aim to protect and maintain both natural environments and high quality wilderness recreational experiences. Although the study examined only factors that influenced visitors' wilderness experiences, the following recommendations are examined within the contexts of both social and biophysical considerations.

6.2 Pattern of Use

Pattern of use describes the nature of visitation to an area, and encompasses visitor demography, routes taken, mode of travel, activities participated in, and trip characteristics. An emphasis on use patterns rather than the amount of use underlies one of the primary philosophies of the LAC planning framework (Stankey *et al.* 1990). Visitor profile information is important, as social and ecological impacts caused by human use are influenced to a greater extent by use characteristics than by absolute magnitudes of use. Qualitative information on use and users, therefore, helps to identify causes and solutions to human-induced impacts to the wilderness condition (Roggenbuck and Lucas 1987). In addition, knowledge of visitors and their use of wilderness is considered essential to proactive management, and therefore, ensures that management actions will not detract from wilderness experiences (Roggenbuck *et al.* 1993). Most importantly, such visitor studies provide baseline information for comparing the nature of

use and users in the future, and helps to identify trends and predict their driving influences.

There were several important findings with respect to the summer visitor and visit characteristics in the HOR in 1994. First, summer visitors were comprised of both hikers and horse users; however, hikers formed the majority of respondents. Although conflicts did not appear to exist between these two groups, hikers seemed to be less tolerant toward horse group encounters than those with other hikers. Conflicts may take many forms (Lucas 1990b); therefore, it is recommended that future management action addresses the nature and extent of conflicts that may exist between hikers and recreational stock users. Use during the summer months primarily transpired in August, as high water levels inhibited travel in June and July. As a result, most use took place during relatively drier periods, and therefore, it can be proposed that the extent of biophysical impacts to trails and campsites was minimized. However, it should be realized that users that visit prior to August, particularly horse parties that are able to cross high creek levels, may impart considerable resource damage. Educating visitors about resource impacts associated with wilderness travel during wet periods, such as spring and early summer, may help to alleviate this problem. The survey results also indicated that several visitors used mountain bikes as a mode of transport; management actions may become necessary, as the use of bikes is currently prohibited in the HOR. The survey also revealed that certain areas received mountaineering use, and therefore, potential long-term impacts to the mountain environment that can occur from relatively brief periods of use should not be ignored.

The high percentage of small group sizes reported during the summer months is favourable, as smaller groups tend to have less effect on both natural conditions and wilderness experiences at backcountry campsites than larger parties (Cole 1990, Lucas 1990b, Cole 1987). Furthermore, there did not appear to be a problem with the number of horse and hiker encounters. With respect to summer travel patterns, visitors tended to

concentrate at two major destination areas (Ralph Lake and Connor Lakes), and consequently, use may have to be dispersed to other existing trail systems if it appears that these areas are too becoming heavily impacted.

From the survey, it was ascertained that summer visitors consisted mainly of local residents from the surrounding areas. These local users, therefore, may serve as indicators of changing wilderness conditions, as these visitors may seek recreation in other areas if worsening social and/or resource impacts threaten the existing quality of the wilderness experience. Lastly, the high level of education exhibited by the summer survey respondents indicates that lighthanded management actions such as visitor education programs may be appropriate for influencing behavior in the HOR.

It is important to re-emphasize that the summer survey sample was not representative of all users, and consequently, future research should be addressed at providing more reliable information on total and seasonal use characteristics.

6.3 Indicator Selection

One objective of the study was to develop indicators which were representative of the overall condition of backcountry campsites. Potential indicators, therefore, included parameters that depicted both the natural setting and the wilderness experience. However, the study only investigated the level of concern visitors had for various aspects of the biophysical and social campsite setting that potentially affected wilderness experiences, and consequently, did not necessarily examine variables that were important to maintaining the overall well-being of the HOR.

The survey results demonstrate, as in other studies, that impacts to social conditions at wilderness campsites are generally more important to visitors than biophysical impacts. Visitors reported, however, that biophysical parameters were also highly important in determining the quality of their experience. As a result, it is

recommended that an overall campsite rating index be adopted as an indicator of backcountry campsite condition. In addition, it is also necessary to monitor the various dimensions of campsite encounters such as group type, size, and behavior, through future visitor studies. In order to maintain the ecological integrity of wilderness in the HOR, it is recommended that the total number of campsites also be used as an indicator, as the spread of such long-term biophysical impacts may not only threaten wilderness experiences but also the state of the natural environment.

The visitor study focused on a narrow aspect of the wilderness recreational experience, namely, backcountry campsites. The survey results also indicated, however, that other dimensions of the wilderness experience such as solitude, freedom, naturalness, and adventure also presented important qualities to summer visitors. Future research is required to define each dimension of the overall wilderness experience with appropriate indicators. The formulation of suitable indicators will hopefully ensure that the southern Canadian Rocky Mountain natural environment found in the HOR is preserved for present and future visitors.

6.4 Standard Setting

Visitor standards for acceptable levels of impact were explored with respect to various biophysical and social conditions at backcountry campsites in the HOR. Standards are used to define wilderness quality, and largely represent value judgments regarding desired and/or appropriate conditions. The issue becomes one of determining whose value judgments should be considered foremost in standard formulation. Sources of information that contribute to the development of standards include managers' professional judgment, scientific research, environmental processes, and legal and policy mandates. The LAC planning process also recognizes that these decisions are made more defensible through public input.

The data collected on standards for campsite conditions not only provided information pertaining to visitors' norms but also revealed limitations associated with using visitor input to develop standards. Interpretation of the results allude to both methodological and theoretical issues involved with the use of normative data, and therefore, questions the importance of visitor input.

Comparisons of actual biophysical and social conditions at backcountry campsites with visitor standards revealed that on average, biophysical impacts such as vegetation loss, tree damage, litter, and human-structures at sites, exceeded the amount of impact that most respondents indicated they were willing to accept. However, when asked about their perceptions of existing campsite conditions, most visitors felt that there was not a problem with the state of these impact items. This discrepancy raises the question as to whether visitor standards from the survey, with regard to the maximum acceptable levels of biophysical impact, represented campsite conditions they desired. It should be noted that an open-ended response format was used to solicit visitor standards for these biophysical impact items; therefore, visitors may not have been able to quantify their preferences. Consequently, it is recommended that visual representations either through photographs or artistic illustrations be used to asses users evaluations of less tangible campsite impacts.

The generally low level of common responses for visitor standards fosters debate as to whether collective social norms exist for wilderness conditions. The lack of consensus, however, may be attributed to how questions are asked, and whether salient issues are addressed. The HOR survey, for example, was structured such that for each question, people were asked to provide preferred, maximum acceptable, and unacceptable levels, in that order. Response rates for each parameter progressively decreased in this sequence, suggesting too much of a burden may have been placed on respondents to answer all of these impact levels. Furthermore, norms may not be well established in the minds of all wilderness users, and therefore, to increase the validity of standards given, it

is recommended that the response format be revised in future studies to include two separate categories that permit visitors to say either "they do not care about the item", or, "they care but cannot give an answer".

It is possible that the typical approach used to examine visitor standards (i.e., HOR survey) does not provide the information that is sought; in other words, it does not accurately reflect visitors' opinions. As a result, more meaningful public involvement may be required. Visitors, for example, must clearly understand what is asked of them and what their answers represent. Therefore, future research needs to address whether visitor standards actually reflect the level of impact or the wilderness experience that users prefer or are willing to accept. Similarly, research is also needed to address whether collective norms exist amongst users regarding wilderness conditions, and if not, wilderness quality may require redefinition.

Lack of consensus with respect to campsite standards may reflect the presence of different user groups within the summer sample, each of which, may have had high intra-group agreement. As stated previously, no reliable information on the composition of the summer visitor population was collected, and consequently, variation between user group standards could not be addressed. Future examination is, therefore, needed to assess whether a significant spectrum of standards exist for the variety of public user groups that wilderness managers must consider.

