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Visitor Use Analysis in Yoho, Kootenay and Banff National Parks of Canada

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Visitor Use Analysis in Yoho, Kootenay and Banff National Parks of Canada" submitted by Derek Petersen in partial fulfillment of the requirements for degree of Master of Science.

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ABSTRACT

The fundamental challenge for the management of many protected areas around the world is the integration of social and ecological systems, goals and objectives. For Canadian National Parks this means being able to provide acceptable levels of visitor and resident opportunities that are consistent with the park's objectives to retain essential ecosystem components, structure and function. The ability to achieve both objectives is dependant upon a thorough understanding of the ecosystem that is being managed. This understanding must extend beyond the natural resources to include one of the principal ecosystem components and drivers of ecosystem change; humans.

This research utilized a travel diary survey to study the activity of the fully independent travel segment in Banff, Yoho and Kootenay National Parks. The survey consisted of two components. The first component was a series of questions that focused on providing information on the visitor, their trips, their experience, their motivations and their trip planning decision process. The research contributed to the discussion of encounter theory by studying the relationship between expectations, encounters and impacts on enjoyment and experience. The results from the first component of the research provided the basis for a number of management conclusions and recommendations in areas of communication, marketing, and visitor experience.

The second component of the travel diary survey was in response to the principal research objective of describing the spatial and temporal components of visitor activity within the study area. An open-ended travel log was embedded in the travel diary survey to capture route/trip sequence and activity information. This approach enabled relationships between visitor behaviour and activity to be related to spatial and temporal data. Response rates were high for both the travel diary and the travel log, however, there was considerable disparity between respondents in the level of detail of their log entries. On average, visitors were reporting only 2.5 stops and 145 minutes engaged in activities for each day of their visit. Possible causes and solutions to this data quality issue are assessed and presented.

The research used a combination of multivariate statistics and GIS frequency mapping to analyze the spatial use information. Trip motivations and decision-making variables were used to cluster visitors into behaviourally similar groups. The cluster information was related to the travel log data to produce cluster frequency maps, from which patterns of use were derived. The five patterns of use included: relaxer, nature seeker, frequent user, activist and socialite.

The research has illustrated the contributions to visitor understanding that can be achieved through the use of a travel dairy/travel log survey approach. Despite acceptable sample size and confidence limits for the results, the research must be considered exploratory. For others who may be interested in undertaking a travel diary study, the research concluded with recommendations aimed at improving survey design, distribution and analysis.

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The author would like to acknowledge his supervisory committee for their willingness to work within tight time frames to see this thesis through to conclusion. The author would also like to thank Parks Canada's Steve Whittingham for his support to this project, Dave Gilbride for his expertise and help in completing the GIS components of the research and Dave McVetty for his advice and support on sampling design and survey distribution.

The author would especially like to acknowledge and thank his family for their patience, support and understanding during the many hours spent away from them while this thesis was being prepared.

DEDICATION

This thesis is dedicated both to those who are responsible for the management of national parks and other protected areas and to those who will, in the future, come to know, use, respect and value these treasured areas. May we all consider them part of the legacy that we will pass along to our children, and they to their children - in perpetuity.

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Social scientists working on protected area issues have for too long avoided prediction for the safer realm of description - describing in social science terms what managers often see for themselves.(Machlis, 1993 pg 18). Too often it offers no conceptual foundation and makes no suggestion about theory development (Manfredo, Vaske, et al. 1995).

Academic enquiry which is intended to improve protected areas management, unless tested in the field, has little real value to the issue of protected areas management. It is very easy to devise/propose alternative solutions and espouse/hypothesize their effectiveness, but when there is no risk (of failure, of embarrassment, of political or legal repercussions) associated with the research findings and/or recommendations, while it may enhance the academic freedom, may limit the ability to contribute useable knowledge (unknown).

CHAPTER ONE: INTRODUCTION

1.1 Problem Statement

Canada is endowed with significant natural resources in the form of energy, raw materials, productive lands and scenic landscapes. These lands are valued both for their economic returns and for their enriching contributions to Canadian identity, society and heritage. The responsible stewardship of Canada's natural resources ensures their sustainability for future generations of Canadians. A system of parks and protected areas is an important component of a strategy to protect and present examples of this natural resource diversity. The cornerstone of this system of protected areas in Canada is the extensive network of national parks.

As with any natural resource, there are often competing interests and demands on its allocation and use. For Parks Canada, these competing interests are the need to protect the lands in perpetuity and the need for the lands to provide opportunities for public understanding, appreciation and enjoyment. The opportunities for use are shared between private individuals and an extensive tourism industry. The positive economic impacts of tourism activity are significant and result in many businesses and regional economies being directly linked to the presence of national parks. It is therefore in the best interest of the tourism industry, national, regional and local economies, and society in general that the national parks of Canada are managed with the goal of sustainability.

National park management is guided by a comprehensive set of policies. The challenge for policy development becomes one of determining how to provide for acceptable levels of visitor and resident opportunities that are consistent with an area's objectives to retain essential ecosystem components, structure and function (Daniel, 2002; Gimblett et. al., 2002). When successful, management for both the visitor opportunity and protection of the recreational setting can occur simultaneously and Parks Canada can achieve its

mandate of ecological integrity[1]. The ability to achieve both objectives effectively is dependant upon a thorough understanding of the ecosystem that is being managed. As ecosystems are comprised of complex sets of social, economic and ecological components, processes and interactions, the human understanding of the systems is usually limited to a few key ecosystem elements and processes. Parks Canada has adopted an ecosystem management philosophy in its approach to understanding and managing park systems. The main principles of this approach are that the human system is embedded within the natural system, that national parks are part of broader landscapes and that ecological integrity may only be achieved through cooperative management within a broader region by agencies and other key stakeholders that have accepted the ecosystem-based management approach (Grumbine, 1994). Other themes related to ecosystem management include: protection of total native biodiversity and supporting processes, emphasis on research and data collection/management, monitoring, adaptive management, adoption of a systems perspective and recognition of the role of human values in defining ecosystem-based management goals (Grumbine, 1994).

Understanding the human ecosystem interrelationships requires the adoption of a human dimensions perspective. A human dimensions approach would include consideration of values, motivations, attitudes, public involvement, partnerships and policy, in addition to a fundamental understanding of human use of the landscape (Arnberger and Brandenburg, 2002; Dunster and Dunster, 1996; Manfredo et al., 1995; Harmon, 1994; Praxis Inc., 1998; Dempsey et al., 2002).

Despite Parks Canada's adoption of an ecosystem management approach and recognition that the human element has been identified as the most significant stressor in greater than 50% of existing national parks (Parks Canada Agency, 2000b), human activity within parks has received little research or monitoring attention. Even the most basic parameters of human activity (where people are going, when they are going, why they are going and

[1] Within the National Parks Act, ecological integrity is defined as: “with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes.” (Parks Canada Agency, 2000a) pg 1.

what they are doing) are poorly understood (Jackson, 2000). Knowledge of these basic parameters of human use information would seem to be critical for any understanding of the patterns of spatial and temporal interactions between social and ecological systems. This need is paramount in the Canadian Rocky Mountain National Parks of Banff, Jasper, Yoho and Kootenay where annual visitation levels exceed 4.6 million (Accord Research, 2002).

Most social research done by Parks Canada has been undertaken to address specific management issues, or to gain an understanding of visitor use at a particular site, or for a particular time period. Such studies are useful for their intended purpose, but do little to provide a comprehensive understanding of the dynamics of visitor use at the scale of a single or multiple parks. What unfolds for park managers is that while they may have a good understanding of the visitor use at specific locations, they are forced to conceptualize the relationships of use between and amongst areas. The result is that management response to an issue at one of the locations is often done in isolation and without an ability to assess cumulative or consequential effects to other locations. To counteract this, an understanding of visitor movements at the individual or trip party level for entire trips throughout single or multiple parks is needed. These movements could then be combined to form a trip profile for each visitor and aggregated to derive overall patterns within and across the trip profiles of all visitors.

It is speculated that similar needs to understand social systems, and in particular visitor use, are likely shared by parks and protected areas elsewhere in Canada and globally. Methodological tools and techniques are needed that will help managers of protected areas better understand visitor use. This understanding could lead to better management of these areas by allowing integration of social and ecological objectives.

1.2 Research Purpose and Objectives

The purpose of this research was to address the need for acquiring a better understanding of visitor use within the Banff, Yoho and Kootenay National Parks study area. The research focused on the following primary objective:

1. *To determine detailed spatial patterns of visitor use, for the fully independent traveller, through the analysis of travel log data.*

Secondary objectives of the research were aimed at complementing the primary objective by providing an understanding of the visitors that were being studied and potential reasons for and implications of their movements. Specifically, these secondary objectives were:

2. To develop a profile of park visitors to the study area,
3. To develop a profile of the trips taken by park visitors,
4. To develop an understanding of the factors that visitors used in deciding where they went and the activities in which they engaged (i.e. reasons for visiting [motivations] and use/importance of information sources),
5. To better understand the trip experience (i.e. how visitor encounters affected visitor experience) and
6. To determine temporal patterns of visitor use.

The research employed a travel diary survey as the principal data collection instrument. The research focused on routes associated with vehicle-based travel along primary and secondary park roads and activities engaged in, both en-route, and at prominent destinations in the parks. The study was further limited, through the choice of sampling methodologies, to the fully independent traveler (FIT). This segment is defined as all visitors except those arriving via train or bus, or visiting as part of a commercial group tour. While it was recognized that this excluded several important user segments (i.e. commercial bus/van tour groups and residents), it was realized that different sampling techniques would be required to survey these groups and it was therefore not possible to acquire information on all segments through a single research project. It was determined acceptable to focus on the FIT traveler as they represented, by their use levels, the dominant user segment within the study area.

1.3 Study Area

The study area (Figure 1-1) includes the three contiguous Rocky Mountain National Parks: Banff, Yoho and Kootenay. Together, the parks comprise 9350 km^2. With the addition of Jasper National Park and Mount Assiniboine and Hamber Provincial Parks, the area constitutes the UNESCO Rocky Mountain Parks World Heritage Site. The study area contains a diversity of landscapes and natural resources. Elevations range from 1000-3500 m across the main and front ranges of the Rocky Mountains and the valleys of the Columbia, Kootenay, Bow and North Saskatchewan Rivers. The elevational gradients combined with differing slopes, aspects and soil conditions result in vegetation composition representative of montane, subalpine and alpine ecoregions.

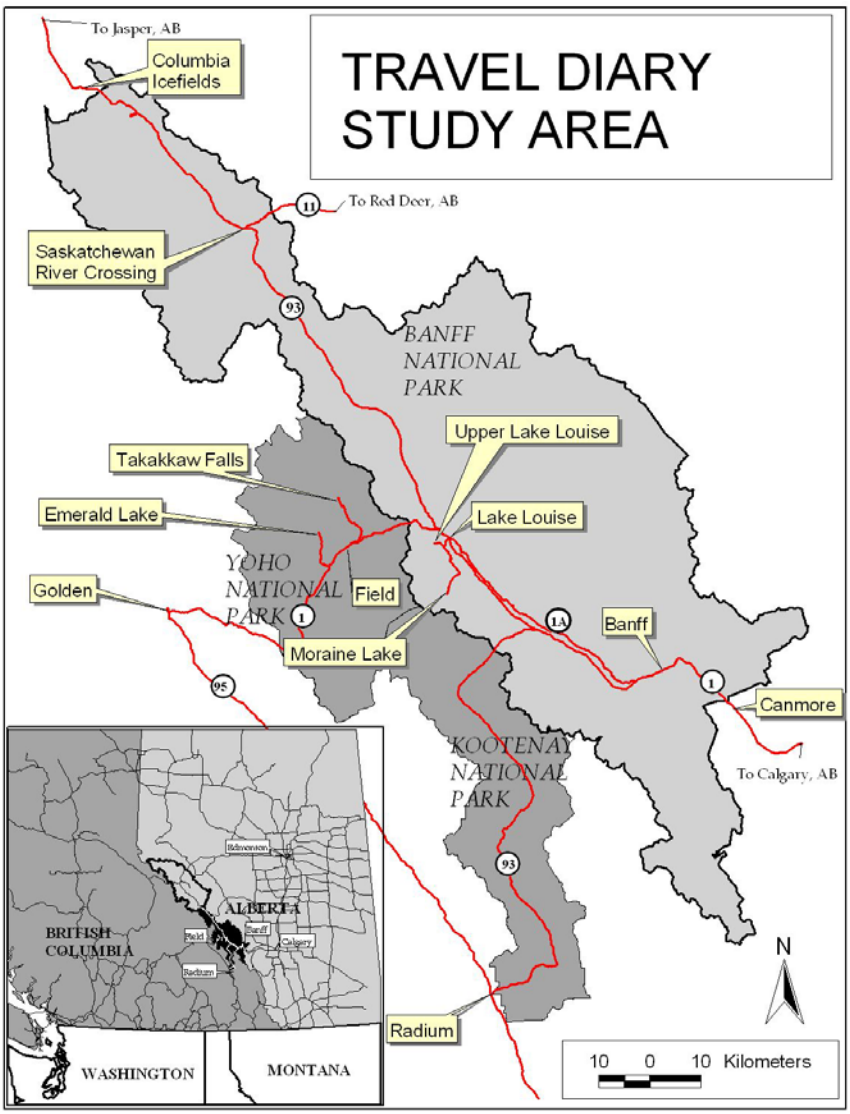

Figure 1-1. Travel Diary study area.

Closed coniferous forests of engelmann spruce, subalpine fir, lodgepole pine, white spruce and aspen are the dominant vegetation types (Komex International Ltd., 1995).

Banff National Park, the birthplace of the Canadian National Park system, is a national and international tourism icon and attracts 4.6 million visitors annually (Accord Research, 2002). In addition to visitor activity, the parks are bisected by an extensive network of roads and railways (including the main national transportation corridors - Trans-Canada highway and Canadian Pacific Railway). In total, it is estimated that Banff, Yoho and Kootenay National Parks hosted 7.6 million person-visits in 1999/2000. This use level represents 52% of all visits to all Canadian national parks (Parks Canada Agency, 2002).

Parks Canada has recently made several policy and management decisions that will limit the amount and type of commercial growth and development within these parks (i.e. caps on commercial development in the Town of Banff, Ski Area Guidelines, Community Plans for Field and Lake Louise and Outlying Commercial Accommodation Guidelines). These decisions deal effectively with internal growth but do not address the extensive development that continues to occur in gateway and regional locations such as Calgary, Canmore, Golden and Radium/Invermere. The regional development associated with the provision of overnight and commercial support services has the potential to increase the component of visitors accessing the study area on a day-use basis. While tourism forecasting is subject to many extraneous pressures (both positive and negative), it is anticipated that demand for access and use of the study area will continue to grow, at a modest rate, into the future.

1.4 Premises and Contributions of this Research

The research explores the general premise that protected areas require a strong inclusion of the social perspective in research, monitoring and management decision-making. In addition, the research discusses the specific premise that for strategic and operational human use management decision-making, credible spatial and temporal use information is critical.