The wide range of visitor opinions with respect to acceptable wilderness conditions demonstrates the potential complexity involved in decision making. Not everyone requires the same degree of pristine resources to have a high quality wilderness experience; indeed, previous exposure, expectations, and personal background all contribute to visitors' perceptions (Kuss *et al.* 1990). To resolve inter-group disparity in the HOR, a future study designed to identify individual perceptions of wilderness between various user groups might help implement more effective management strategies. For example, it would beneficial to identify those users that desire facility-

oriented recreational experiences, so that they can be directed to areas other than wilderness that meet their recreational requirements.

Although there was complete consensus amongst 50 % or more of respondents with respect to preferred campsites conditions in the HOR, the results do not provide a useful source for developing standards for certain biophysical parameters. The stringent standards desired for vegetation loss, for example, are not realistic, as even low amounts of human use inevitably lead to ecological impacts. For the other impact items, such as campsite encounters, campfire rings, tree damage, and human-structures, standards based upon preferred conditions are feasible. The actual biophysical state of campsites in the HOR, however, did not usually meet these desired standards. For example, although most summer visitors (over 90 %) reported no encounters at campsites during their stay, most sites were characterized by significant levels of biophysical impacts. Based upon visitors' preferred conditions, standards for wilderness campsites would be very strict, and although feasible for most parameters, extensive management actions would be required to maintain these pristine conditions. Moreover, the maintenance of natural wilderness settings may jeopardize wilderness experiences, as restrictive management actions are usually required to prevent noticeable impacts. Overall, recreational experiences in pristine areas are a desired component of wilderness, however, recreational use would have to be severely limited if zero-impact standards were adopted for the entire HOR.

The HOR is characterized by a system of management zones which provide a range of wilderness opportunities; the zone I, II, and III designations are directed towards achieving or maintaining primitive and semi-primitive non-motorized wilderness zones. Similarly, respondent standards for campsite parameters based upon the first and second quartile of maximum acceptable levels of impact represent semi-primitive non-motorized and primitive recreation settings. Therefore, based upon visitor input, the current range of standards for backcountry campsites are in agreement with the management plan's concept of wilderness. However, since the ROS settings for zone I, II, and III

designations are vague groupings, it is recommended that more specific standards be adopted that more clearly define these zones for the HOR. As mentioned previously, future research is required to ensure that acceptable impact levels given by respondents actually represent desired conditions. Also, in consideration of the non-representative nature of the survey sample, valid preference values for all backcountry visitors such as summer and fall users, wilderness interest groups, outfitters, and outfitter clientele must be assessed before standards are formalized.

While public input provides one source for developing standards, it is precarious to base decisions solely upon visitor perceptions. Indeed, the importance of natural processes and thresholds with respect to campsite standards should not be overlooked. From an ecological perspective, for example, it has been found that biophysical impacts will almost always be minimized by restricting use to a small number of campsites instead of dispersing use throughout many sites (Cole 1995). In general, the curvi-linear relationship between amount of use and amount of impact demonstrates that most biophysical impact occurs after very low use levels. Therefore, in the two semi-primitive non-motorized zones where evidence of humans is permitted, the number of wilderness campsites should be limited to designated and established sites. Moreover, concentrating campsite use to a few sites also helps maintain the ecological integrity of wilderness areas; by limiting disruption to localized sites, potential influences on the function, structure, succession, or other components of ecosystems, can be minimized. Conversely, in the primitive zones where evidence of human presence is prohibited, visitors should be encouraged to spread out and camp in undisturbed areas. From the above discussion it appears that, visitor standards regarding acceptable biophysical and social impacts at wilderness campsites may be too stringent, and therefore, future management strategies of concentrating and dispersing use may need to be supported by intensive educational programs.

In addition to campsite quality, the results of the survey found that summer visitors also valued other irreplaceable characteristics of the wilderness experience such as solitude, communing with nature, freedom, wildness, and adventure. Wilderness also has more far-reaching values than recreation. In addition to providing opportunities for high quality wilderness experiences, the HOR is to be managed to protect the integrity of the natural resources, and retain the natural character of ecosystems with a minimum degree of human interference. Future research is, therefore, needed to explore potential indicators for all dimensions, and consequently, develop appropriate standards that represent the major elements of the wilderness experience while preserving ecological integrity.

In summary, visitor input presents only one source of information that should be considered when formulating standards. Although there are methodological and theoretical concerns associated with visitor feedback, user surveys still present a valid and important component of this process. Defining wilderness quality is a complex procedure that must take into account the full spectrum of visitor perceptions, legal and policy mandates, scientific research, management objectives, and ecological processes and thresholds. Ultimately, standards used to define wilderness quality should preserve both natural systems and processes, as well as intangible characteristics of the wilderness experience. Future research efforts are, therefore, required to develop a framework for defining wilderness quality that incorporates all potential sources of information.

6.5 Wilderness Campsite Condition

From the results it was evident that social impacts had a greater influence on visitor experiences than corresponding biophysical disturbances. However, visitors are habitually more sensitive towards social conditions, and therefore, it should not be concluded that biophysical impacts were insignificant at backcountry campsites in the

HOR. Indeed, resource impacts generally exceeded visitor standards; parameters of particular concern included vegetation loss, mineral soil exposure, tree damage, the presence of human-made structures, and the effects of packstock use (Appendix VII). Consequently, management actions would be required to rehabilitate deteriorated sites to desired states. Furthermore, campsites would need continued, regular monitoring of social and biophysical conditions to ensure that wilderness quality does not deteriorate. In light of the differing reactions summer respondents exhibited with respect to encounters with varying user groups, party size, and user behaviors, managers would be advised to monitor each type. Horse and hiker encounters, group size, and occurrences of discourteous behavior, for example, all represent contrasting dimensions of the wilderness experience. Moreover, consistent monitoring of conditions would help identify undesirable changes, and therefore, permit the use of more proactive management strategies. Alternatively, failure to implement monitoring schemes in the HOR might require managers to eventually resort to reactive management; such actions tend to be intrusive, controversial, difficult to enact, and can negatively impact visitors' experiences. If needed management actions are ignored, wilderness quality will potentially deteriorate, and as a result, visitors could either be displaced to other areas that provide recreation experiences they seek, or become more tolerant towards higher levels of impact.

6.6 Opportunity Classes/Management Zoning

The HOR has been zoned to accommodate three types of wilderness experiences. Zone I has been allocated to areas that are not accessible by trails and require technical skills to travel within them, and are basically characterized by steep rock, snow, and ice. Zone II represents regions that can be accessed by foot; consequently, some areas have established trails and campsites (Ralph Lake and Goat Basin), whereas others presently

offer primitive experiences. Zone III areas are those that receive the most use, and therefore, contain the majority of the established trails and campsites. Presently, the two zone II areas that have campsites and trails do not differ significantly from zone III regions, with respect to experience opportunities. In practicality, therefore, only two recreational opportunities (primitive and semi-primitive non-motorized settings) presently exist in the HOR.

From the visitor study, it appeared that summer users largely confined their visits to management zone III (see Figure 3), except for those that visited Ralph Lake (zone II). Moreover, the study results also indicated that evidence of previous use was important to most respondents (68 %) when camping. Since summer users preferred to use established campsites, it may reflect the fact that the majority were seeking a less primitive wilderness experience.

The LAC process recognizes the importance and seeks to enhance and protect diversity in wilderness conditions. Within the HOR management plan, there is little disparity between the wilderness criteria for zones II and III, and as a result, the variety in wilderness experiences is not adequately represented in the current zoning. To increase and maintain diversity, it is recommended that some more accessible zone II and III units prohibit horse use. In addition, a few zone II areas that presently do not have established trails or campsites should be designated as zone I in order to provide easier access to primitive wilderness; pristine settings should not be restricted to remote areas that are steep and not easily accessible.

The boundaries of the management zones in the HOR are generally delineated by natural topographical features, and therefore, it appears that only recreational opportunities were considered in designating these classes. When allocating wilderness zones, other non-recreational values, such as ecological integrity should also be considered. The present zones, therefore, may need to be re-evaluated to ensure that attributes of natural systems and processes are not jeopardized by recreational use. Rare

and endangered species, wildlife habitats, habitat and wildlife sensitivities, and unique physical-biological features, are a few attributes of the natural environment that should also be examined when defining wilderness classes.