The research makes three main contributions to protected areas management. These include a discussion of the application of human use information, a detailing of human use information for the study area and the development of the travel diary as a survey instrument. Firstly, the thesis contributes to a better understanding of Parks Canada Agency's human use management objective of "attracting park visitors to the right place, at the right time, in the right numbers and with the right expectations" (Parks Canada Agency, 2001, p.18). These contributions relate more to the issue of defining the mechanics of understanding current conditions related to the location (place), timing, numbers and expectations of use as opposed to determining the 'right' values. Despite the focus on approaches to understanding use, the thesis undertakes a preliminary exploration of the concept of a 'right' value from the perspective of assessing impacts of current levels and types of use on visitor experience and enjoyment. Secondly, the research provides detailed human use information for the study area. This may lead to better informed management and policy decisions and a more knowledgeable client base (i.e. planners, regional land managers, resource specialists, tourism industry personnel, stakeholders and business operators) (Praxis Inc., 2000 and Parks Canada, 2001b). Thirdly, the research contributes to the development of the travel diary as an acceptable survey instrument for collecting travel information within a national park setting. The development and application of the diary in this research is critiqued and recommendations made for future modifications.

There is no single body of theory that applies to this research. Instead, the research is multidisciplinary in nature and draws upon elements within the disciplines of travel and tourism (i.e. travel itineraries, psychographics and demand forecasting), recreation and leisure (i.e. human dimensions, encounter expectations/effects, enjoyment, motivations, quality of experience), transportation (i.e. demand forecasting) and geography (i.e. spatial analysis and visualization). Development of new, or expansion of existing, theory is limited. The main theoretical contributions of this thesis relate to the comparison and application of techniques for the spatial analysis of recreational travel patterns in a national park frontcountry setting.

1.5 Author Affiliation

The author is employed by Parks Canada as an Integrated Land-Use Specialist and is currently stationed within the study area for this research. Principle work responsibilities include the integration of social and environmental values and objectives into land use planning, policy development and decision making. This affiliation to the study area presents both negative and positive challenges for this research in that although the knowledge and understanding of the study area and its management challenges may result in a greater applied utility for the research, it can lead to a tendency of approaching the thesis as a project document for Parks Canada. Every effort has been taken to ensure that the latter did not occur and to ensure that the document fulfils all expectations of a graduate thesis.

1.6 Limitations

There are few published references of travel research that focus on high use components of a national park setting (i.e. highways, roadways and at major activity nodes). Initial investigation concluded that while diary methodologies are employed regularly in transportation planning, backcountry recreation and tourism travel demand research, few studies have used it within a national park, and specifically a national park frontcountry setting. The work has been subsequently approached both as a test application of the travel diary survey methodology and as an exploration of relevant analytical tools.

Other limitations of the research include:

- The research is unable to provide a comprehensive summary of all human activity within the study area. Major components missing include the activities of residents and commercial group travel.
- The thesis has focused on the presentation of results related to the stated research purpose and objectives. As a consequence, the results from some of the questions contained in the survey instrument have not been presented.
- The relatively small overall size of the sample population makes detailed sub-group analysis of little statistical value.

The project's value ultimately lies in its abilities to provide sound recommendations for future research on the topic of understanding visitor use in a national park setting.

1.7 Document Organization

This thesis has been organized into five chapters. The introductory chapter outlines the nature of the research problem; the purpose, objectives, premises and limitations of the research, the study area and the affiliation of the author to the study area and research topic. Chapter 2 provides the context for the research and analysis as acquired through a literature review.

Chapter 3 describes the research methods by detailing the design and administration of the travel diary survey instrument and the process used for data entry and analysis. Appendix A supports this chapter by providing a copy of the survey instrument administered for this research.

Chapter 4 presents the research results for the spatial and non-spatial components of the travel diary survey. Non-spatial results relate to visitor profiles, trip profiles, trip experience and decision-making. Spatial results include the application of multivariate, network and descriptive GIS mapping techniques to produce response rates, trip profiles and activity and route summaries.

The final chapter provides conclusions and recommendations related to both the research and to the management of visitor activity within the study area.

CHAPTER TWO: RESEARCH AND ANALYTICAL CONTEXT

2.1 Introduction

This chapter provides an overview of current perspectives and literature relevant to the topics of understanding and managing human activity within a protected area setting and the analysis of spatial travel diary data. It explores the protected areas management issue from the perspectives of both protected areas generally and Parks Canada specifically, with the latter discussion focusing upon the Rocky Mountain national parks of Banff, Yoho and Kootenay. The topic of spatial travel diary data analysis is approached as an exploration of the potential methodological techniques relevant to the diary approach to data collection and analysis. Potential disciplinary approaches including transportation planning, tourism, network analysis, multivariate analysis, visualization, modeling, sequence-alignment and frequency mapping, were reviewed. The contributions of these approaches to travel diary data analysis generally and to the techniques used in this thesis are presented.

2.2 Perspectives on Understanding and Managing Human Activity in Banff, Yoho and Kootenay National Parks

2.2.1 Introduction

Much of the natural diversity found in Canada is protected and presented through a system of national parks. Banff, Yoho and Kootenay, while only three of forty national parks, represent the origins of the system and are recognized as Canadian icons both nationally and internationally. With this high level of recognition comes a high demand for access and a heightened scrutiny for adequate protection.

Management direction for national parks is provided through a number of pieces of legislation and key policy documents, including the National Parks Act (NPA) (Parks Canada Agency, 2000a), Parks Canada Guiding Principles and Operating Policies (Parks Canada, 1994), Parks Canada Agency Act (Parks Canada Agency, 1998) and Parks Canada Agency Charter (Parks Canada Agency, 2002).

Key direction statements from these documents include:

> *Sec 4 (1) NPA - "The national parks of Canada are hereby dedicated to the people of Canada for their benefit, education and enjoyment, subject to this Act and the regulations, and the parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations." (Parks Canada Agency, 2000a, pg 3).*
>
> *Sec 8 (2) NPA; "Maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks." (Parks Canada Agency, 2000a, pg 5).*

Within the Act, ecological integrity is defined as: "with respect to a park, a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes" *(Parks Canada Agency, 2000a, p. 1).*

The policy document, Parks Canada Guiding Principles and Operational Policies (Parks Canada, 1994) provides additional direction related to management of the national park system. The policy document provides direction on issues of park establishment, management planning, protection and management of park ecosystems, visitor activity management, historical activities and infrastructure, and land tenure and residency. Policy references relevant to the focus of this research include:

i. ecological and commemorative integrity - "protecting ecological integrity and ensuring commemorative integrity take precedence in acquiring, managing, and administering heritage places and programs. The integrity … is maintained by striving to ensure that management decisions affecting these special places are made on sound cultural resource management and ecosystem-based management practices." pg 16.

ii. human-environment relationship - "people and the environment are inseparable. Protection and presentation of natural and cultural heritage take account of the close relationship between people and the environment." pg 17.

Overall, the policy direction does not imply a dual mandate of preservation and use. Instead, it clearly suggests that National Parks have a role to play in providing Canadians with educational and recreational opportunities, but that these opportunities must be provided and managed in such a way that the natural values of significance to the area are not lost for future generations. National parks were not established nor intended to be managed as 'ecological sanctuaries' devoid of human activity. Instead, they were expected to celebrate the natural and social fabric of the country by properly managing the inherent values for which they were established, by presenting these values to all visitors and for providing opportunities to bring Canadians together through exploration and education. The future of national parks depends on, and will be determined by, its public constituency. Rollins and Robinson (2002, p. 115) have expressed this idea as "parks unused are parks unappreciated" and "parks unappreciated are parks unsupported."

The desire to provide Canadians with educational and recreational opportunities, is however, met with the realization that human disturbance has been identified as the most significant stressor within the study area and is one of the top five stressors for 22 of 38 national parks (Parks Canada Agency, 2000b). While the intent of the mandate, legislation and policy is clear, the reality is that achieving this direction in the field represents the fundamental management challenge facing most Canadian national parks.

The difficulty of the situation is partly due to the complexity of interactions and relationships between the social and ecological elements that are operating within and around parks. To address these challenges and difficulties, Parks Canada needs to develop tools that will help to explain and understand these systems better. It is proposed that the concepts of human dimensions and ecosystem management may provide the theoretical foundation for this understanding and for the subsequent development of tools necessary for effective explanation and management.

2.2.2 Human Dimensions

The human dimensions concept takes a comprehensive view of the relationship between social and environmental systems. It recognizes a range of factors, including: 1) people are a part of ecosystems (not separate from them); 2) people's pursuits of past, present, and future desires, needs and values (including perceptions, beliefs, attitudes and behaviours) have and will continue to influence ecosystems; 3) parks have social values beyond recreational use (i.e. awe, wonder and sacred values); and 4) management must include consideration of the physical, emotional, spiritual, mental, social, cultural and economic well-being of people and communities (Dunster and Dunster, 1996; Manfredo and others, 1995; Dempsey and others, 2002; and Canadian Parks and Wilderness Society, 1998). A human dimensions information base may include research from the following disciplines: archaeology, cultural anthropology, demography and settlement patterns, ethnobiology, political science, psychology, sociology, resource economics, land tenure, geography, use and management systems and traditional land uses (Harmon, 1994).

A human dimensions approach attempts to expand the discussion of the inclusion of the human element in park and protected areas management beyond the view of human activity only being a negative impact or an unnatural element of natural systems.

Taking a human dimensions perspective however is not an attempt to disregard the fundamental fact that visitors may ultimately impact the environment and 'consume places' (Dearden and Rollins, 2002); nor is it an attempt to prioritize the role of humans above any other species within the ecosystem. It is instead suggesting that in order to effectively manage park lands, there is a need to understand more about the social systems operating within and around them. This understanding needs to extend the focus on human use and associated impacts to a focus on humans as being one of many species in the ecosystem. To be able to do this, there would seem to be the need to integrate ecological and social sciences.

Unfortunately, this holistic and inclusive perspective of humans is in contrast to that of traditional ecological sciences where humans were seen as either an exotic species (Vandeman, 2000; Shopland, 2000), or as a species excluded from the list of normal ecological factors because they violated many of the assumptions of the ecological paradigm (Pickett and Ostfeld, 1995). Human ecology tended to provide a more moderate view by suggesting instead that when parks are viewed as ecosystems in which visitors are one of the key components, along with the biophysical environment and the larger society, visitor behaviour can be understood and described by a language that shares similarities with existing ecological concepts. This ability to share a common language can greatly facilitate the integration of the two perspectives. Some of the shared concepts are presented in Table 2-1 (Machlis, Field, and Campbell, 1981; Clark, 1987; Schroeder, 1990; Pacas, Cornwell, and Green, 1996; and Banff-Bow Valley Study, 1996).

Table 2-1. Shared terms between social and ecological sciences.

SOCIAL CONSTRUCT	ECOLOGICAL PARALLEL
Alternative visitor opportunities	Landscape complementation and supplementation
Market segmentation	Metapopulation
Roads, trails, boatable streams	Travel corridors
Attachment to special places	Territoriality
Region of preferred recreation settings	Home range
User group interactions	Interspecific population dynamics such as competition or mutualism
Population diversity (age, sex, race) Cultural diversity	Biodiversity
Sustainable economy/tourism Limits of acceptable use (front and backcountry)	Carrying capacity
Visitor/resident relationships Crowding Infrastructure capacity	Assimilation capacity
Land transportation (roads, rails, trails) Water and air transportation Utility corridors	Connectivity

Both the human dimensions and human ecology perspectives advocate for humans to be considered and integrated as only one of many ecosystem components.

2.2.3 Ecosystem Management

Parks Canada's response to addressing the need to integrate social and ecological considerations was to adopt an ecosystem based management approach. The National Parks Policy (Parks Canada, 1994, p. 33), included the following definition of the concept:

> "ecosystem management provides a conceptual and strategic basis for the protection of park ecosystems. It involves taking a more holistic view of the natural environment and ensuring that land use decisions take into consideration the complex interactions and dynamic nature of park ecosystems and their finite capacity to withstand and recover from stress induced by human activities."

To assist with the development of the ecosystem management concept for Parks Canada, a framework was developed to assist understanding human/environment relationships. The framework included three components: 1) landscape/seascape (a human conception of the physical world), 2) people (distribution, organization, behaviour and values, and 3) processes (including both ecological and socio-cultural processes that influence relationships among the people and between people and places) (Nepstad and Nilsen, 1993). During the same period, other research was being undertaken to explore the concept of ecosystem management and its relevance to protected areas management (Grumbine, 1994). This other work further emphasized the need to integrate both ecological and social elements.

In addition to work occurring for Parks Canada, numerous other tools and approaches to assist in understanding and assessing the human/environment relationship were being developed and applied to protected area settings elsewhere in and outside of Canada. The Visitor Activity Management Process (VAMP), Recreation Opportunity Spectrum (ROS), Limits of Acceptable Change (LAC), Visitor Experience and Resource Protection (VERP) and Visitor Impact Management (VIM) are a few of these processes. For a thorough comparison and evaluation of these frameworks, refer to McCool et. al., 1997.

While each of the frameworks has been applied successfully for certain management situations, there has yet to be a single framework that has received universal adoption for protected areas planning and management. This is problematic in that the continual development of new frameworks does not recognize the value of the work done to date and limits implementation of the frameworks due to a perceived lack of credibility and utility. The inability to accept a single framework also creates two other problems: 1) valuable research and management resources that are devoted to the development of new processes are resources that are then unavailable for undertaking on-the-ground management actions, and 2) protected areas management continues to be undertaken without the support of an acceptable integrated model to support understanding and decision making.

Although tool development is necessary and will continue to be supported, Parks Canada has recently adopted a more fundamental approach for exploring and understanding human/environment relationships. Current policy direction for the development of national park management plans and State Of The Parks Reports (SOPR) require that a systems approach be taken (Parks Canada, 2001c). This begins with the development of a conceptual framework synthesizing the park's understanding of its ecosystems, its key elements and key processes, and the main linkages among them. To facilitate public, stakeholder and staff understanding, the conceptual framework can take the form of an ecosystem model. While a model is a simplified explanation of real world phenomena and is incapable of capturing the full scope of the components, interactions and processes for all systems, it can be a valuable tool to encourage an integrated discussion between the social and ecological sciences. Such a model was developed by Banff National Park for inclusion in both its 2003 State of the Park Report and an Indicators Amendment for its Park Management Plan 5 year review (Parks Canada Agency, 2003a). The systems represented by the ecosystem model included ecological, human/wildlife, human/ecosystem, human dimensions, cultural and national park opportunities (social) (Figure 2-2).

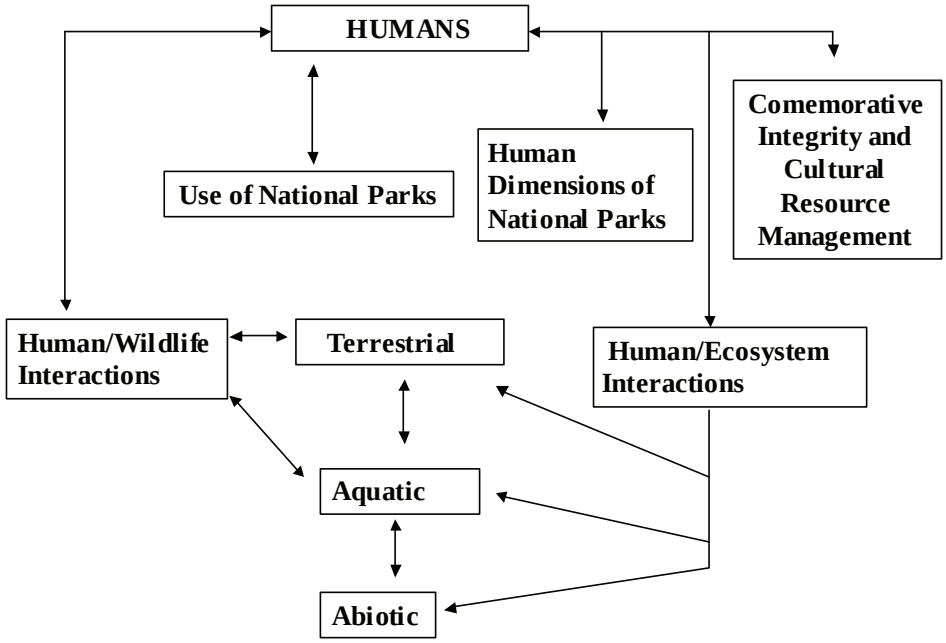

Figure 2-2. Generalized ecosystem model of Banff National Park.