6.7 Designation Status

As mentioned previously, the HOR became a provincial park in July of 1995. With its new designation status, use patterns will surely change, as the area will now be noted on the provincial road map and be advertised on B.C. Parks' maps and brochures. In response to increased awareness of its locale, use levels will probably increase, and as a result, the composition of future user groups may also deviate from the present make up. For example, it may be expected that more visitors will come from more distant areas and that new users will predominantly be hikers rather than horse users.

Increased visitation may threaten present wilderness experiences, as growing use levels tend to hinder the maintenance of desired social and ecological qualities. Moreover, visitor survey results may not reflect deteriorating trends, as users tend to accept the status quo with respect to desired conditions. Quality wilderness experiences, therefore, could be undermined with increased use and more lenient standards of backcountry visitors. As a result, certain wilderness values such as solitude, naturalness, wildness, and ecological integrity may be irrevocably lost.

To ensure that wilderness experiences and natural environments in the HOR are not threatened by its change in status., it is recommended that B.C. Parks maintains the management objectives and zoning system outlined by the Ministry of Forests (1993). Although these management objectives tend to be general and somewhat vague, they emphasize values that are integral to the concept of wilderness. However, it is difficult to clearly define what constitutes quality wilderness experiences and natural settings when management objectives lack sufficient specificity; therefore, such mandates are open to

interpretation. As a result, it is recommended that B.C. Parks also adopts a management planning framework (i.e., LAC, Visitor Impact Management) that uses specific standards to evaluate whether the condition of the area is at a level that meets wilderness criteria.

Setting standards represents an important step in the planning process, although by itself, does not ensure that wilderness conditions will be attained. In other words, proper management involves more than defining levels that explicitly delineate specific environmental and social conditions to be maintained or achieved. It also requires the implementation of responsive planning systems that are effective through time. More specifically, there must be a mandate to monitor conditions, identify how changes in conditions are caused, and implement management strategies to achieve desired conditions.

In summary, to perpetuate the character of wilderness in the HOR, it is recommended that B.C. Parks implements a planning system that not only defines specific standards but also responds to change. If a suitable mandate is adopted, the change in designation status will not necessarily result in potential long-term deterioration due to increased use and/or diminishing standards.

6.8 Summary

In this section, the major recommendations made from the HOR study are compiled. The intention is to illustrate management concerns and areas of future research, and to provide a foundation from which to draw final conclusions. Table 38 presents recommendations pertaining to visitor management, indicator selection, standard setting, campsite condition, management zoning, and change in designation status.

Table 38: Summary of recommendations illustrating management concerns and areas of future research in the Height-of-the-Rockies.

Visitor Management
1. Monitor potential conflicts between hiker and recreational stock users.
2. Evaluate the amount of horse use during wet periods such as spring and early summer.
3. Determine areas used by mountaineers and evaluate their use levels and impacts.
4. Continue monitoring of social conditions at backcountry campsites.
5. Further assess the distribution of use at backcountry campsites.
6. Examine trends in visitor and visit characteristics, and distributions of use.
7. Determine more accurately total use levels, the composition of visitor groups, and distribution patterns.
Indicator Selection
1. Develop an overall campsite rating index as an indicator.
2. Determine whether the number and location of backcountry campsites threatens the integrity of the ecosystem or its components.
3. Select indicators that represent other dimensions of the recreation experience and the natural environment.
Standard Setting
1. Determine whether visitors are able to quantify the amount of acceptable change for less tangible ecological impact items such as vegetation loss and tree damage.
2. Use visual representations to assess users' evaluations of biophysical impacts.
3. Determine whether different standards exist for the variety of user groups.
4. Further examine whether collective norms regarding campsite conditions exist.
5. Examine whether visitor standards actually reflect desired or appropriate conditions.
6. For each user group, identify the kinds of experiences the area provides or ought to provide.
7. Formulate standards for each management zone that reflect the character of primitive and semi-primitive non-motorized recreation opportunity settings.
8. Examine preference values for all backcountry visitors before standards are formalized.
9. Develop standards that represent all dimensions of the wilderness experience.
10. Formulate indicators and standards to evaluate ecological integrity.
11. Develop a framework for setting standards.

Campsite Condition

1. Determine backcountry campsites that will need to be rehabilitated to meet biophysical standards.
2. Implement restoration actions on these sites.
3. Continue, regular monitoring of social and biophysical conditions at campsites.
4. Identify probable causes for changes in biophysical and social conditions at sites.

Management Zone Classification

1. Re-evaluate management zones to ensure that non-recreational values are not jeopardized by recreational use.
2. Examine whether the current management zones provide the desired range of recreational opportunities.

Designation Status

1. Document changes in use and user characteristics that may occur with its change in designation.
2. Develop standards that represent the concept of wilderness.
3. Implement management plans that monitor, evaluate, identify probable causes, and specify appropriate strategies to actually achieve or maintain desired conditions.

CHAPTER SEVEN

CONCLUSIONS

The objective of the HOR research was to examine two components of the LAC planning framework; more specifically, indicators and appropriate indicator standards for backcountry campsites were hoped to be developed from solicited visitor input. Due to several unforseeable factors, however, a representative survey sample was not obtained for the entire visitor population, and consequently, the results could not be assumed to accurately represent the views of all users and user groups. In spite of the recognized limitations, the results provided considerable insight into the opinions held by summer users with respect to social and biophysical conditions at backcountry campsites. Consequently, it was felt justified to suggest potential campsite indicators and standards based upon visitor input, as well as on independent ecological considerations.

It is realized that problems can be associated with using visitor input in the development of standards, and as such, fosters debate over the justification of using visitor feedback in defining wilderness quality. Examination of the HOR survey results, for example, illustrates both methodological and theoretical concerns with respect to the usefulness of the acquired data. First, discrepancies in the data invoke doubt as to whether standards given by respondents actually reflect the campsite conditions visitors preferred or were willing to accept. Such inconsistencies may relate to the nature of the question format. And second, this point underlies a more philosophical issue, which questions whether collective social norms exist for wilderness campsites.

These issues, however, do not refute the validity of public involvement in defining wilderness quality. Wilderness represents a perceived reality or state-of-mind that encompasses values other than the natural environment; similarly, determining the degree of separation from the pristine is largely a value judgment. As people can

quantify the intangible factors that relate to wilderness, visitor input can help identify potential indicators that best represent high quality wilderness experiences. Most importantly, visitor studies can identify the range of desired conditions that visitors seek from an area. Such information plays an important role in effective management, as knowledge of potential conflicts between visitor standards and implemented standards can help managers maintain both quality experiences and the integrity of the natural environment. Management decisions are, therefore, made more defensible through legitimate public participation, as consensus among various user groups can be more easily achieved.

Visitor input provides only one source of information from which wilderness quality should be defined. Consideration of ecological thresholds, long-term ecological impacts, and ecosystem functioning, helps ensure that indicators and indicator standards also represent and preserve the integrity of the natural environment. The implementation of standards, however, must involve measures to maintain the desired environmental and social conditions. A commitment must be made to implement effective management plans that monitor, evaluate, identify probable causes, and specify appropriate strategies to actually achieve or maintain desired conditions. Once established, wilderness standards should reflect management objectives with respect to the desired social and resource conditions, and should not necessarily respond to changes in visitor populations.

From a more general standpoint, the HOR research has addressed several relevant issues of importance to visitor surveys. First, in addition to contributing to our knowledge of social behaviour and opinions of primitive, low-use wilderness areas, the information acquired provides a basis for future comparative studies. In particular, the change in designation status offers a unique situation to assess the changes associated with visitor displacement and succession. The study also clearly outlines the potential hindrances in conducting surveys in regions that are characterized by low, dispersed, and

multi-access use. Finally, the results illustrate the difficulties of designing appropriate visitor sampling strategies when no prior information on use characteristics are available.