The model in Figure 2-2 is an advancement of traditional ecological models where humans were presented only in relation to their ecosystem impacts (i.e. the human/wildlife and human/ecosystem systems)(White, 2001). The human dimensions system addresses components discussed earlier in this chapter including public awareness, support, economics and public involvement (Table 2-2). The national park

Table 2-2. Elements of human dimensions and national park opportunity components of generalized ecosystem model.

Human Dimensions	***National Park Opportunities***
- public awareness/understanding and support, volunteering, internet usage, environmental assessments, visitor comments, special events, human infrastructure footprint, development, business licenses, revenues, expenditures, assets, economic impacts, regional socio-economic trends, employment, regional relationships, heritage tourism, public involvement, education and policy	- use (traffic, visitation, overnight, day), patterns of use (demographics, activities, commercial), experience (satisfaction, quality, community life), recreational river use, highway accident rates, appropriate behaviours, parks act violations, crowding/congestion, motives, benefits and conflicts

opportunities refer to the interaction of visitors/park users with each other (human to human interactions) and relates to use levels, patterns of use etc. (Table 2-2). While it could be argued that national park opportunities are simply part of the human dimensions system, these opportunities are important to the mandate of Parks Canada and warrants its profiling as a separate component in the ecosystem model.

From a description and discussion of the elements of the general ecosystem model, a number of indicators were identified. These indicators comprised an amendment to the Banff National Park Management Plan (Parks Canada Agency, 2003). The indicators being proposed as representative of the social systems included:

- human/ecosystem and human/wildlife: wildlife mortality, major corridor use, grizzly bear habitat effectiveness, fire, environmental management system and forest insect and disease.
- human dimensions and national park opportunities: regional growth and development (land conversion, regional population, road and trail density), visitor use (profile of visitors, behaviour of visitors, number of visitors), visitor opportunities (satisfaction, public understanding, contemporary asset condition), economic vitality (occupancy rate, dollar spent/capita), communities (no-net-negative environmental impact) and ski areas (long-range plans).

The key to understanding the social components of both the ecosystem model and the indicator amendments is knowledge about visitor activity. Knowledge of this activity is in the form of levels, types, timing and locations of use.

The concept of ‘human use’ is intended to account for all on-site recreational and commercial activities (i.e. tourism) of residents and visitors, thereby avoiding the tourism versus recreation debate (Leiper, 1979; Mathieson and Wall, nd; Murphy, 1986; and McKercher, 1996). There is general agreement that regardless of the term used, the dominant need is the understanding and management of acceptable level, types and timings of park use. The Banff-Bow Valley study concluded that human numbers and

use of the landscape were the most important variables of change in the Banff Bow Valley and surrounding area (Green, et al., 1996).

The specific need for Parks Canada to collect use information has been identified through a number of internal and public fora (Parks Canada Agency, 2000c; Payne, 2000; Kachi and Walker, 1999; Praxis Inc., 2000; Parks Canada, 2001a; and Parks Canada Agency, 2003b). Some of the common data needs identified through these and other reviews include: impacts and indicators of visitor use, visitor understanding and knowledge, distribution of people, expectations, attendance, demographics, behaviour, resource demands, decision processes, motivations, experiences, satisfaction and temporal and spatial patterns of use (Watson, Cole, Turner, and Reynolds,2000; Pacas et.al.,1996; Waltho,1998; Machlis,1995; Hornback, McIntyre, and Eagles,1997; Payne, 1997; Kinnear, 1990; and Nepstad and Nilsen, 1993).

One of the common applications of visitor use data in recreation and carrying capacity research relates to encounter theory and the specific study of encounters, crowding and norms (Vaske and Donnelly, 1999). Encounters is a measure of the number of other visitors an individual reports seeing during some temporal or spatial unit of analysis. Crowding is a negative evaluation of the reported encounters, and norms are the evaluative standards for acceptable conditions for the unit of analysis. Encounter theory predicts that when encounters exceed a visitor tolerance limit (norm) for seeing others, crowding will increase. A review of 11 different studies (Vaske and Donnelly, 1999) demonstrated that when individuals encounter more than their norm, crowding increases. This topic is important within the study area given the high levels of visitation to some of the popular nodes within the Parks.

Some baseline use data is currently being collected within the study area. Methods to collect these data include highway traffic counters, trail counters, still and video camera monitoring on trails, service/facility user counts, public contacts with Parks Canada staff and social surveys. Unfortunately, most data collection in the study area has been and/or is site or area specific, has focused on a specific management issue and has occurred in

backcountry[2] locations. This information, while useful for its intended purpose, has done little to provide an overall picture of patterns of human use for the majority of park users, whose activities are generally within frontcountry[3] locations.

Parks Canada needs to develop tools through which a comprehensive understanding of use can be achieved. This understanding must include the dynamic elements of the use and must extend to the scale of an entire park or to multiple parks or regional landscapes.

2.3 Methodological Approaches To Spatial Travel Diary Data Analysis

"The major difficulty in the analysis of human activity-travel patterns is that individual movement in space-time is a complex trajectory with many interacting dimensions. These include the location, timing, duration, sequencing and type of activities and/or trips" (Kwan, 2000, p.185). Options exist either to analyze these complexities by addressing an individual or small group of components or by treating the patterns in their entirety through the use of multivariate methods (i.e. cluster/factor, pattern recognition algorithms etc.), as were used for this thesis research.

Travel behaviour (especially multidestination) has caught the interest of researchers in diverse areas such as transportation, geography, marketing and tourism. From a transportation research point of view, multidestination travel behaviour can be understood as the basis for a more appropriate design and management of transportation systems. On the other hand, marketing and tourism research focuses on travelers' selection of combinations of destinations. However, due to the particularities of selection choices in the area of tourism, different approaches and methods are demanded in multidestination tourism research (Hwang, Gretzel, and Fesenmaier, nd).

The following discussion explores the analytical approaches used within transportation and tourism studies, and other potentially relevant disciplines, to the understanding of

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[2] Backcountry: "Portions of a park not accessible by private vehicles." (Public Works and Government Services, 1997:8) (cited in Thingsted, 2003)

[3] Frontcountry: "Portions of a park which are accessible by motor vehicle or boat and which contain a concentration of services and facilities." (Public Works and Government Services, 1997:65)

spatial visitor use data within the Rocky Mountain national parks. This review was undertaken to assess the scope and relevance of methodological approaches that had been used for the analysis of data similar to the travel diary research. This review was necessary as there was no single source of published literature found that directly paralleled the research objectives of this thesis. Methodological approaches reviewed but not utilized for analysis in this thesis are only briefly presented at the outset of the following discussion. Others that have been applied are more thoroughly reviewed.

2.3.1 Transportation Planning

Transportation research and planning uses the diary survey intensively as its main approach to data collection. Transportation research seemed to offer the most potential with respect to the analysis of the travel diary data. In addition, key word searches for "travel diary" and variants produced significant numbers of transportation related references.

Much of the transportation planning literature is focused on assessing travel demand. Traditionally, this was done through a trip-based approach utilizing deterministic models pertaining principally to four components of daily travel: number of trips, origin and destination, mode and route of travel. These models were problematic because they generated trips which were independent of transportation supply characteristics and possible technological improvements, were site specific, and did not adequately account for the interconnectivity among trips, the interplay between activities and travel, the role played by the time-space continuum in modeling travel demand and time of day dimensions (Kalton, 1990; Pendyala and Goulias, 2002).

Approaches to travel demand forecasting have evolved to the current use of activity based analysis (Kalton, 1990; Ma and Goulias, 1997; Keuleers, Wets, Arentze, and Timmermans, 2001; Wen and Koppelman, 2000; Pendyala and Goulias, 2002). The underlying premise of the activity-based approach in transportation demand forecasting is that travel decisions are driven by a collection of activities that need to be completed during some specific time period by either an individual or by collective members of a

household. Travel is undertaken to fulfill both the need and desire to participate in these activities (Wen and Koppelman, 2000). This approach does not consider travel to be an activity. Instead, it shifts the focus away from analyzing the trip to using the scheduling of activities as the driver of travel patterns (Murakami and Wagner, 1999). In activity-based modeling, the basic travel unit is a tour defined as the sequence of trip segments that start and end at home (Shiftan and Suhrbier, 2002). Basic patterns are derived from an understanding of activity, duration, location and mode of travel. Travel demand forecasting has conventionally used diary information for short periods (<7 days but commonly 2-3 days). Concerns have been raised that this approach, although providing detailed and accurate data for the short sampling period, does not provide information of the underlying variations in the rhythms of daily life across time (Axhausen, Zimmermann, Schonfelder, Rindsfuser, and Haupt, 2002).

Early approaches to activity-based travel demand forecasting incorporated space-time constraints that defined feasible activity patterns from a list of programmed activities, available locations, transportation system structure and facility opening times. This mechanistic approach did not attempt to model activity choice behaviour. In response, utility-based models were developed that used extensions of conventional nested logit models to predict destination and mode choice behaviour based on trip data. Subsequent model development replaced trip data with data on activity patterns and used rule based systems to account for the cognitive components that determine travel behaviour (Arentze, Hofman, and Timmermans, 2001).

Approaches to understanding this behaviour have involved either the determination of probabilities derived from traditional travel choice models or association rules that assume that individuals and households apply particular heuristic decision rules in scheduling their activities in space and time (Keuleers et al., 2001). If this latter assumption is accurate, spatial-temporal patterns in activity diary data should be identifiable.

Transportation research does address the issue of leisure traffic and recognizes that this travel is different from travel for other purposes. Leisure traffic is very heterogenous - especially compared to work trips. Additionally, leisure activities are generally characterised by less rigid temporal constraints than for work or school activities. This heterogeneity makes it difficult to study (Simma, Schlich, and Axhausen, 2002). Fundamentally, however, there would seem to be significant differences between leisure travel and the holiday related travel that is being studied in this thesis. Leisure travel is envisioned to include the short trips that focus on non-work activities and are part of normal daily household schedules. Holiday related travel represents the trips of a longer duration that are outside of normal daily routines and are generally at locations distant from the home location. These travel patterns have little impact on most urban transportation systems and therefore have little importance and interest to regular transportation research. Given these limitations, it was determined that the transportation planning methods reviewed would not be utilized for the analysis of the Travel Diary research data.

2.3.2 Tourism

Travel itineraries and patterns as they relate to tourism destinations are key concepts in tourism planning (Lew and McKercher, 2002). The relationship that the destination of interest has to the rest of the itinerary defines the type of destination it is. Knowledge of this is valuable in understanding the different ways that travelers perceive and experience a destination as part of their itinerary and how a destination can best position itself relative to its major markets. Gartner and Hunt (1988, p. 159) suggest that "the ultimate end of acquiring information on tourist flows is to increase visitor satisfaction and revenues to businesses providing tourist services." Itinerary knowledge combined with sociodemographic data about the travelers can help destinations to better position themselves for different market segments. A diversified market segment can provide economic stability through periods of market fluctuations. In addition to market oriented information on the location and relationships of single or multiple destinations, analysis of travel itinerary data is used for travel demand forecasting (Oppermann, 1995).

A travel itinerary is comprised of a route with one or more stops. The initial tourism demand models focused primarily on the general flow of travelers from one destination to another (i.e. country to country) and on variations in the patterns of these flows. These analytical approaches focused on the route, to the exclusion of understanding the stops en-route (i.e. the itinerary). Failure to study the itineraries was the result of two major scale issues: aggregation and sampling limits. Data aggregation refers to the level of detailed information that is available to researchers. A study by Lew and McKercher, (2002) identified three levels of aggregation common to trip itinerary data: arrivals by country of residence or nationality (as collected at border crossings), main destination ratios (percentage of main destination travelers among all travelers to a destination) and full itineraries. The latter aggregation level collects data by asking travelers to list in order, all of the stopover places on their itinerary or to trace their travel route on a map. These routes then form the basis for describing travel patterns. The first forms of aggregation would provide data that is too generalized to be of much value to the planning and management of a single protected area or site (i.e. assessing environmental impacts at specific locations). The limitations of the data relate to spatial resolution, sample size, absence of intervening routes, absence of specific visitation data and limited local detail of movements (Forer, 2002). The second issue of sample limits suggest that both the detail and boundaries of maps determines the detail of the data that is obtained from respondents and that for many specific itineraries within a survey, sample sizes are often too small to be of any statistical value.

Most of the analysis of tourism related travel itinerary data has focused on descriptive outputs (i.e. traveler volumes), generalizations of types or patterns of travel routes, or modeling of travel destinations (Forer, 2002). Some of the travel route patterns proposed to date include direct routes, partial orbits, full orbits, fly/drives (Mings and McHugh, 1992) single-destination, en route, base camp, regional tour, trip-chaining, open jaw loop, multidestination area loop (Lue, Crompton, and Fesenmaier, 1993) and single destination, gateway destination, egress destination, touring destination and hub destination (Lew and McKercher, 2002). The latter study advanced the discussion of multi-destination trips and suggested five motives for this travel behaviour: to satisfy the heterogeneity of

preferences present in their travel party; to visit family and friends; to find variety; to reduce the risk of being dissatisfied with the vacation; and to increase travel efficiency by visiting many destinations that interest them during one trip.

The tourism literature suggests certain approaches to data analysis that could enhance the understanding of travel patterns. These include the use of dynamic segmentation and routing to transform the itineraries into forms that could provide a much wider range of queries about flows and their constituent parts; route building algorithms in GIS to generate multiple itineraries that could then be questioned and aggregated; and network analysis of map traced travel paths (Forer, 2002; and van der Knaap, 1999). Few published examples of applications of these analytical tools to recreational or holiday travel were found.

One approach that was published related to a study undertaken in Northern Alberta to develop a statistical model of day-use travel and visitation to parks (Vaillancourt, 1991). The data consisted of characteristics of both visitor origin and facilities or features of the parks. The technique was defined as a spatial interaction model that established the relationship between the number of day-visits to parks, the attractiveness of the parks (number of recreation opportunities and facilities offered), and the distance between origin and park. The general structure of the model consisted of a set of rules that determined how the variables related to each other and how they predicted day-use attendance. This research utilized logistic regression, which is a routine that is particularly well suited to modeling discrete choices. Two examples of a discrete choice are the choice of a recreation activity and the choice of a recreation site. The spatial interaction model developed by this study consisted of a trip generation and a trip distribution component. The study used the results of the model to predict the consequences of a variety of policy decisions (i.e. adding/deleting park facilities and adding/deleting parks). It was concluded that the model performed poorly in forecasting day-use attendance at specific sites but better at predicting the overall impacts to day-use visitation patterns resulting from policy changes.

The literature review of tourism research resulted in few methodological approaches that could be applied directly to the site specific analysis required from the Travel Diary data. There is the likely potential, however, that through further research and development several of the tools identified could have application to the analysis of the travel diary data.

2.3.3 Network Analysis

In general, a network is a system of interconnected linear features. Networks, and the use of network analysis have been applied to transportation, social and tourism issues. Measures used to define the relationships within networks include centrality, degree, closeness and cliques. Centrality is a structural attribute of nodes in a network. It measures the contribution of network position to the importance, influence and prominence of an actor in a network – the extent to which a network revolves around a single node. Degree represents the number of ties to others. A node with a high degree centrality in a city travel network refers to a city that is frequently connected with other cities. Betweeness centrality measures the extent to which a node is directly connected only to those other nodes that are not directly connected to each other (i.e. travel hubs). Closeness is the graph-theoretic distance of a given node to all other nodes (Wasserman and Faust, 1994). Cliques refer to a strong connection between three or more nodes (Hwang et al., 1993).

Within tourism studies, multidestination travel flows can be understood as networks of relationships among destinations. In contrast to conventional statistical methods, network analysis does not require observation to be independent, which makes it particularly suitable for an investigation of multi-city travel patterns (Hwang et al., 1993). In addition to network structures, the directional property of travel flows need to be investigated in order to enhance our understanding of multidestination travel patterns. This suggests that the likelihood of visiting a certain destination depends on the previous destinations visited due to the spatial structures of origin and destination. Network analysis was used successfully in a study of international visitors to the United States to understand the

relationship between multi-destination travel patterns and visit frequency and visitor origin (Hwang et al, 1993).

Initial exploration suggested that network analysis was one of the evaluated analytical techniques that showed potential utility to the analysis of travel diary data. These preliminary explorations, including the development of requisite database structures, are presented in the methods and results sections. In the end, however, it was determined that other approaches better met the research objectives of the thesis.

2.3.4 Multivariate Analysis

The objective of pattern recognition is to identify a small number of relatively homogeneous groups within a larger data set (Ma and Goulias, 1997). In many applications (especially transportation planning), this is achieved through the use of cluster analysis. In general, this approach groups objects or cases on the basis of their nearness, which is measured relative to distance and similarity. Distance is a measure of how far apart two cases are, while similarity measures their closeness. The analysis of variance (ANOVA) is used to evaluate the result of clustering and the strength of variables in discriminating cases among clusters. When the number of clusters is less than five, increasing the number of clusters substantially increases the explanation of the information (Ma and Goulias, 1997).

Factor analysis is used to uncover patterns among variations in values of several variables and is commonly used to reduce a large number of variables (i.e. activity and location) into a smaller number of new combinations that explain the variation in the larger set (Accord Research, 2002). This is done through the generation of artificial dimensions (factors) that correlate highly with several of the real variables and that are independent of one another. Two criteria are taken into account: a factor must explain a relatively large proportion of the variance found in the study variables; and every factor must be more or less independent of every other factor (Babbie, 1989).

In the transportation research cited by Ma and Goulias (1997), cluster analysis was used to summarize relatively homogenous daily activity and travel patterns, and contingency tables were used to examine the temporal-interplay between activity and travel patterns. The analytical process used was: cluster analysis to summarize daily activity and travel behaviour of persons and households separately; cluster analysis to group persons based on their activity and travel behaviour; and contingency tables to test cluster membership for temporal homogeneity in the short and long term. Temporal changes in cluster membership and the relationship between activity patterns and travel patterns can be analyzed using the measures of association between the variables.

2.3.5 Visualization

Most quantitative approaches to data analysis were not designed to handle real geographical locations of human activities and trips. They often relate spatial references to a measure against some geographic location (i.e. distance from an origin or to a destination) or to some broader aggregation (i.e. zonal divisions in transportation planning) (Kwan, 2000). Quantitative methods are also intended to deal with categorical data, whereas spatial and temporal dimensions of activity-travel are continuous. To analyze the continuous data therefore requires an organizing of the data into discrete units of space and time. There is the potential that the results of the analysis can be impacted by the organization scheme used. Visualization may have an important role to play in addressing these issues since the spatio-temporal patterns of the original data can be explored before they are categorized for further analysis or modeling

“Visualization is the process of creating and viewing graphical images of data with the aim of increasing human understanding”. “Geovisualization is the use of concrete visual representations and human visual abilities to make spatial contexts and problems visible" (Kwan, 2000, p. 187). Early studies used 2D maps and graphical methods in the form of lines connecting various destinations to represent the space-time paths of activity-travel behaviour. Unfortunately, in using this approach, information about the timing, duration and sequence of activities and trips was lost. The use of a 3D vector data structure has overcome many of these limitations. Additional advantages to using GIS-based 3D

geovisualization include: the provision of a dynamic and interactive environment that is much more flexible than the conventional mode of data analysis in transportation planning, the capability to integrate a large amount of geographic data in various formats and from different sources into a comprehensive geographic database (generating far more complex and realistic representations of the environment, and the ability to retain the complexity of the original data (Kwan, 2000).

The geovisualization approach takes a time-geographic perspective in which an individual's activities and trips in a day can be represented as a daily space-time path. "This time-geographic conception is valuable for understanding activity-travel behaviour because it integrates the temporal and spatial dimensions of human activity patterns into a single analytical framework" (Kwan, 2000) pg 190. The approach represents the geographical location data as the x,y coordinates and the time variable as the z coordinate.

An enhancement to the above approach required the use of 3D activity density surfaces. Kernel estimation was used to generate a density surface from a point distribution of 'n' activity locations. The grid based density surfaces were then converted to 3D format and added into a 3D scene. "The major advantage of this method is its capability for examining the spatial relationships between different surfaces in their concrete geographical context" (Kwan, 2000) pg 194. Temporal elements were incorporated through the development of space-time activity density surfaces. This requires that a grid structure be developed to represent the time component. In one example, the grid structure was created by dividing the day into 960-1.5min time slices and the distance from home into 960-40.2m blocks. "The 3D space-time activity density surfaces reveal the intensity of activities in space and time simultaneously, is amenable to many map-algebraic operations and makes the derivation of a 'difference surface' for two population subgroups relatively easy" (Kwan, 2000) pg 196.

"The 3D methods can be the basis for developing and formulating quantitative methods for the characterization and extraction of patterns from the large number of space-time trajectories as valuable analytical tools" (Kwan, 2000) pg 198.

Simple visualization approaches, combining frequency data and GIS, were used extensively for the analysis of Travel Diary data.

2.3.6 Modeling

Static and simulation modeling has been used extensively within recreational research. Initial research into models to predict the spatial distribution of use within backcountry wilderness areas in the United States and how this distribution may respond to various management scenarios were conducted by: Romesburg (1974), who proposed the use of mathematical decision modeling to develop management scenarios that minimized encounters among users; Peterson, deBettencourt, and Wang (1977) who used a Markov-based linear programming model to predict interior use levels within the Boundary Waters Canoe Area as a function of the number of groups entering various peripheral trailheads and the US National Park Service who used a regression model to predict the number of hikers at one time on interior trails as a function of vehicle counts at entrance gates in Mt. Ranier National Park (Cole, 2002).

Traditional static models, although useful for identifying and explaining ecosystem components, processes and relationships, have limitations when attempting to understand dynamic systems such as visitor use in protected areas. Due to these limitations, dynamic simulation modeling is being advocated for recreational data analysis.

> "Simulation modeling is the imitation of the operation of a real-world process or system over time. It involves the generation of an artificial history of a system and the observation of that artificial history to draw inferences concerning the operating characteristics of the real system. The most appropriate approach for simulating outdoor recreation is dynamic, stochastic, and discrete-event, since most recreation systems share these traits" (Wang and Manning, 1999, p. 206).

Dynamic models represent systems as they change over time. Stochastic simulation models contain probabilistic components and take into account the random variation of systems over time. Discrete event simulation models are dynamic models that imitate systems where the variables change instantaneously at separate points in time (Wang and Manning, 1999). Considerable work has occurred in an attempt to integrate simulation models with recreation management. Some of this work was undertaken by

i. Cesario (1975), who described an approach that utilized GPSS (General Purpose Systems Simulator) language.

ii. IBM and the US Forest Service, who collaborated in the development of the Wilderness Travel Simulation Model (Lucas and Shechter, 1977), also using GPSS language.

iii. Wang and Manning (1999), applied the object-oriented dynamic simulation program Extend to undertake a study of carriage road use in Acadia National park. Input data included: census counts of visitors, on-site visitor surveys (group size, mode of travel, amount of time spent on carriage roads and where and how long visitors had paused during the visit, listing of all intersections passed during their trip), GIS analysis (length of carriage road sections between intersection), field visit, examination of engineering maps (to determine that the length of a typical viewscape was approximately 100m) and computer timing of visitor arrival patterns (data gathered to verify the use of an exponential distribution to simulate arrival patterns) (Lawson, Manning, Villiere, Wang, and Budruk, 2002). The model outputs established a relationship between management parameters (i.e. total use) and indicators of quality (i.e. persons per viewscape). These relationships were used to assess current conditions and to predict new conditions under changing patterns and levels of use. The simulation outputs were also available for use in discrete choice experimentation.

iv. Lawson et al (2002), who used Extend in another simulation modeling study. The model was used to assess three management issues: how the

scheduling of bus transportation in Yosemite Valley would influence levels of congestion at popular destinations, to relate the number of vehicles entering Arches NP to the persons-at-one-time at Delicate Arch and to adjust entry quotas at arrival points at Isle Royale NP to minimize the problem of multiple groups having to use individual designated campsites on the same night.

v. (Gimblett et.al., 2002; and Itam and Gimblett, 2001), who developed agent-based or multi-agent system tools for understanding highly variable spatial phenomena and modeling human land-use decisions. In agent-based models, individual agents autonomously make decisions based on internal rules and local information. Autonomous agents are a computer simulation that is based on concepts from Artificial Life research. Agent simulations are built using object oriented programming technology. Agent behaviour evolves over time and adapts to ongoing changes in their environment. Their utility is only limited by the ability to collect meaningful spatial/temporal data about visitors. The model produces a sense of collective behaviour. The interdisciplinary nature of the field includes geography, landscape ecology, regional science, agricultural and resource economics, anthropology, political science and computer science. Development of the Recreational Behaviour Simulator (RBSim) is the initial application of the agent-based approach. It has been applied to management issues in Sedona Arizona, and the Grand Canyon National Park in the U.S. The spatial information that was necessary for the simulations included: destination, arrival and departure times, number of visitors per party, and type of activity. In RBSim 2 (Itami, Raulings, MacLaren, Hirst, Gimblett, Zanon, and Chladek, 2002), agents assumed capabilities over physical mobility, senses and cognition.

vi. (Kebel, Klupfel, Meyer-Konig, and Schreckenberg, 2002), who developed a simulation model for pedestrian flows in Germany. The parameter set for the characteristics of the pedestrians included walking speed, swaying probability, dawdle probability, patience and maximum vision range.

2.3.7 Frequency Mapping

A pilot survey in the Skoki Valley of Banff National Park used a diary type approach to collect backcountry travel information (Wistowsky, 1998). Diary data was analyzed by assessing the frequency distribution of used trail segments and then rank ordering the segments according to usage levels. The approach provided good aggregate level information on the spatial patterns of use and for temporal time blocks. This track segment approach to data reporting is supported in other research as a simple method that can provide an illustration of how use is distributed across the study area and how this differs when actual use is compared to intended use (Rundle, 2002; Kelly and Wright, 1997).

Arnberger and Brandenburg (2002) combined multivariate and frequency mapping methods to analyze and present visitor use data near Vienna, Austria. They utilized a multivariate analysis of visitor use data to create categories of visitors with similar behavioural patterns and spatio-temporal distribution and frequency mapping to present the results.

Frequency mapping is used in the analysis of the Travel Diary data.

It is clear from this review that there are many analytical approaches that involve either diary generated data or focus on spatial data. It seems also apparent that there are very few examples that compare directly to the objectives of the travel diary survey. In chapter three, the methods that have been selected are described and in chapter four, the results of the analyses are presented.

CHAPTER THREE: METHODS

3.1 Introduction

This chapter outlines the methods employed for all components of this thesis. Section 3.2 discusses the rationale for the use of the travel diary survey. Section 3.3 more fully describes the methods used, including discussion of the literature review and the design and administration of the travel diary questionnaire. Section 3.4 details the approaches used to enter and analyze the data and section 3.5 discusses how the results are being presented. The chapter concludes with section 3.6, a presentation of the sampling response.

3.2 Methods Rationale

The selection of the survey method was guided by the research objectives. In order to understand the visitors and their spatial and temporal use of the study area, a survey instrument that included a mechanism to capture visitor travels would be required. The travel diary survey questionnaire was subsequently developed. It utilized a combination of open-ended and closed questions and an open format travel log for data acquisition. The survey was deployed as a self-administered questionnaire.

3.3 Methods Used

3.3.1 Document/Literature Review

Literature reviews were used to identify and synthesize information on two principal topics. The first related to the issue of understanding the role and integration of humans and social systems for protected areas management. The second topic related to the collection and analysis of diary data for understanding travel related patterns of visitor use. Sources for these reviews included published journal articles, books, theses, dissertations, conference proceedings, government and non-government publications, personal communications and reference collections, internal and unpublished Parks Canada documents and web references. Searches of electronic resources and library catalogs included disciplines of geography, sociology, biology, environmental science,

transportation planning, tourism, leisure, recreation and protected areas planning and management. The findings from the literature reviews, although being used as reference materials throughout the thesis, were summarized in chapter 2.

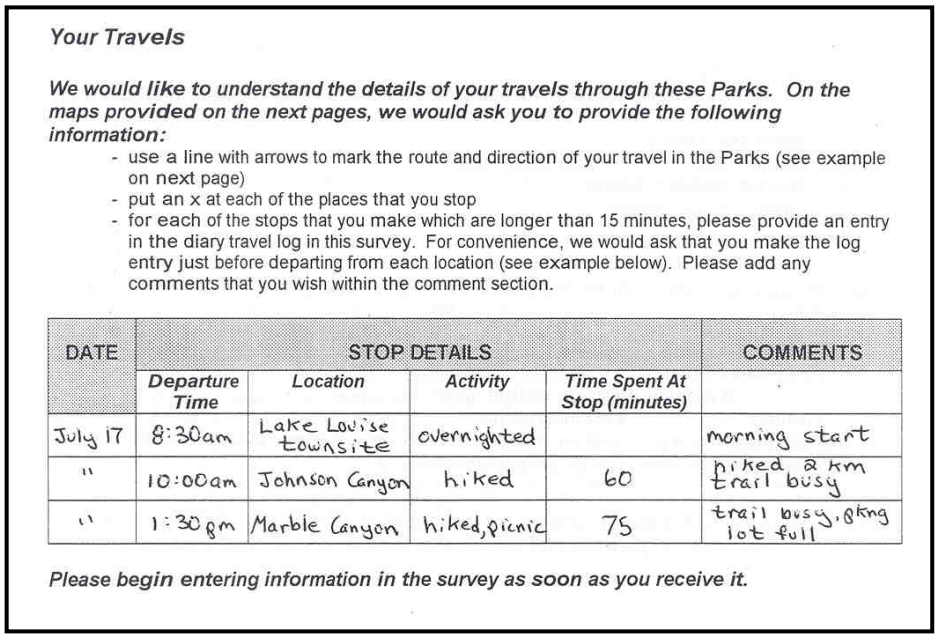
3.3.2 Self-Administered Questionnaire

Survey Design

The Travel Diary survey questionnaire (appendix A) was configured as a small coil-bound (21.5cm x 14cm) booklet consisting of two components:

1) nineteen open ended/closed questions intended to collect information on trip profile, experience, motivations, decision processes and demographics
2) a travel log to collect information on stops made, time spent at each stop location, time of day of travel and nature of activities at each location.