Overall, recreation management in wilderness areas presents a great challenge, as actions must incorporate both resource and social data to ensure that both experiences and natural environments are maintained. The LAC planning model presents a dynamic process that strives to protect the wilderness resource by defining appropriate conditions and developing specific measures of these desired conditions. Ultimately, chosen standards should maintain both wilderness experiences as well as natural systems and processes. However, the implementation of standards does not represent a means to an end, as management strategies must be incorporated to insure that wilderness is perpetuated for future and present users.

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APPENDIX I Trailhead Information Sign

SPECIAL WILDERNESS RESEARCH STUDY

ALL VISITORS REGISTER WHEN ENTERING

The University of British Columbia in cooperation with the British Columbia Forest Service is conducting a research study in the Height-of-the-Rockies Wilderness Area. To help protect and manage the area, we need to know more about you, the backcountry user and what you think. Please write the names and addresses of each person over 18 in your group on a card from the specially marked box and drop it through the slot. Some of you will be picked as sample visitors and mailed a questionnaire. Please complete and send it back. All responses will be kept strictly confidential.

THANK-YOU FOR YOUR HELP

APPENDIX II Trailhead Registration Card

SPECIAL WILDERNESS RESEARCH STUDY
VISITOR REGISTRATION CARD

Date: _____

Name: _____ Street Address: _____

City: _____ Province/State: _____

Country: _____ Postal Code (Zip): _____

Primary Activity: Hike _____ Fish _____ Hunt _____ Other _____

Travel Method: Foot _____ Horse _____ Other _____

Group Type: Alone _____ Family _____ Friends _____

Family and friends _____ Club or organization _____

Did you use a commercial guide or outfitter? Yes _____ No _____

Planned length of stay: _____ days Number in group: _____

THANKS FOR YOUR HELP

APPENDIX III Sample Questionnaire

PART I

Your Recreation Visit

Please answer all questions as they relate to your **most recent recreation visit** to the Height-of-the-Rockies Wilderness Area.

1. What was the beginning date of your **most recent recreation visit** to the Height-of-the-Rockies Wilderness Area (**HoR WA**)? (please enter numbers)

Month _____ Day _____ 19 _____

2. Was this your **first recreation visit** to the HoR WA? (please circle one number)

1. Yes..... (go to Question 3)
2. No..... (if no, please answer the following, then go to Question 3)

a) What was the year of your first visit? 19_____

b) About how many times have you recreated in HoR WA? (please enter number)

Number of previous recreation visits: _____

3. How long was your **most recent recreation visit** to the HoR WA? (please enter numbers)

Number of days: _____ Number of nights: _____

4. During this recreation visit, what type of group were you with? (please circle one number)

1. Alone
2. Friends
3. Family
4. Family and Friends
5. Club or organized group
6. Other (please specify): _____

5. Including yourself, how many people were in your group? (please enter number)

Number of people: _____

6. How was your trip organized and outfitted? (please circle one number)

1. Commercially
2. Privately

7. What **activities** did you participate in during this recreation visit? (please circle as many as apply)

1. Fishing
2. Nature Study
3. Hiking
4. Horseback riding
5. Hunting
6. Mountaineering
7. Photography
8. Wildlife viewing
9. Other (please specify): _____

8. What were the **two most important activities** to you on this recreation visit? (please enter the numbers from the activities you circled in Question 7 above)

Most important activity: _____ Second most important: _____

9. On this visit, what was your **primary method of travel** while in the backcountry? (please circle one number)

1. Foot
2. Horse
3. Bike
4. ATV

Please enter any other comments you have about your recreation visit below.

10. There are many **REASONS** why people recreate in the HoR WA. Some possible reasons are listed below. Try to recall **how important** each of the following reasons was to you on your **most recent recreation visit.** (please check [√] one box for each reason)

I visited HoR for the opportunity:	**Not at all Important**	**Slightly Important**	**Moderately Important**	**Very Important**	**Extremely Important**
To view the scenery					
To be close to nature					
To develop my outdoor skills					
For adventure					
To get away from other people					
To hunt					
To be with friends					
To be with my family					
For solitude					
To be physically challenged					
For excitement					
To be in the wilderness					
To meet new people					
To fish					
To learn about nature					
To observe / encounter wildlife					
To see historic or cultural sites					
To take a break from my routine					
Other:					

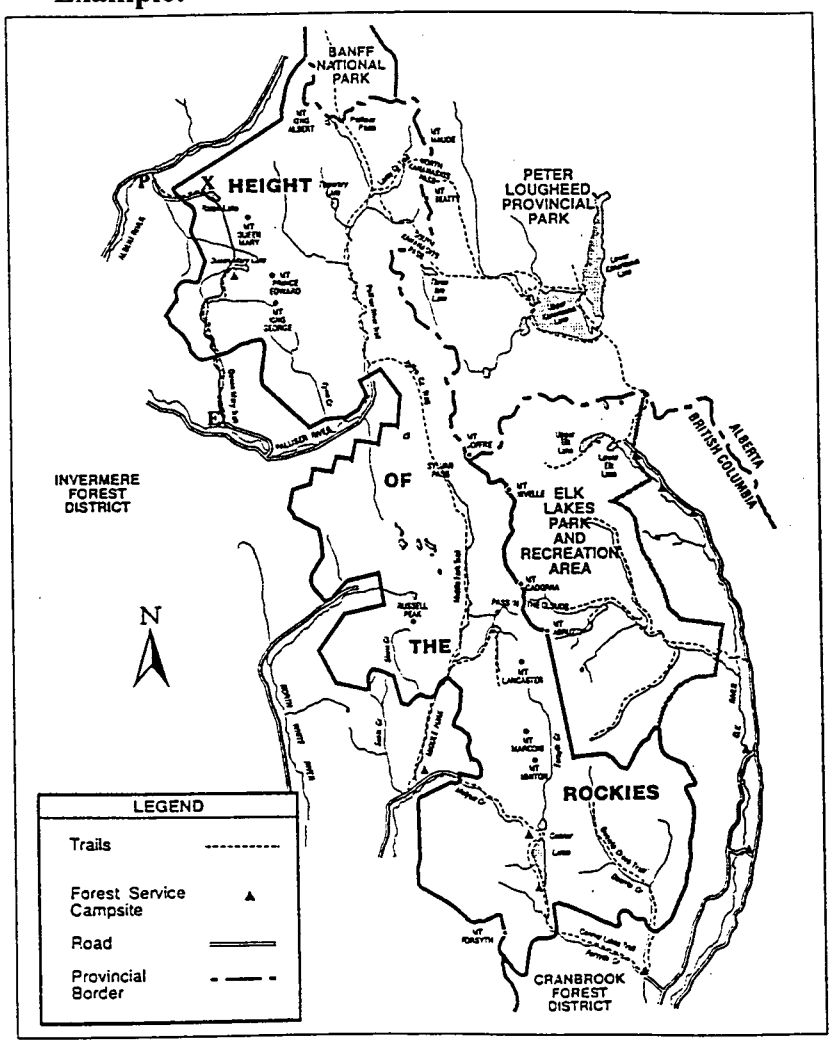
PART II
Your travel route

The HoR WA is managed to provide a range of wilderness experiences. Information on **where you travel** will help protect the diverse wilderness conditions found within the area.

11. On the map provided, please indicate the following:

Your entrance point: mark with a **"P"**
Your route(s) within the area: trace with a solid line (———)
Places you camped: mark with an **"X"**
Your exit point: mark with an **"E"** if it differs from the entrance point

Example:



This user started at the Ralph Lake trailhead, camped at the lake, traversed to Queen Mary Lake, camped there, and exited the wilderness area at the Queen Mary trailhead.

PART III

Existing Campsite Conditions

This section refers only to **backcountry campsites** in the HoR WA. Please answer the following questions for campsites you visited during your **most recent recreation** visit.

12. Did you camp at more than one place in the HoR WA? (please circle one)

1. No..... (if no, please read A, then go to Question 13)
2. Yes..... (if yes, please read B, then go to Question 13)

A. If you camped at only one place, it will be referred to as **"Site A"** in the following questions. If you did not stay overnight, please go to Question 22.

B. If you camped at two or more places, pick just one, circle and label it **"A"** on the map provided. It will be referred to as **"Site A"** in the following questions. (Questions 13 - 21)

NOTE: If you were personally interviewed within the HoR WA with respect to your stay at a specific campsite, please ensure that this campsite is the one (Site A) chosen for this section.

13. On average, how many **other groups** were camped within sight or sound of your campsite? (please check one box [√] for each group type)

At Site A:

Group Type:	**None**	**One or Two Groups**	**Three - Five Groups**	**> Five Groups**
Hunters				
Hikers				
Horse Users				
Other:				

14. How did you feel about the number of other groups you saw at **Site A**? (circle one number in each column)

HIKER GROUPS
1. I saw far too few
2. I saw somewhat too few
3. About right
4. I saw somewhat too many
5. I saw too many
6. Did not matter to me one way or the other

HUNTER GROUPS
1. I saw far too few
2. I saw somewhat too few
3. About right
4. I saw somewhat too many
5. I saw too many
6. Did not matter to me one way or the other

HORSE GROUPS
1. I saw too few
2. I saw somewhat too few
3. About right
4. I saw somewhat too many
5. I saw too many
6. Did not matter to me one way or the other

OTHER: _____
1. I saw too few
2. I saw somewhat too few
3. About right
4. I saw somewhat too many
5. I saw too many
6. Did not matter to me one way or the other

15. On average, what was the **size** of other groups camped within sight or sound of your campsite? (please check [√] one box for each group type)

At Site A:

Group Type:	**No Other Groups at Campsite**	**One or Two People**	**Three or Four People**	**Five - Seven People**	**> Seven People**
Hunters					
Hikers					
Horse Users					
Other:					

16. Did the **actions** of another group or person not in your own group **negatively affect** your stay at the campsite? (please circle one number)

Site A: 1. Yes
2. No

If yes, please explain: _____

_____

17. How do you **FEEL** about the **condition** of **your backcountry campsite** (Site A) in terms of the following factors? (please check [√] one box for each statement)

Factors:	**Not a Problem Site A**	**Slight Problem Site A**	**Moderate Problem Site A**	**Serious Problem Site A**
Number of campfire rings				
Number of human-made structures (racks, corrals, fences, etc.)				
Size of other groups camped nearby				
Tree damage caused by other people				
Amount of vegetation loss and bare ground				
Number of hiker groups camped nearby				
Amount of litter in and around campsite				
Number of hunter groups camped nearby				
Behaviour of others camped nearby				
Number of horse groups camped nearby				
Other:				

18. How **important** are the following items **at your backcountry campsite** (Site A) in determining the **quality** of your **EXPERIENCE** when recreating in the HOR WA? (please check [√] one box for each item)

Item:	Not at all Important Site A	Slightly Important Site A	Moderately Important Site A	Very Important Site A	Extremely Important Site A
1. The amount of vegetation loss and bare ground					
2. The number of campfire rings					
3. The number of trees that have been damaged by people					
4. The number of hiker groups camped within sight or sound of my campsite					
5. The number of horse groups camped within sight or sound of my campsite					
6. The number of hunter groups camped within sight or sound of my campsite					
7. The amount of litter					
8. The size of other groups camped within sight or sound of my campsite					
9. The behavior of others not in my group					
10. The number of human-made structures that I see					
11. Evidence of prior use					
12. Availability of natural feed for packstock					
13. Presence of packstock					
14. Other:					

19. What were the **two most important items** to you during your stay at your campsite (Site A)? (please enter the numbers from the items listed in Question 18)

Site A

Most Important Item: _____

Second Most Important: _____

20. I would like to explore your **specific EVALUATIONS** on conditions at backcountry campsites in the HoR WA. People desire different things from wilderness areas, therefore, it is important to know what things you find **acceptable** and what things you find **unacceptable.**

For the following items, please indicate :

1. the condition you would **most prefer** at your campsite (Site A)
2. the **maximum amount of change** in condition **you would accept** before your experience would be negatively affected at your campsite (Site A)
3. the **amount of change** in condition **you would not accept** at your campsite(Site A)

(If you cannot give a number or if this item does not matter to you leave it blank.)

Item:	Preferred Condition Site A	Maximum Amount I would accept Site A	Amount I would not accept Site A
The percentage of vegetation loss or bare ground at the site			
The number of campfire rings at the site			
The number of trees damaged by humans at the site			
The number of hiker groups camped within sight or sound at the site			
The number of horse groups camped within sight or sound at the site			
The number of hunter groups camped within sight or sound at the site			
The number of pieces of litter I see at a site			
The number of human-made structures seen at a site			
Occurrences of discourteous behavior by another group or person not in my group in a day			
The number of horses or packstock animals at the site			
Other:			

21. Do you expect to see fewer groups at some backcountry campsites in the HoR WA than others? (please circle one answer)

1. No
2. Yes (please specify where): _____

PART IV

Personal Characteristics

Finally, we would like to as a few questions about yourself to help us interpret our results and to further our understanding of visitors to the HoR WA. Please remember that your responses will be kept strictly confidential.

22. Are you? (please circle one number)

1. Male
2. Female

23. In what year were you born? (please enter number)

19_____

24. What is your highest level of education? (please circle one number)

1. Grade school
2. High school
3. Some college / university
4. College / technical school diploma
5. Complete university
6. Post-graduate

25. In what town or city do you permanently reside? (please fill in the blanks)

Town/city: _____

Province/state: _____

26. Is your permanent residence? (please circle one number)

1. On a farm
2. On a rural non-farm acreage
3 In a town less than 1,000
4. In a town 1,000 - 9,999
5. In a city 10,000 - 99,999
6. In a city 100,000 - 249,999
7. In a city 250,000 +

*** THANK YOU FOR YOUR PARTICIPATION ***

Please return the questionnaire in the stamped envelope provided

Please enter any **remarks** you have about the campsites you visited or specific questions about the questionnaire; also, if you have any other **comments or suggestions**, please write them in the space below.

APPENDIX VI Follow-up Letters

October 24, 1994

Dear Height-of-the-Rockies Wilderness Area Visitor:

About three weeks ago I wrote to you asking about your most recent recreation visit to the Height-of-the-Rockies Wilderness Area. As of today, we have not received your completed questionnaire.

This wilderness research study has been undertaken to gather visitor opinions about what affects the quality of their recreation experience. We believe that this information is an important consideration that should be used to help guide future management actions for the Height-of-the-Rockies Wilderness Area.

I am writing to you again because it is extremely important that each questionnaire be completed. As only a portion of the visitors to the Height-of-the-Rockies Wilderness Area received a survey, it is essential that each visitor contacted return their questionnaire. This will help ensure that the results of the study are truly representative of all of the Height-of-the-Rockies Wilderness Area visitors.

If you have already completed and returned the questionnaire, thank you for you help. In the event that your questionnaire has been misplaced, I have enclosed another copy. Please return it in the post-paid envelope. Remember your responses are strictly confidential.

Thank you for your time.

Sincerely yours,

Debbie Johnson
Research Coordinator

November 7, 1994

Dear Height-of-the-Rockies Wilderness Area Visitor:

About six weeks ago, I wrote to you asking about your recreation visit to the Height-of-the-Rockies Wilderness Area. As of yet, I have not receive either of the two questionnaires that were sent to you.

The number of questionnaires that have been returned so far is very encouraging. The accuracy of our results, however, depends on you and the others that have not yet responded. Your opinion on what affects the quality of your wilderness experience will help the results of this survey to be representative of the visitors to the Height-of-the-Rockies Wilderness Area. To develop future management plans for the wilderness area, an accurate description of the visitor views is required.

Remember, your identity will be held strictly confidential. Your contribution to the success of this survey is extremely important to me and will be greatly appreciated. I have enclosed a third questionnaire in case the former two did not arrive or were misplaced.

Thank you again for your time.