The travel log component utilized an open-ended format. Respondents were free to enter any form or amount of data. An introductory page (Figure 3-3) to the section was included in an attempt to provide some guidance and exemplify the preferred approach to data entry.



Your Travels

We would like to understand the details of your travels through these Parks. On the maps provided on the next pages, we would ask you to provide the following information:

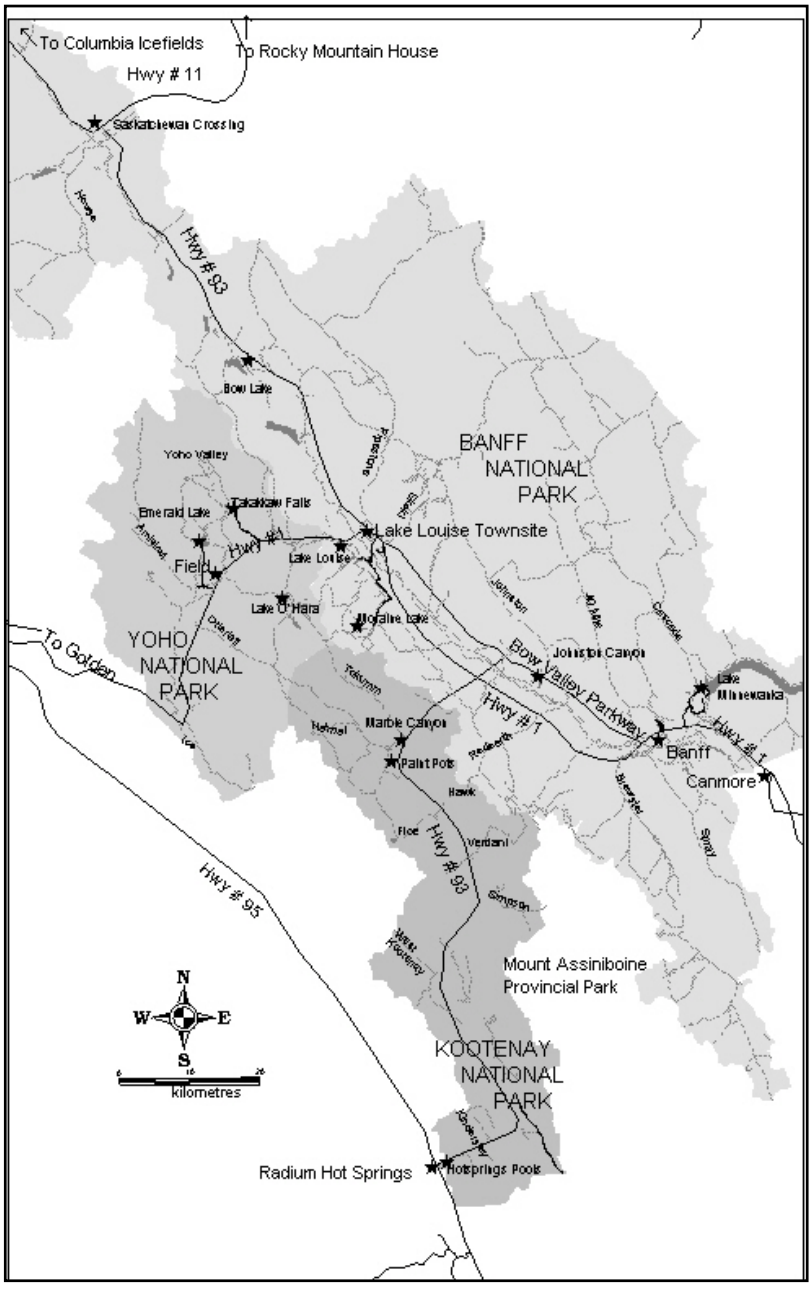
- use a line with arrows to mark the route and direction of your travel in the Parks (see example on next page)
- put an x at each of the places that you stop
- for each of the stops that you make which are longer than 15 minutes, please provide an entry in the diary travel log in this survey. For convenience, we would ask that you make the log entry just before departing from each location (see example below). Please add any comments that you wish within the comment section.

DATE	STOP DETAILS				COMMENTS
	Departure Time	*Location*	*Activity*	*Time Spent At Stop (minutes)*	
July 17	8:30am	Lake Louise townsite	overnighted		morning start
"	10:00am	Johnson Canyon	hiked	60	hiked 2 km trail busy
"	1:30pm	Marble Canyon	hiked, picnic	75	trail busy, pkng lot full

Please begin entering information in the survey as soon as you receive it.

Figure 3-3. Diary instructions from the survey instrument

The questionnaire also included a map (Figure 3-4) opposite each page of the diary travel log. The map was included both as a visual reference to facilitate trip recollection and as an approach to recording trip movements.



Included with the questionnaire as part of the package given to each potential survey respondent, were a stamped self-addressed return envelope (if visitors chose not to drop off the completed survey prior to departing the parks), a pen and a prize draw entry form[4]. The incentive used for the survey was the chance to win one of three prize packages each containing a fleece vest and a photographic book of the National Parks. The questionnaires were available in English and French.

Figure 3-4. Travel diary map.

[4] The entry form was separate to help ensure confidentiality of results

Pre-testing of the survey instrument occurred prior to the initiation of the study. This involved a limited distribution to six camping parties in Yoho National Park, followed by a debriefing with the principal researcher. Issues raised during the pre-testing (i.e. clarity of questions) were addressed during the final design of the survey.

Survey Administration

Fully independent travelers (FIT), because of their large numbers and high level of personal mobility, represented the visitor group that was of most interest to the researcher. This group was defined as those driving, or traveling in, their own (or leased/rented) vehicle. The research focused on the collection of information pertaining to 'visits' to the study area. These 'visits' were defined as park entry for the purposes of recreation and/or heritage appreciation. For the research, a visitor party that left the park and re-entered on the same day represented a single visit, but if they had left for a night or longer, the re-entry represented a new visit.

The Travel Diary questionnaire was distributed as part of a larger project occurring within the area at the same time (Patterns of Visitor Use Study [POVU])(Accord Research, 2002; McVetty & Petersen, 2000). The distribution method for the POVU study, including the travel diary questionnaire, was as follows: i) visitor's vehicles (including bicycles and pedestrians) were intercepted at one of 14 highway exit points within the study area, ii) visitor parties within the intercepted vehicles were asked a brief series of questions to determine eligibility for the study, iii) parties were deemed eligible if they met the following operational definition of a visitor[5]: all people entering a park except those traveling through a park, local traffic, traffic by Parks Canada personnel, commercial traffic and those entering for personal business, iv) those who were eligible were given a brief interview and then asked to complete a survey questionnaire. Twenty

[5] Parks Canada defines a visitor as: "a person entering…for recreational, educational or cultural purposes…(but not) people traveling through a park…local traffic (or) parks Canada personnel." The definition used by the POVU survey is slightly different to capture the full range of visitors. It is based on exclusions only…all people entering the parks except those "traveling through a park, local traffic, traffic by Parks Canada personnel", commercial traffic (deliveries, etc.) and those entering for personal business (e.g.: visit a doctor, etc.) (Butcher and Eldridge, 1990)."

percent of the eligible participants were to receive a travel diary questionnaire. The survey was administered between June 6 and October 9, 2000.

The survey population represented all visits to the park during the sampling period. The sampling frame is the list of visits in the population from which the sample will be drawn. The survey used a stratified, multi-stage cluster sample. Cluster sampling is used when it is either impossible or impractical to develop an exhaustive list of the elements composing the target population (Babbie, 1989). Multi-stage cluster sampling requires that primary sampling units be listed, potentially stratified and then sampled from within each unit. Stratification is done to organize the population into homogenous subsets and to select the appropriate number of elements from each. For this research, the survey stratified the population by intercept point and month (McVetty and Petersen, 2000):

> **Intercept point**: Each sampling day was assigned to one of fourteen intercept points. The number of sampling days at each site was proportional to the volume of visitor traffic at that point. This helped ensure a representative sample.
>
> **Month**: Sampling days at each intercept site were assigned to one of five months, June, July, August, September, or October. This helped ensure that results from all sites represented use throughout the season.

The random sampling of survey periods was drawn from a sampling frame that included all days and intercept points. Within each month, the days for each intercept point were randomly drawn until all of the available days were allocated. Sampling occurred between 8:00 a.m. and 8:00 p.m.

Other potential sampling frames, such as time of day and day type (weekend/weekday), were not used. Given the number of intercept points, and limited staff resources, the survey did not assume a priori that there was a difference between visitors in these other frames.

Since human subjects were involved with this study, approval was required and obtained from the University of Calgary's Research Ethics Board. In addition, the survey

underwent internal review and approval through the Client Research function of the External Relations Branch of Parks Canada Agency.

3.4 Data Management

3.4.1 Data Entry

Completed travel diary surveys were either left at designated drop-off locations prior to visitor's departure from the study area, or were returned via mail to the principal researcher.

An Access (ver. 2000) database was developed to assist with the entry, storage and querying of data. Entry of completed diary data was done directly into the database via a visual interface form that mirrored the structure of the survey. Sub-forms were created for entry of travel log, demographic and comment data as well as for generating master lists of activity and locations visited. Quality control for data entry was achieved through manual verification and through internal checks built into the database structure. Data from open-ended questions were entered verbatim. The data from each survey question were stored in a relational database structure. This resulted in a database with 39 unique tables.

3.4.2 Data Analysis

Queries of the original data were done through Access. Otherwise, cleaned tabular data were exported from Access into the following programs for subsequent analysis and presentation: Excel (ver. 2000), SPSS (ver. 10.0.5 and 10.1) and ArcView GIS (Environmental Systems Research Institute, 1996). Numerous analytical approaches were used to better understand the data and to respond to the objectives identified for the research. The approaches used included:

i) frequency distributions – used to report the frequency of responses of each category of a variable and/or to explore the nature of the data so that appropriate statistical measures can be selected. This is a common approach for the presentation of social survey data and is used extensively throughout chapter four of this thesis.

ii) measures of central tendency - for normally distributed data, means were reported for interval data, median for ordinal and mode for nominal data. For scaled frequency

distributions (i.e. Likert scaled questions) means were reported. This approach was used for reporting on components of visitor decision making (motivations – section 4.4) and trip experience (i.e. encounters versus expectations and encounter effects – section 4.3).

iii) dispersion – reports the range in a distribution and is measured by standard deviation. This approach was used for presenting results of ordinal and interval measures in this research (i.e. trip profiles – section 4.2).

In addition to descriptive statistics, multivariate analyses were undertaken. The approaches for these calculations included:

i) cross-tabulated contingency tables which are used to examine the relationship between two or more variables (adds an explanatory dimension to frequency distribution) - but only identifies whether a relationship exists between two or more variables. This method was employed to assess whether relationships existed between expectations and enjoyment,

ii) tests of statistical significance and measures of association (analytical statistics) that are applied to data to verify the existence and strength of any apparent relationships between variables. In this thesis, the chi-square (χ^2) test of significance was used to assess the nature of the relationship between visitor expectations and enjoyment at various generalized locations (i.e. in parking lots, while driving, on frontcountry trails etc. – section 4.3). This test is concerned with the differences between the frequencies that are obtained from the sample survey and those that would be obtained if there were no differences among the categories of the variables. The assumption that no difference exists among the categories of the variables is known as the null hypothesis. The chi-square test seeks to identify whether the perceived findings are genuine or the result of chance. It can be applied to nominal, ordinal or interval scaled data. The chi-square statistic is more reliable as the overall sample size increases. There is a “rule of thumb” that each cell of a contingency table should contain an expected frequency of at least 5. If the expected frequency falls below 5 in any cell, categories should be merged (Rea and Parker, 1997),

iii) factor analysis which is used in exploratory data analysis to study the correlations amongst a large number of interrelated quantitative variables. The approach assesses whether correlations exist by grouping the variables into a few factors and interpreting each factor according to the meaning of the variables (SPSS Inc., 1999). For analysis of the travel diary data, factor analysis, using principal component analysis (PCA), was applied to the data from the decision-making and motivation variables. Varimax rotation was used to enhance the interpretability of the results by making the large loadings larger than before and the small loadings smaller than before. Through the rotation, each variable is then associated with a minimal number of factors (SPSS Inc., 19990. The rotation also computed component scores for each factor, and

iv) cluster analysis which is a multivariate procedure for detecting groups in the data. It can be used to analyze interval, count or binary data. A hierarchical cluster analysis was applied to the components score from the factor analysis using Ward's clustering method with squared Euclidian distances. Hierarchical cluster analysis was used because variables, as opposed to cases, were being clustered. A five-cluster solution was selected based on the agglomeration schedule. To conclude the analysis, the cluster centres from these solutions were used as initial clusters for a 5-cluster, k-means cluster analysis. The resulting cluster membership data were then transferred to the merged diary and route segment databases and matched to specific surveys and routes. This was done to determine if the clusters, which represented groups with similar motivations and travel decision processes, utilized similar routes during their visits. The results of this analysis are presented in section 4.3.6.

For certain analytical procedures, data needed to be simplified or converted from their original form. Where this has occurred, it has been noted in the analysis.

For two procedures, route based analysis and network analysis, new database structures had to be created. This included the following tasks:

- Route based analysis - the travel log diary data included a mixture of point and linear information (i.e. Icefields Parkway vs. Moraine Lake). To undertake route

analysis, it was necessary to convert the entire data set into a linear form. This was done by identifying the route segments that joined each of the travel log diary entries (i.e. either joining point to linear or point to point locations). This required the assumption that the travel log entries were sequential with respect to the actual trip completion (i.e. that additional locations were not visited between travel log entries) and it was therefore acceptable to simply join locations with the applicable route segments.

- Network analysis - from the Access database, a complete list of all locations that were identified in the travel diaries was generated. This resulted in a list of 84 unique locations. Then an Excel spreadsheet was constructed which identified, for each of the 235 survey respondents who completed a questionnaire, the locations that they visited. The data was coded with a 1 indicating that a site was visited and a 0 indicating that a site was not visited. This coding process resulted in a 235 x 84 cell matrix (19,740 cells). In reviewing the descriptive data (especially the number of respondents per location) 46 of the locations were identified as having only 1-5 [out of 235] respondents reporting a visit. It was therefore determined that for the purposes of the network analysis, it would be appropriate to review the locations list and lump locations where logical. As a result of this exercise, the list was reduced to 30 locations (resulting in a 235 x 30 cell matrix = 7050 cells). This reduction was mostly achieved by lumping low visitation locations into generalized location codes (i.e. Banff town and area, Banff backcountry, Icefields Parkway, Bow Valley Parkway, Upper Lake Louise area, Moraine Lake area, Kootenay backcountry, Kootenay Frontcountry, Yoho Park frontcountry and Emerald Lake area). Although there was some concern regarding the loss of detailed information with the lumping exercise, it was felt that generalizations would not seriously diminish the utility of the resulting analysis for management purposes. It was also felt that this data reduction was appropriate given the exploratory nature of the analysis. The respondent-by-location matrix that resulted from the previous steps (where each row represents one survey respondent and each column a visit location) was converted to a location-by-location matrix by multiplying the matrix times its transpose

(Y=XX'). The result was a matrix in which the ijth cell records the number of respondents that location I and J were visited in common. An example of the resulting matrix is provided as Appendix

3.5 Presentation of Findings

The research findings are presented in several different ways in this thesis. For the majority of the analysis, findings from the descriptive and multivariate analyses are presented in a mixture of narrative, tabular and graphic forms. In most cases, the presentation has incorporated the outputs generated by the computer programs being used. Geographical information systems (GIS) are used to present results where spatial reference is important. The analytical results are presented in chapter four.

3.6 Sampling Response

The initial distribution target for the travel diaries was 20% of the intercepted visitors, or 1,015 diaries (Figure 3-5). At the conclusion of the survey period, 418 travel diaries had been distributed and 259 were completed and returned to the principal researcher. This represented a response rate of 62%. With 259 completed questionnaires, overall results have a 95% confidence level and a margin error of +/-6.1% (4.4% in summer and 13.5% in autumn). In other words, if the survey were administered repeatedly to 259 different visitor-parties from the same population, the results would be the same 19 times out of 20 (95% of the time), plus or minus 6.1%. Because of the high margin of error associated with the autumn data, results are presented only for the aggregated survey period.

Summer Period (June 12 – Aug. 26)	Autumn Period (Sept 7 – Oct. 12)
5,029 parties intercepted 200 ineligible 454 refusals	1,126 parties intercepted 94 ineligible 333 refusals
4,375 parties interviewed 875 possible diaries distributed	699 parties interviewed 140 possible diaries distributed
337 diaries accepted	81 diaries accepted
206 valid surveys returned (191 completed travel logs)	53 valid surveys returned (43 completed travel logs)

Summer results are accurate within 6.8%, 19 times out of 20	Autumn results are accurate within 13.5%, 19 times out of 20
Overall survey accuracy is 6.1%, 19 times out of 20	

Figure 3-5. Sampling results for travel diary survey.

The total number of visitors represented by the 259 completed surveys was 647.

During the research period, no French versions of the survey were requested.

CHAPTER FOUR: RESULTS - TRAVEL DIARY DATA ANALYSIS

4.1 Introduction

This chapter includes the results of both the non-spatial (questionnaire) and spatial (travel log) components of the travel diary survey. Only results that have relevance to the objectives of this research are presented. The chapter concludes with a discussion of the findings.

4.2 Descriptive Profiling

4.2.1 Visitor Profile

i) visitor origin

Twenty-six percent of visit parties/visitors were from Canada, 47% from the USA, and 27% from other countries (Figure 4-6). There was little difference in the relative numbers of visitors and visitor parties between origins.

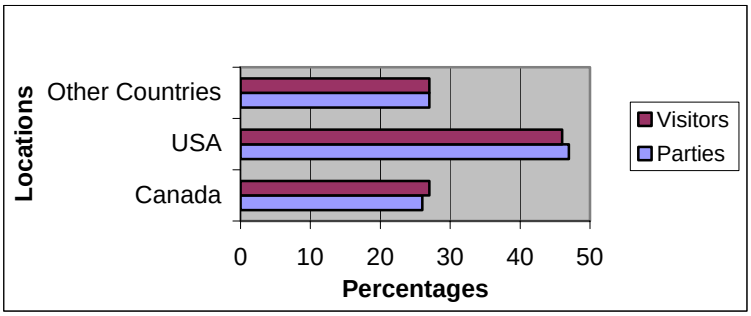


Figure 4-6. Origin of visitors to the study area.

Within the Canadian totals, 48% were from Alberta, 25% from British Columbia and 27% from other areas of Canada (Figure 4-7).

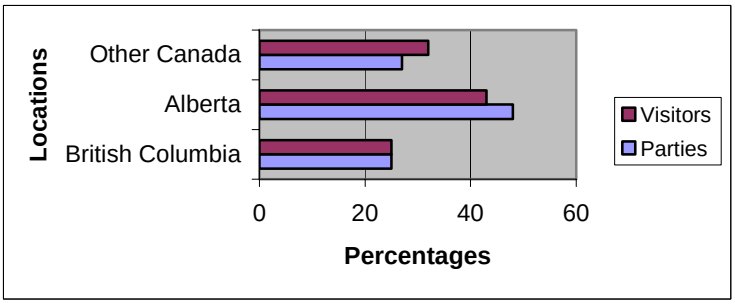


Figure 4-7. Origin of Canadian visitors.

ii) age of visitors

Age data were reclassified using categories established for the POVU study. The age category of 35 – 54 accounted for 37.2% of the total visitation and represented the largest user age group (Table 4-3). Over fifty-five years-of-age accounted for an additional 29.8%. The combined categories under 16 represented only 14.7% of the total visitation. The lowest visitation was accounted for within the 17 – 24 age category at 3.7%. The mean average visitor age was 42 years.

Table 4-3. Visitor age.

		Frequency	Valid Percent	Cumulative Percent
Valid	Under 12	57	8.8	8.8
	12 – 16	38	5.9	14.7
	17 - 24	24	3.7	18.4
	25 - 34	92	14.3	32.7
	35 - 54	241	37.4	70.1
	55 - 64	110	17.1	87.1
	Over 64	83	12.9	100.0
	Total	645	100.0	

iii) gender of visitors

There was an even split between the 297 male (45.9%) and 318 female respondents (49.1%). In addition, 32 (4.9%) visitors did not provide a response to the gender question.

iv) first versus repeat visits

For 61.8% of the respondents, this was their first visit to the parks (Table 4-4). For the remaining 38.2%, 50.5% had not visited these national parks in the last two years, while almost 37% had visited more than once. Of those parties that had visited more than once, more (14.7%) had visited 6+ times than any other response category (Figure 4-8).

Table 4-4. Visit frequency.

		Frequency	Valid Percent	Cumulative Percent
Valid	First Time	157	61.8	61.8
	Repeat	97	38.2	100.0
	Total	254	100.0	
Missing		4		
Total		258		

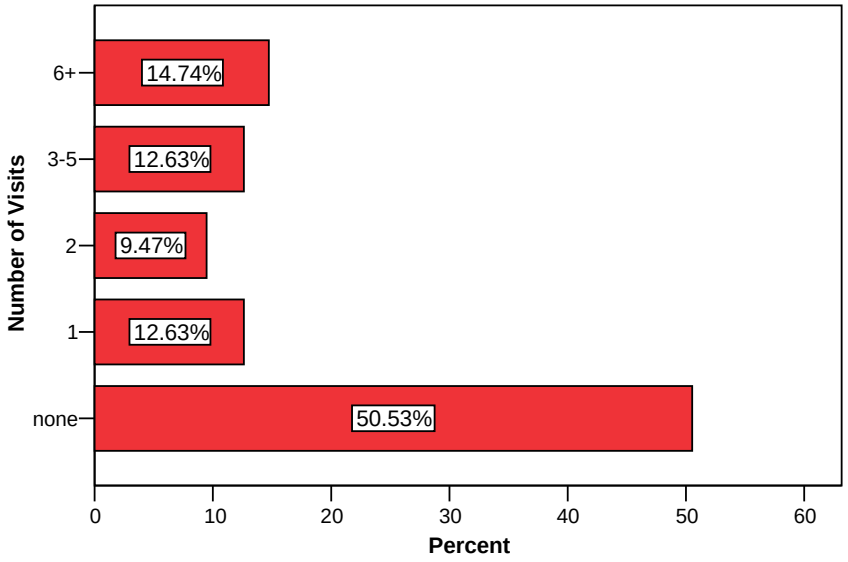


Figure 4-8. Number of visits in last two years if not the first visit.

v) vehicle type

Most visit parties (75%) arrived by automobile (including van)(Table 4-5). The next most frequent vehicle type was truck at 11.7% followed by RV/motorhome at 8.3%. Contributions from the remaining categories were low.

Table 4-5. Vehicle type.

		Frequency	Valid Percent	Cumulative Percent
Valid	Auto/van	172	74.8	74.8
	truck	27	11.7	86.5
	RV/motorhome	19	8.3	94.8
	Motorcycle	1	.4	95.2
	Truck camper	3	1.3	96.5
	bus	7	3.0	99.6
	Bicycle	1	.4	100.0
	Total	230	100.0	
Missing		28		
Total		258		

It is impossible to know whether SUV operators may have responded in the auto or truck category, although auto would be the assumed response.

vi) vehicle ownership

Of the respondents, 52.8% reported that their vehicle had been rented, while 44.9% indicated that it was either owned or leased long-term.

vii) towed items

The majority of respondents (90.7%) indicated that they were not towing anything (Table 4-6). Of those who reported towing an item, travel trailers were the most popular (5.6%), followed by tent trailers and second vehicles each representing 1.9% of the items being towed.

Table 4-6. Items being towed.

		Frequency	Valid Percent	Cumulative Percent
Valid	Nothing	147	90.7	90.7
	tent trailer	3	1.9	92.6
	travel trailer	9	5.6	98.1
	second vehicle	3	1.9	100.0
	Total	162	100.0	
Missing		96		
Total		258		

From the travel diary, the general profile of park visitors is that the majority were from the USA, but if from Canada then they were most likely to be from Alberta. Group sizes of visit parties were consistent across all visitor origins. Most visitors were over 35 years of age, evenly split between male and female, arrived by either rental or owned/leased automobile/van without anything in tow and were either first time visitors or had visited numerous times over the past two years.

4.2.2 Trip Profiles

i) entry point

The majority of responding visit parties (55%) arrived into the study area via the Banff National Park east gate on Highway # 1 (Figure 4-9). Of the remaining entry points, similar numbers (~12%) arrived via the Kootenay, Yoho and Jasper gates.

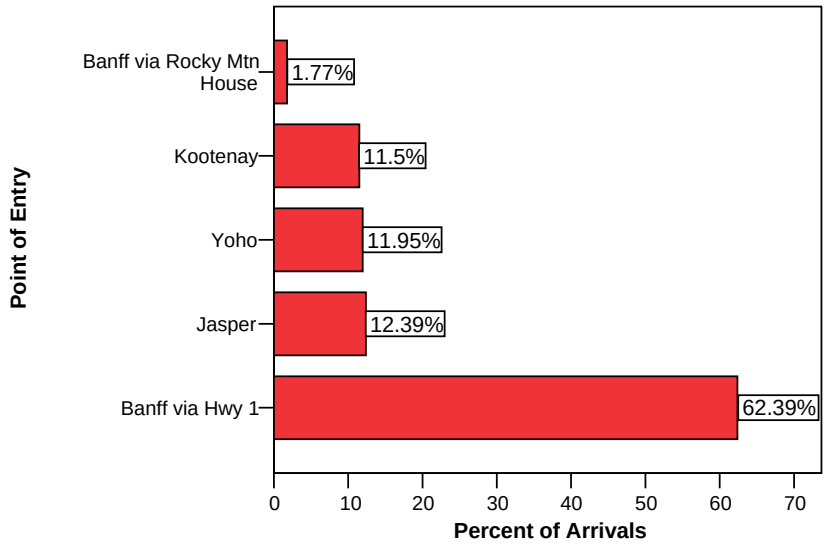


Figure 4-9. Point of entry into study area.

ii) party size

The average party size was 2.6. Groups of four or less people account for 95% of the visit parties to the study area. Within this, groups of two are the largest contributor (62%), followed by groups of 3 (14%), 4 (13%) and 1 (6%) (Figure 4-10). There were only forty family units (1 or more adults plus 1 or more children under 16) identified in the data.

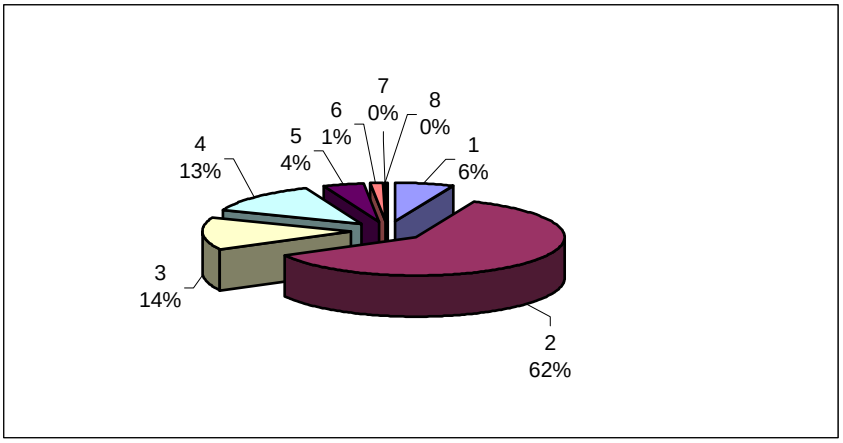


Figure 4-10. Average group size.

iii) day versus overnight use

10.1% of survey respondents indicated that they had used the study area on a day-use basis only, 81.0% indicated they had spent nights in the parks and 5.4% stated they had stayed outside of the parks.

Of the respondents that spent nights in the parks, 60% reported spending four or more nights, with the most common response being 4-6 nights (Figure 4-11). The respondents reporting two or three night stays were nearly equal. With only 7% of visit parties reporting a one-night stay, it would suggest that the study area is a destination for visitors.

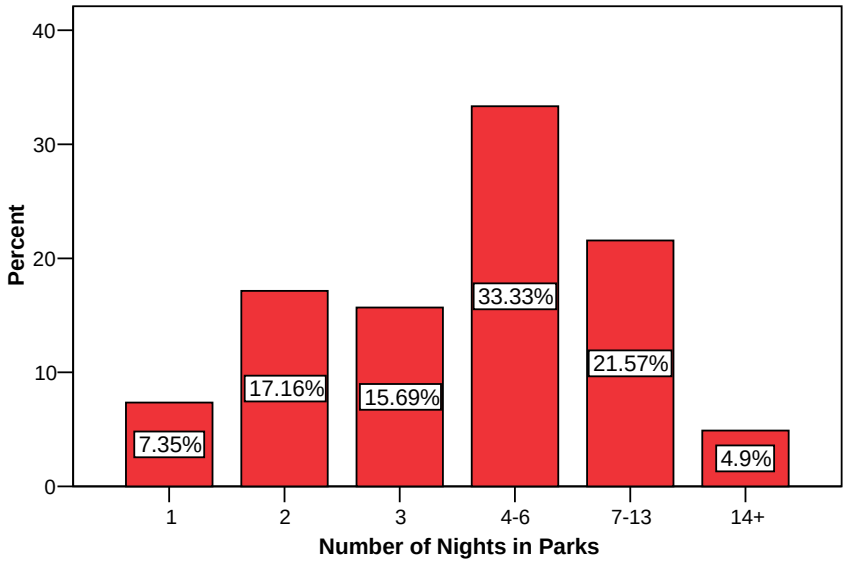


Figure 4-11. Number of nights spent in parks.

iv) overnight location

Those visit parties that reported spending nights outside of the parks were asked to identify whether they had stayed within 80km/50 miles. Of those staying outside of parks, 83.6% reported staying within 80 km. This group was also asked to report the number of nights and locations of their stay (Figure 4-12). Of the 10% (27) of visit parties that reported staying in Canmore, 60% stayed for 2 days or less; of the 3.9% (10)

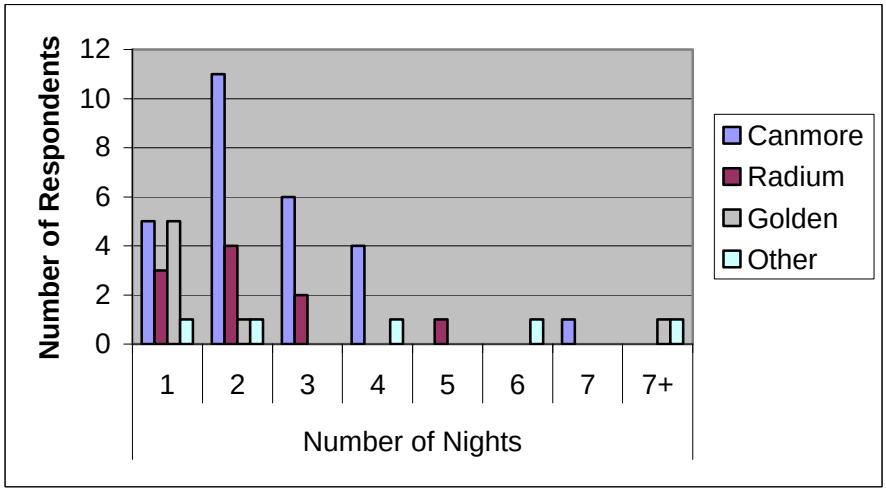


Figure 4-12. Number and location of nights spent outside of parks but within 80 kilometres.

that stayed in Radium, 70% stayed for 2 days or less; of the 2.7% (7) staying in Golden, 85% stayed for 2 days or less; and of the 1.9% (5) staying in other locations 40% stayed for 2 days or less. The "other" locations included Cochrane, Hinton and David Thompson Resort in Alberta; Windermere, and Fairmont in British Columbia.

v) day of trip that diary was received

Sixty-eight percent of visit parties received their diary within the first three days of the start of the trip (Figure 4-13). Although the instructions within the survey instrument were for people to begin recording the travel log information as soon as they received the survey (Figure 1-2), based on the observation that most travel log entries began at the point of park entry, it appeared that most people recalled and entered the travel information for their entire trip. The remaining 32% of visit parties received the survey between day three and eight of their trip.