Sincerely yours,

Debbie Johnson
Research Coordinator

APPENDIX VII Results of Campsite Monitoring in the Height-of-the-Rockies Wilderness Area, 1994

RESULTS:

Summary statistics of the impact parameters are presented in Tables 1 and 2. Median values were reported instead of the mean as, outliers from several heavily impacted campsites distorted mean values, and therefore, the median provided a more representative indication of the central tendency of impact parameters. Table 1 presents the median and range for each of the parameters measured. In addition, the frequency, percentage, cumulative frequency and cumulative percentage were calculated for the ordinal rankings of the impact parameters; the results are shown in Table 2. Both sets of results were used to describe the condition of the thirty campsites in the study area with respect to each impact parameter.

In general, most campsites exhibited fairly uniform degrees of impact with respect to most measured parameters (Table 2). However, the extensive variability in the ranges of some parameters illustrates the presence of a few heavily impacted sites. The individual impact parameters' measured values and their ratings were sorted by ascending order for all campsites in the area (Appendix 1). The sorted impact parameters indicated that eight campsites were characterized by extensive impacts in approximately all parameters, while six exhibited significant degrees of impact in only a selected number. Overall descriptions of each impact parameter are presented.

Table 1: Median changes and ranges on thirty campsites in the Height-of-the-Rockies REP Backcountry Campsite Monitoring Data, 1994

Impact Parameter	**Number of Sites**	**Median**	**Range**
Vegetation Loss Rating (1-3)	30	1.0	1 - 3
Mineral Soil Increase Rating (1-3)	30	1.0	1 - 3
Tree damage:			
Number	30	11.0	0 - 113
Rating (1-3)	30	3.0	1 - 3
Root Exposure:			
Number:	30	3.5	0 - 24
Rating (1-3)	30	2.0	1 - 3
Development Rating (1-3)	30	3.0	1 - 3
Cleanliness:			
Number of fire scars	30	1.0	1 - 5
Rating (1-3)	30	2.0	1 - 3
Social Trails:			
Number	30	2.0	0 - 5
Rating (1-3)	30	2.0	1 - 3
Camp area:			
Area (m^2)	30	123.5	12 - 837
Rating (1-3)	30	2.0	1 - 3
Bare core area:			
Area (m^2)	30	5.0	0 - 214
Rating (1-3)	30	1.5	1 - 3
Summary Impact Index:			
Number	30	39.0	22 - 63
Rating (1-3)		2.0	1 - 3
1. Minimum Impact	9		
2. Moderate Impact	13		
3. Heavy Impact	8		

Table 2: Summary Statistics of Impact Parameter Ratings for Height-of-the-Rockies REP Backcountry Campsite Monitoring Data, 1994

Impact Parameter Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Vegetation Loss				
1	19	63.3	19	63.3
2	4	13.4	23	76.7
3	7	23.3	30	100.0
Mineral Soil Increase				
1	18	60.0	18	60.0
2	8	26.7	26	86.7
3	4	13.3	30	100.0
Tree Damage				
1	2	6.7	2	6.7
2	12	40.0	14	46.7
3	16	53.3	30	100.0
Trees with Exposed Roots				
1	13	43.3	13	43.3
2	6	20.0	19	63.3
3	11	36.7	30	100.0
Development				
1	4	13.3	4	13.3
2	8	36.7	12	40.0
3	18	60.0	30	100.0
Cleanliness				
1	7	23.3	4	23.3
2	19	63.3	12	86.6
3	4	13.4	30	100.0
Social Trails				
1	12	40.0	12	40.0
2	10	33.3	22	73.3
3	8	26.7	30	100.0
Camp Area				
1	7	23.3	7	23.3
2	12	40.0	19	63.3
3	11	36.7	30	100.0
Bare Core Area				
1	15	50.0	15	50.0
2	11	36.7	26	86.7
3	4	13.3	30	100.0
Impact Index				
1	9	30.0	9	30.0
2	13	43.3	22	73.3
3	8	26.7	30	100.0

1. Vegetation Loss

Nearly two thirds of the campsites (19 sites) showed no difference in the percent cover class of live understory vegetation between the campsite and the comparison (unused) site; the vegetative cover class for these campsites and their controls was 76 - 100%. Consequently, the median vegetation loss had a class 1 impact rating (no difference in vegetation cover between the campsite and the comparison site) for the thirty campsites (Table 1). Of the remaining eleven campsites, seven had a vegetation loss rating of three (Table 2); these sites had lost more than 50% of their original vegetative cover.

2. Mineral Soil Increase

Approximately two thirds of the campsites (18 sites) exhibited no mineral soil increase with respect to their comparison sites (Table 2). Consequently, the thirty sites had a median mineral soil increase rating of 1.0 (Table 1). Contrary to the above, the majority of the remaining campsites (8 of 12) had a mineral soil increase rating of 2.0 (a difference of one coverage class between the campsite and the comparison site). The other four sites exhibited significant levels of mineral soil exposure.

3. Tree Damage

With the exception of one campsite, all exhibited some degree of tree damage; the numbers of damaged trees ranged from 0 - 113, while the median was 10.5 (Table 1). Tree damage constituted trunk scars made by axes, ropes or packstock; embedded nails; cut branches; and felled trees. Due to a few heavily impacted campsites, the median was chosen to more accurately represent the average condition. The median tree damage rating of 3.0 (Table 1) illustrates the severe extent of impact; over one half of the campsites had a minimum of eight scarred trees per site (Table 2). Of the remaining campsites, only two (6 %) had a rating of 1.0 (damage restricted to broken lower limbs),

while the remaining forty percent warranted a class 2 impact rating (one to eight damaged trees per site or 1 - 3 badly scarred or felled).

4. Root Exposure

The median number of trees with exposed roots (root length greater than 0.30 m) was 3.5 with values ranging from 0 - 24 (Table 1). The observed median translated to a class 2 rating for root exposure (Table 1) and indicated the presence of 1 - 6 trees per site with root exposure; twenty percent of the campsites fell within this class (Table 2). Over forty percent of the campsites (13 sites) were absent of any observable root exposure (impact rating of 1), while thirty-seven percent (11 sites) had more than six trees with root exposure (class 2 impact rating).

5. Development

The development impact parameter measures the number and obtrusiveness of human-made structures on campsites; structures include fire rings, hitching racks, tables, log seats, food racks, corrals and other constructions. Approximately two thirds of the campsites (18 sites) earned a development rating of 3.0 (Table 2). Consequently, this ranking represented the median development rating for all thirty campsites (Table 1) and indicated that on average, there was more than one fire pit or major structure per site. No human-made structures were evident at four campsites (13% of the sites), while the remaining 40% (8 sites) had a class 2 development rating (at least one fire pit with or without primitive log seats).

6. Cleanliness

The cleanliness of the campsites was evaluated by examining a number of impacts; these included the number of fire scars, and the occurrence of litter, human waste and/or packstock manure. The median number of fire scars for the thirty campsites

was 1.0 with values ranging from 1.0 to 5.0 fire scars per site (Table 1). The median cleanliness rating for the thirty campsites was 2.0 and indicated that the average site had at least remnants of more than one fire pit and some litter and manure. Table 2 shows that approximately two thirds of the campsites (63%) exhibited the median rating, 23% (7 sites) were rated at 1.0 (no more than scattered charcoal from one fire pit) and 13% (4 sites) had a class rating of 3.0 (occurrence of human waste or considerable litter and packstock manure).

7. Social Trails

The number of social trials and their degree of development were measured to assign an impact rating. Social trails at a site are informal trails that lead from the campsite to water sources, main trails, the latrine or neighboring campsites. The median number of social trails for the thirty campsites was 2.0 trails with values ranging from 0 - 5 social trails per site (Table 1). The median social trail rating was 2.0 and indicated that the average site had at least 2 - 3 discernible social trails or a maximum of one well-worn trail. Table 2 shows that twelve campsites (40%) had a rating of 1.0 (no more than one discernible trail), ten sites (33%) exhibited the median rating and eight sites (27%) warranted a class 3 rating (more than 3 discernible and or more than one well-worn trail).

8. Camp Area

The median camp area for the thirty sites was 123.5 m^2 with the values ranging from 12.0 to 837.0 m^2 (Table 1); the large variation in camp area was the result of a few, heavily impacted campsites (Appendix 1). The median camp area rating was 2.0 and indicated that the average site had a camp area between 45 to 180 m^2. The majority of campsites in the area (77% or 23 sites) exhibited a camp area greater than 45 m^2 (Table 3). Seven sites (23%) had a camp area rating of 1.0 (4.5 to 45 m^2), twelve sites (40%) had the median rating and eleven sites (37%) warranted a class rating of 3.0 (> 180 m^2).

9. Bare Core Camp Area

Barren core camp area measures the size of the camp area void of any vegetation; camp areas without any vegetation are usually located in the middle of the campsite around a central fire pit. The median bare camp core area of the thirty sites was 5.0 m^2 with the values ranging from 0 to 214 m^2 (Table 1); significant variation in bare core camp area can largely be attributed to one heavily impacted campsite (Appendix 1). The median bare core camp area rating of 1.5 indicated that the average was less than 45 m^2. Twenty-six sites (87%) exhibited less than 45 m^2 of bare core area (Table 2), of which, fifteen had a rating of 1.0 (less than 4.5 m^2). The remaining four campsites (13%) had more than 45 m^2 of bare area (a rating of 3.0).

10. Summary Impact Index

The impact index is the sum of the weighted impact parameter ratings and, provides a measure of the total degree of campsite impact. The median impact index for the thirty campsites in the area was determined to be 39.0 with values ranging from 22.0 to 63.0 (Table 1). The median impact index rating of 2.0 indicated that on average, the campsites exhibited moderate degrees of impact. Table 2 shows that 43% (13 sites) fell within this impact rating (index between 31 and 49). Nine campsites (30%) were characterized by a minimum impact rating (index between 20 and 30) while, eight campsites were rated as heavily impacted (index > 49).

APPENDIX ONE: Campsite Impact Parameter Ratings for all thirty campsites in the Height-of-the-Rockies Wilderness Area

For all thirty campsites sampled using the REP method, the impact parameters' measured values and their ratings were sorted by ascending order. Listed below in tables are the sorted values for the impact parameters assessed in the study:

- A. Vegetation loss
- B. Mineral soil increase
- C. Tree damage
- D. Trees with root exposure
- E. Development
- F. Cleanliness
- G. Social trails
- H. Camp area
- I. Bare core area
- J. Summary index impact rating.

A. Vegetation Loss

Site Name	Vegetation Cover on Campsite (%)	Vegetation Cover on Comparison (%)	Vegetation Loss Rating
Palliser River 02	76 - 100	76 - 100	1
Palliser River 03	76 - 100	76 - 100	1
Palliser River 04	76 - 100	76 - 100	1
Palliser River 05	76 - 100	76 - 100	1
Ralph Lake 01	76 - 100	76 - 100	1
Ralph Lake 02	76 - 100	76 - 100	1
Joffre Creek 01	76 - 100	76 - 100	1
Joffre Creek 02	76 - 100	76 - 100	1
Joffre Creek 04	76 - 100	76 - 100	1
Joffre Creek 05	76 - 100	76 - 100	1
Joffre Creek 06	76 - 100	76 - 100	1
Connor Lakes 01	76 - 100	76 - 100	1
Connor Lakes 03	76 - 100	76 - 100	1
Middle White R. 01	76 - 100	76 - 100	1
Middle White R. 02	76 - 100	76 - 100	1
Middle White R. 04	76 - 100	76 - 100	1
Middle White R. 06	76 - 100	76 - 100	1
Middle White R. 07	76 - 100	76 - 100	1
Deep Lake 01	26 - 50	26 - 50	1
Middle White R. 03	51 - 75	76 - 100	2
Middle White R. 05	51 - 75	76 - 100	2
Joffre Creek 03	51 - 75	76 - 100	2
Deep Lake 02	26 - 50	51 - 75	2
Deep Lake 03	26 - 50	76 - 100	3
Goat Basin 01	26 - 50	76 - 100	3
Palliser River 01	26 - 50	76 - 100	3
Connor Lakes 02	26 - 50	76 - 100	3
Connor Lakes 04	26 - 50	76 - 100	3
Connor Lakes 06	26 - 50	76 - 100	3
Connor Lakes 05	6 - 25	76 - 100	3

Vegetation Loss Rating: 1 = no difference in coverage class between site and control
2 = difference of one coverage class
3 = difference of two or more coverage classes

B. Mineral Soil Increase

Site Name	Mineral Soil Exposure on Campsite (%)	Mineral Soil Exposure on Comparison (%)	Mineral Increase Rating
Middle White R. 01	0 - 5	0 - 5	1
Middle White R. 02	0 - 5	0 - 5	1
Middle White R. 04	0 - 5	0 - 5	1
Middle White R. 05	0 - 5	0 - 5	1
Middle White R. 06	0 - 5	0 - 5	1
Middle White R. 07	0 - 5	0 - 5	1
Connor Lakes 01	0 - 5	0 - 5	1
Connor Lakes 03	0 - 5	0 - 5	1
Joffre Creek 01	0 - 5	0 - 5	1
Joffre Creek 04	0 - 5	0 - 5	1
Joffre Creek 05	0 - 5	0 - 5	1
Joffre Creek 06	0 - 5	0 - 5	1
Ralph Lake 01	0 - 5	0 - 5	1
Ralph Lake 02	0 - 5	0 - 5	1
Deep Lake 02	0 - 5	0 - 5	1
Palliser River 02	0 - 5	0 - 5	1
Palliser River 03	0 - 5	0 - 5	1
Palliser River 04	0 - 5	0 - 5	1
Middle White R. 03	6 - 25	0 - 5	2
Connor Lakes 02	6 - 25	0 - 5	2
Connor Lakes 05	6 - 25	0 - 5	2
Joffre Creek 02	6 - 25	0 - 5	2
Deep Lake 01	6 - 25	0 - 5	2
Goat Basin 01	6 - 25	0 - 5	2
Palliser River 05	6 - 25	0 - 5	2
Connor Lakes 06	26 - 50	0 - 5	3
Joffre Creek 03	26 - 50	0 - 5	3
Deep Lake 03	26 - 50	0 - 5	3
Palliser River 01	26 - 50	0 - 5	3
Connor Lakes 04	51 - 75	0 - 5	3

Mineral Soil Increase Rating: 1 = no difference in coverage class between site and control
2 = difference of one coverage class
3 = difference of two or more coverage classes

C. Tree Damage:

Site Name	Tree Damage (No.)	Tree Damage Rating
Palliser River 04	0	1
Deep Lake 01	1	2
Joffre Creek 01	2	2
Deep Lake 02	2	2
Palliser River 03	2	2
Connor Lakes 06	3	2
Middle White River 04	4	2
Connor Lakes 03	5	2
Joffre Creek 03	5	2
Joffre Creek 04	5	2
Palliser River 02	5	2
Joffre Creek 06	6	2
Connor Lakes 01	7	2
Palliser River 01	7	2
Ralph Lake 02	9	3
Joffre Creek 05	12	3
Middle White River 06	13	3
Connor Lakes 02	13	3
Connor Lakes 05	14	3
Joffre Creek 02	18	3
Middle White River 01	19	3
Ralph Lake 01	23	3
Palliser River 05	23	3
Connor Lakes 04	25	3
Middle White River 07	30	3
Middle White River 05	32	3
Middle White River 03	42	3
Deep Lake 03	58	3
Goat Basin 01	94	3
Middle White River 02	113	3

Tree Damage Rating: 1 = no more than broker lower branches
2 = 1 - 8 scarred trees; 1 - 3 badly scarred or felled
3 > 8 scarred trees, badly scarred or felled