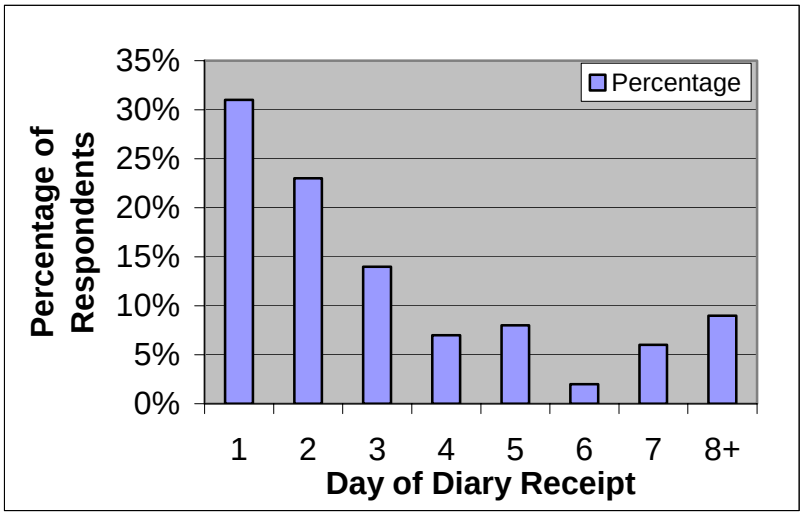


Figure 4-13. Day of trip when diary was received.

vi) commercial activity

Of the reporting visit parties, most (74.2%) did not use any commercial providers of recreational services. Of those that did report participating in commercial activities, 38% utilized services not listed in the survey. Of these “other” activities, 43% were white-water rafting and 37% were the Columbia Icefields Snocoach Tours. Next to "other", the second most popular commercial activity in the study area was horseback riding (23%) (Figure 4-14).

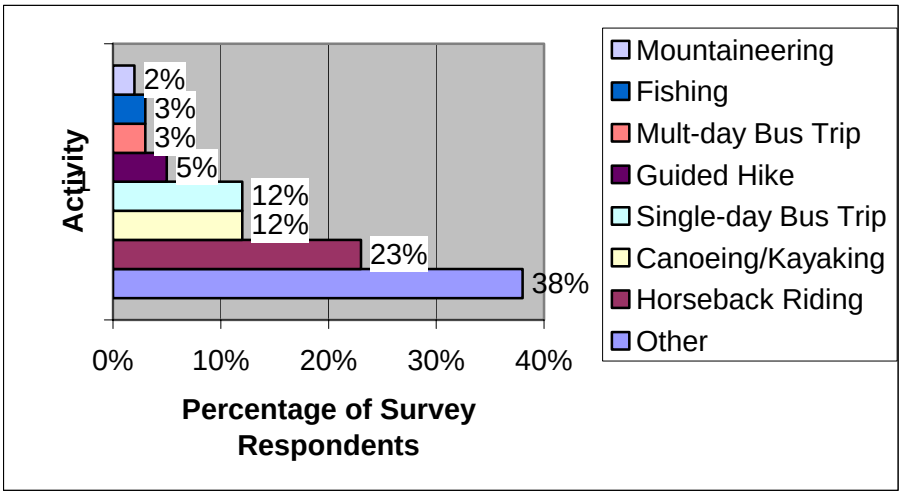


Figure 4-14. Participation in commercial activity.

With respect to the analysis of trip profiles, the travel diary discovered that most of the visitors arrived in groups of two, were driving rental vehicles and arrived via the Banff east gate. Once inside the parks, they generally spent more than one night and did not use any commercial providers of recreational services. With respect to the survey, most visitors had received the diary within the first three days of the start of their trip.

4.2.3 Trip Experience

One of the critical human use management questions facing park managers is how to identify an appropriate level (type, timing and amount) of human activity. Parks Canada expresses this challenge as putting the right number of people into the right place at the right time (with the right expectations). Other protected and wilderness area managers approach the question from the perspective of defining an area’s carrying capacity. Many ecological, social, economic and political considerations go into the determination of

what an appropriate level of use should be. The travel diary study focused on providing data that would facilitate provision of socially appropriate levels of activity[6]. In partial contrast to the more common practice of approaching the issue from the perspective of encounters, crowding and norms, the diary evaluated the relationship of encounter expectations, encounter levels and presence of different types of users with their effects on visitor enjoyment and experience.

i) encounters versus expectations

Twenty-eight percent of the respondents encountered more people than expected, 54.4% the same as expected, and 17.6% less than expected (Figure 4-15). The five areas that visitors encountered more people than expected (compared to the number of visitors reporting less than expected levels of encounters) included parking lots, interpretive displays, frontcountry trails, while driving and townsites (Figure 4-16). The greatest relative difference between the expectation measures (i.e. more or less than expected) was found for townsites and parking lots. Although it is the objective of park managers to try and ensure that visitors are arriving with appropriate expectations, there is no value that has been identified as an appropriate threshold for this issue (i.e. <10% of visitors will encounter more people than had been expected).

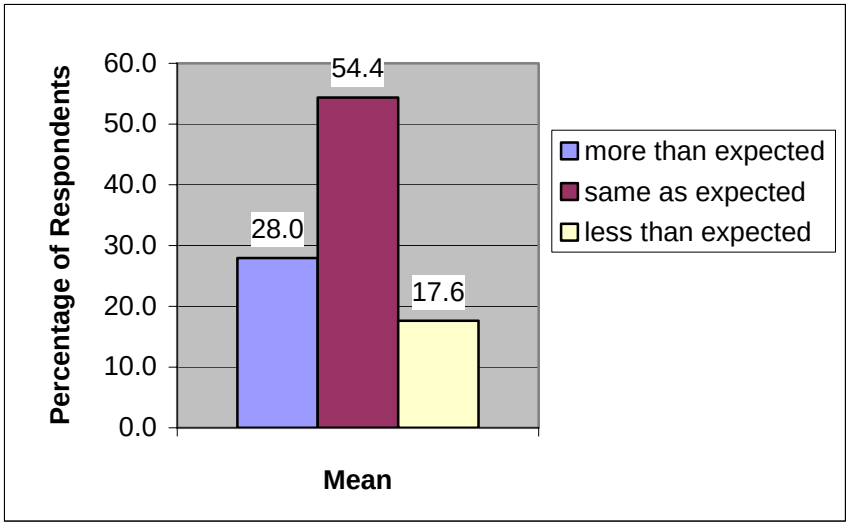


Figure 4-15. Mean encounter expectations.

[6] These are determined to be levels of activity that meet social objectives related to quality of experience, crowding and encounters.

Another way to express the data is through the use of mean scores. Figure 4-17 illustrates that in day-use areas and on backcountry trails, visitors overall are reporting less encounters than were expected, whereas for the remainder of the locations encounters

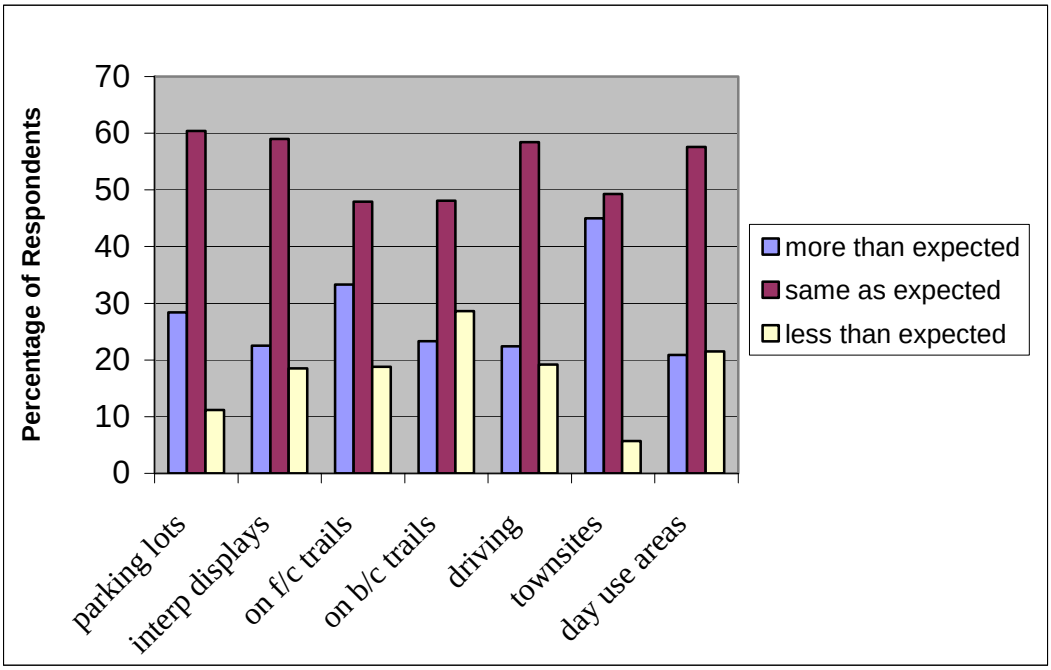


Figure 4-16. Encounter expectations by location.

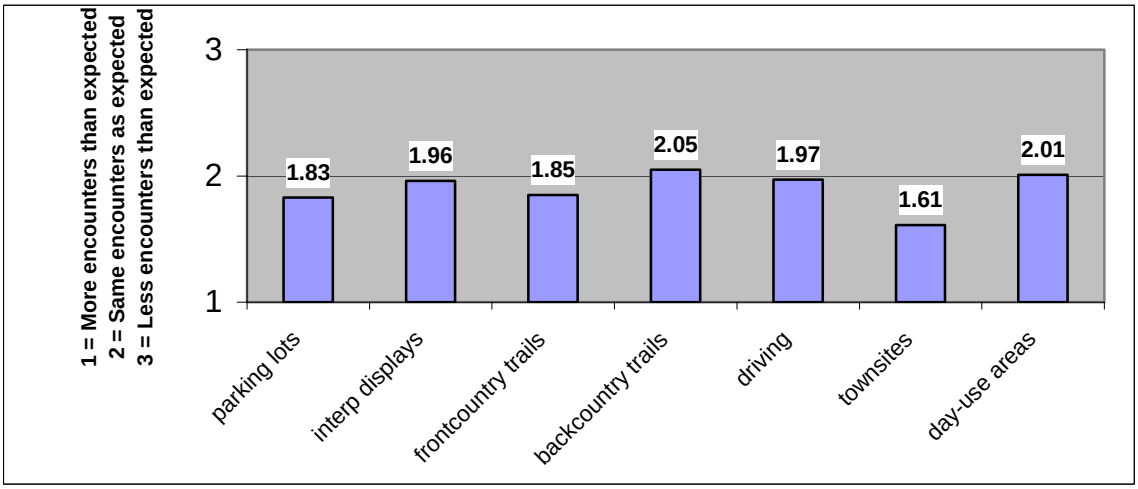


Figure 4-17. Mean values of encounters versus expectations

exceeded expectations. Knowing whether or not a visitor's expectations matched the conditions being provided at each location is important as a measure of the effectiveness and accuracy of internal and external marketing, information and communications programs.

ii) effects of encounters

An important question regarding visitor encounters with other people concerns the impacts that those encounters have on visitor enjoyment. The results presented in Figure 4-18 illustrate two general conclusions: 1) there is a range of responses to the effects of encounters on visitor enjoyment at each survey location, and 2) the majority of responses for each survey location are neutral, suggesting that encounter levels may have had little overall impact on enjoyment. Mean scores (Figure 4-19) illustrate that encounters negatively affected visitor enjoyment at only two locations: townsites and parking lots (although mean scores were only slightly positive for frontcountry trails, while driving and at day-use areas).

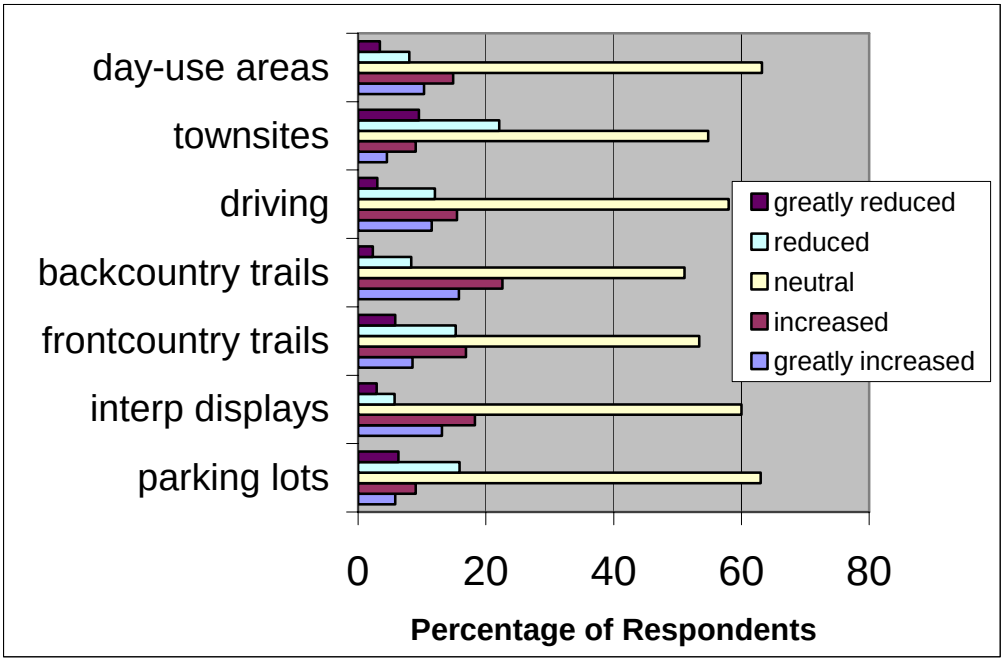


Figure 4-18. Effects of encounters on visitor enjoyment at general locations.