D. Trees with Root Exposure:

Site Name	Root Exposure (no. trees)	Root Exposure Rating
Middle White River 01	0	1
Middle White River 04	0	1
Connor Lakes 01	0	1
Connor Lakes 03	0	1
Connor Lakes 06	0	1
Joffre Creek	0	1
Ralph Lake 01	0	1
Ralph Lake 02	0	1
Deep Lake 01	0	1
Deep Lake 02	0	1
Palliser River 02	0	1
Palliser River 03	0	1
Palliser River 04	0	1
Joffre Creek 06	1	2
Joffre Creek 03	3	2
Joffre Creek 05	4	2
Palliser River 05	4	2
Joffre Creek 01	5	2
Middle White River 06	6	2
Connor Lakes 05	7	3
Palliser River 01	8	3
Deep Lake 03	9	3
Connor Lakes 02	10	3
Joffre Creek 02	15	3
Middle White River 05	16	3
Goat Basin 01	16	3
Middle White River 07	17	3
Middle White River 02	21	3
Middle White River 03	23	3
Connor Lakes 04	24	3

Root Exposure Rating: 1 = no trees with root exposure
2 = 1 - 6 trees with root exposure
3 > 6 trees with root exposure

E. Development:

Site Name	Development Rating
Middle White River 04	1
Palliser River 02	1
Palliser River 03	1
Palliser River 04	1
Connor Lakes 03	2
Connor Lakes 05	2
Joffre Creek 01	2
Joffre Creek 04	2
Joffre Creek 06	2
Deep Lake 02	2
Palliser River 01	2
Palliser River 02	2
Middle White River 01	3
Middle White River 02	3
Middle White River 03	3
Middle White River 05	3
Middle White River 06	3
Middle White River 07	3
Connor Lakes 01	3
Connor Lakes 02	3
Connor Lakes 04	3
Connor Lakes 06	3
Joffre Creek 02	3
Joffre Creek 03	3
Joffre Creek 05	3
Ralph Lake 01	3
Ralph Lake 02	3
Deep Lake 01	3
Deep Lake 03	3
Goat Basin 01	3

Development Rating: 1 = no more than 1 scattered fire ring
2 = 1 fire ring with or without primitive log seat
3 = >1 fire ring or major development

F. Cleanliness

Site Name	Number of Fire Scars	Cleanliness Rating
Middle White R. 04	1	1
Connor Lakes 03	1	1
Joffre Creek 03	1	1
Deep Lake 01	1	1
Deep Lake 02	1	1
Palliser River 03	1	1
Palliser River 04	1	1
Middle White R. 07	1	2
Connor Lakes 01	1	2
Connor Lakes 05	1	2
Joffre Creek 01	1	2
Joffre Creek 05	1	2
Joffre Creek 06	1	2
Deep Lake 03	1	2
Palliser River 01	1	2
Palliser River 02	2	2
Middle White R. 01	2	2
Middle White R. 03	2	2
Middle White R. 06	2	2
Ralph Lake 01	2	2
Ralph Lake 02	2	2
Joffre Creek 04	2	2
Palliser River 05	2	2
Connor Lakes 02	3	2
Connor Lakes 04	3	2
Connor Lakes 06	5	2
Middle White R. 02	2	3
Middle White R. 05	1	3
Joffre Creek 02	2	3
Goat Basin 01	2	3

Cleanliness Rating: 1 = no more than scattered charcoal from 1 fire ring
2 = remnants of more than 1 fire ring, some litter or manure
3 = human waste or much litter or manure

G. Social Trails

Site Name	Number of Social Trails	Social Trail Rating
Connor Lakes 03	0	1
Joffre Creek 04	0	1
Joffre Creek 05	0	1
Joffre Creek 06	0	1
Deep Lake 01	0	1
Deep Lake 02	0	1
Palliser River 03	0	1
Palliser River 04	0	1
Middle White R. 01	1	1
Middle White R. 02	1	1
Middle White R. 04	1	1
Joffre Creek 03	1	1
Connor Lakes 05	1	2
Middle White R. 06	2	2
Middle White R. 07	2	2
Connor Lakes 01	2	2
Connor Lakes 04	2	2
Connor Lakes 06	2	2
Joffre Creek 01	2	2
Ralph Lake 02	2	2
Palliser River 05	2	2
Ralph Lake 01	3	2
Middle White R. 05	3	3
Middle White R. 03	4	3
Joffre Creek 02	4	3
Deep Lake 03	4	3
Connor Lakes 02	5	3
Goat Basin 01	5	3
Palliser River 01	5	3
Palliser River 02	5	3

Social Trail Rating: 1 = no more than 1 discernible trail
2 = 2-3 discernible trails or 1 well-worn trail
3 = more than 3 discernible or 1 well-worn trail

H. Camp Area

Site Name	Camp Area (m^2)	Camp Area Rating
Deep Lake 01	12	1
Deep Lake 02	12	1
Connor Lakes 05	21	1
Connor Lakes 03	29	1
Middle White River 04	30	1
Middle White River 01	31	1
Connor Lakes 01	34	1
Joffre Creek 06	59	2
Connor Lakes 06	70	2
Joffre Creek 05	77	2
Ralph Lake 02	88	2
Ralph Lake 01	91	2
Palliser River 03	102	2
Palliser River 04	108	2
Deep Lake 03	112	2
Joffre Creek 03	135	2
Middle White River 07	137	2
Joffre Creek 04	150	2
Palliser River 01	180	3
Palliser River 02	200	3
Joffre Creek 01	240	3
Middle White River 06	247	3
Joffre Creek 02	280	3
Middle White River 05	283	3
Connor Lakes 04	306	3
Middle White River 03	546	3
Connor Lakes 02	647	3
Palliser River 05	672	3
Goat Basin 01	811	3
Middle White River 02	837	3

Camp Area Rating: 1 < 45 m^2
2 = 45 - 180 m^2
3 > 180 m^2

I. Bare Core Area

Site Name	Bare Core Area (m^2)	Bare Core Area Rating
Middle White River 04	0	1
Middle White River 02	1	1
Middle White River 06	1	1
Middle White River 01	1	1
Middle White River 07	1	1
Connor Lakes 03	1	1
Connor Lakes 01	1	1
Joffre Creek 04	1	1
Ralph Lake 01	1	1
Deep Lake 01	1	1
Deep Lake 02	1	1
Palliser River 02	1	1
Palliser River 03	1	1
Palliser River 04	1	1
Joffre Creek 06	3	1
Joffre Creek 05	7	2
Palliser River 01	8	2
Ralph Lake 02	9	2
Connor Lakes 06	10	2
Joffre Creek 02	10	2
Joffre Creek 01	12	2
Connor Lakes 05	14	2
Deep Lake 03	24	2
Middle White River 05	31	2
Joffre Creek 03	36	2
Palliser River 05	39	2
Middle White River 03	50	3
Connor Lakes 02	72	3
Goat Basin 01	72	3
Connor Lakes 04	214	3

Bare Core Area Rating: 1 < 4.5 m^2
2 = 4.5 - 45 m^2
3 > 45 m^2

J. Summary Impact Index:

Site Name	Impact Index	Impact Index Rating
Middle White River 04	22	1
Connor Lakes 03	23	1
Connor Lakes 01	24	1
Palliser River 03	24	1
Palliser River 04	24	1
Deep Lake 02	25	1
Middle White River 01	27	1
Deep Lake 01	27	1
Joffre Creek 04	28	1
Joffre Creek 06	31	2
Ralph Lake 01	33	2
Ralph Lake 01	35	2
Palliser River 02	35	2
Joffre Creek 05	36	2
Middle White River 07	39	2
Joffre Creek 01	39	2
Middle White River 06	40	2
Joffre Creek 03	41	2
Middle White River 02	42	2
Connor Lakes 05	43	2
Connor Lakes 06	43	2
Palliser River 05	44	2
Middle White River 05	50	3
Palliser River 01	50	3
Joffre Creek 02	51	3
Deep Lake 03	53	3
Middle White River 03	54	3
Connor Lakes 02	56	3
Goat Basin 01	57	3
Connor Lakes 04	63	3

Summary Impact Index Rating: 1 = 20 - 30
2 = 31 - 49
3 > 4