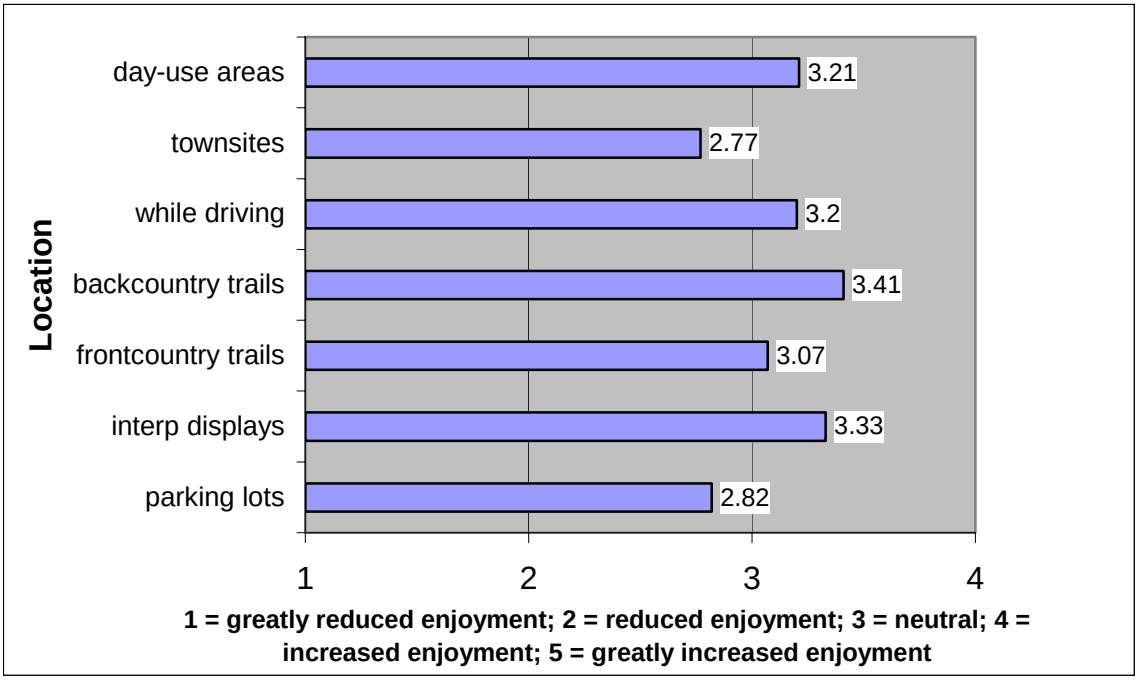


Figure 4-19. Mean effects of encounters on visitor enjoyment at general locations.

While it is important to know how existing conditions compare to expectations and how encounter levels impact visitor enjoyment, a follow-up question of importance to park management is whether there is a relationship between expectations and effects (i.e. are visitors who reported that encounter levels were higher than expected more likely to report their enjoyment as being negatively affected?). This assessment is valuable in order to understand the importance of appropriate expectations to trip enjoyment. Figure 4-20 depicts this relationship using the mean scores for the expectation and enjoyment variables. Figure 4-20 also illustrates that at interpretive displays, on backcountry trails, while driving and at day-use areas, where encounter levels either matched or were less than expected, the effect of encounter levels on experience was neutral or positive. For the locations where encounters were higher than expected (parking lots and townsites), the effect on enjoyment was negative. For frontcountry trails however, although encounter levels were higher than expected, the mean effect on enjoyment was slightly positive (3.07). One possible explanation of this latter finding may be that hikers on frontcountry trails are either seeking or expecting higher levels of social interaction with other visitors.

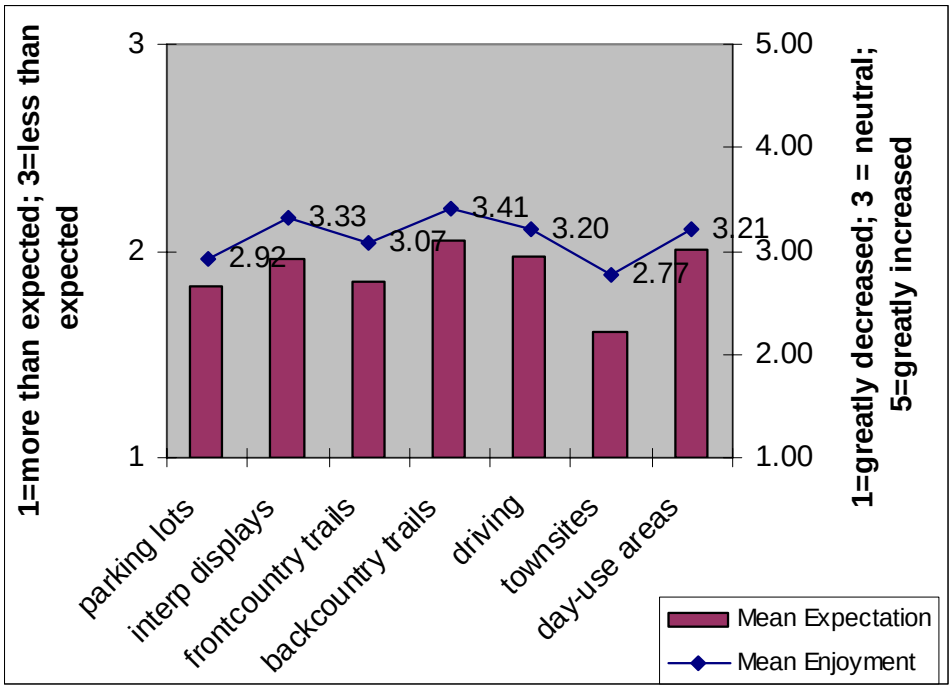


Figure 4-20. Correlation between expectations and effects on enjoyment.

Another interesting question for a protected area manager is whether there is a relationship between encounter expectations at one location and enjoyment at another. For example, if a visitor encountered more people than expected in a trailhead parking lot, might this effect their enjoyment on adjacent front or backcountry trails? This relationship of expectations and enjoyment between areas was assessed through the use of crosstabulations and calculations of Pearson chi-square statistics. The assessment concluded that the following relationships between expectations and enjoyment were significant at $p<.01$: (chi-square outputs are contained in Appendix C – critical value χ^2 with $p=.01$ is 20.09)

- parking lot, backcountry trail and day-use expectations and frontcountry trail enjoyment
- day-use, frontcountry trail and while driving expectations and parking lot enjoyment
- day-use, frontcountry trail and parking lot expectations and driving enjoyment
- parking lot, while driving and frontcountry trail expectations and day-use area enjoyment

- parking lot expectations and
  interpretive displays/exhibit enjoyment
- driving expectations and
  townsite enjoyment

The data would need to be explored further to assess whether the relationships were positive or negative, however from the results presented above, it appears as though encounter expectations in parking lots have a significant effect on enjoyment at four of the six locations in the survey. This may be explained, at least partly, by the recognition that parking lots are often the point of departure for many of the other survey locations (front and backcountry trails, interpretive displays and day-use areas). It would seem that the physical and social conditions experienced in the parking lots could carry over into potential effects on enjoyment in the other subsequent locations.

iii) encounter impacts by location

The previous question was used to assess the impact of encounters on visitor enjoyment at general park settings. This was important to explore the relationship between encounter expectations and impacts on enjoyment. Of even more interest to park managers is the effect of current visitor loadings on visitor experiences at specific sites within the parks. This assessment was done for nineteen specific locations within the study area. For all locations except the Skoki Valley, respondents were reporting some level of negative impact on experience due to the number of other visitors encountered (Figure 4-21). Caution should be exercised, due to the small respondent sample size, in interpreting the results reported for backcountry locations (Spray, Cascade, Larch, Skoki and O'Hara Valleys).

As discussed in section 4.2.3 i), it is difficult to report on the significance of the results because of a lack of any form of management threshold or target. However, for the sake of explanation, if a threshold value were selected as a management target for the impacts of encounters on experience, then it could be assessed from Figure 4-21 whether an area was currently in compliance. In areas where threshold values were exceeded, a management response could be developed.

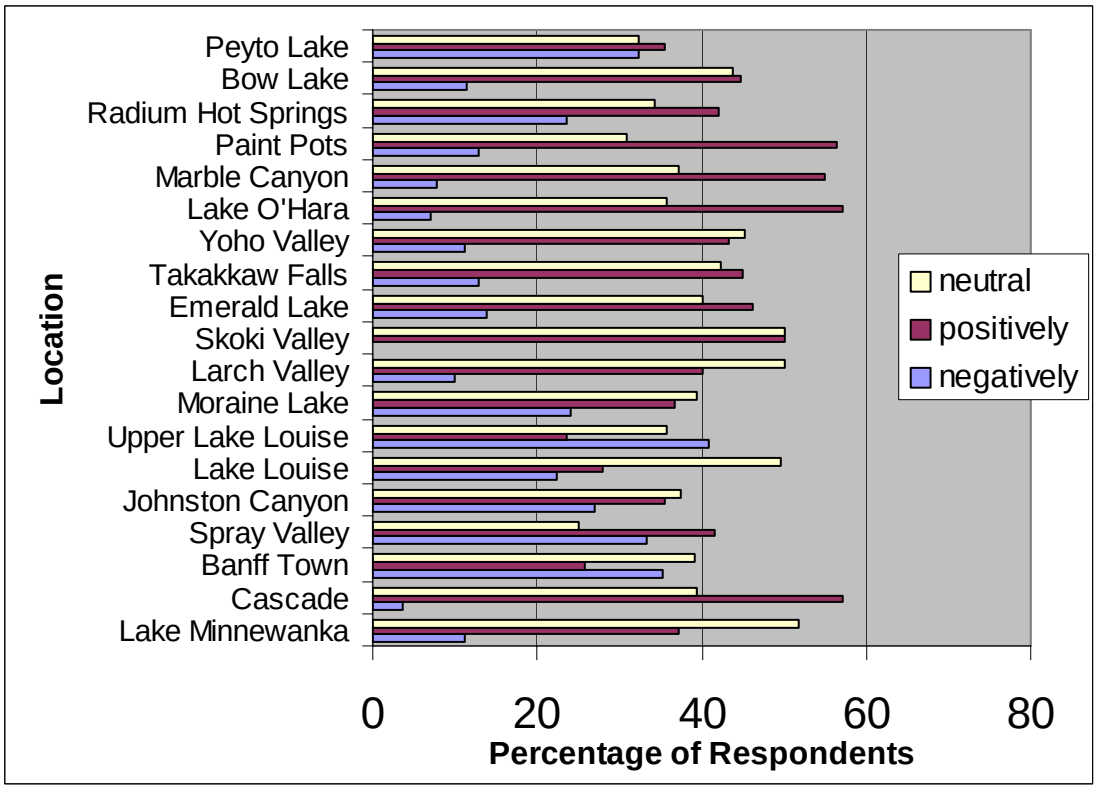


Figure 4-21. Impacts of encounters on experience by location.

iv) user effects

In addition to location based impacts, the researcher wanted to better understand the effects of different types of users on visitor experience. Survey questions were developed to enable the assessment of the impacts of bus and large groups, mountain bikers, horse riders and hikers with dogs at pullouts/interpretive displays/picnic areas and on trails. The research concluded that for 61.8% of respondents, bus tours/large groups reduced their enjoyment of the parks within the study area (Figure 4-22). Figure 4-22 also concluded that for 27.1% of respondents, "other" groups increased their enjoyment. The most cited "other" group responses included families and bicyclists.

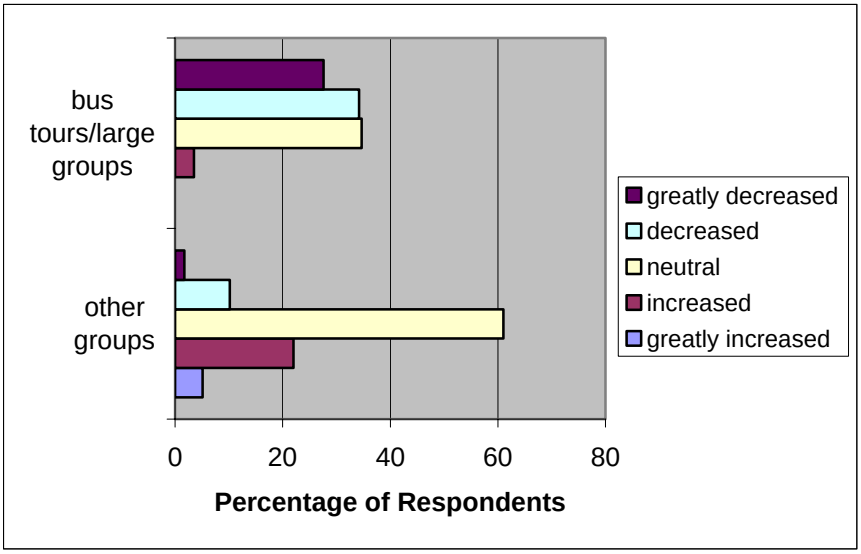


Figure 4-22. Effects of user type encounters at day-use nodes.

On trails, the study investigated the impacts from large groups and mountain bikers, horse riders, hikers with dogs and others. It concluded that there were both negative and positive impacts on visitor enjoyment by each of the user groups (Figure 4-23), however, the largest net negative impacts were the results of encounters with large groups and mountain bikers (with 42% more respondents reporting negative impacts).

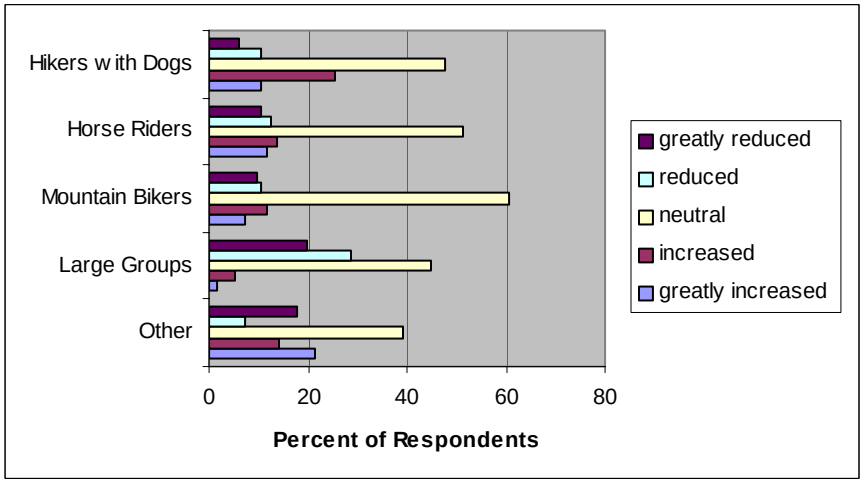


Figure 4-23. Impacts of different trail users on experience.

4.2.4 Decision Making

Leisure behaviour research involves the study of people's actions and feelings when outside of the work environment, when they can choose their behaviours freely (Rollins and Robinson, 2002). The model of leisure behaviour proposes that people undertake certain activities in certain locations with the objective of realizing a group of sociological benefits which are known, expected, and valued (Manning, 1999). It is suggested that the benefits become the motives that create the forces that push or pull people to seek out specific leisure activities and experiences. In leisure situations, these motives then may be the drivers behind human behaviour. The travel diary study explores this issue by assessing people's reasons for visiting the parks within the study area. Because the response list of motives is provided, the results are referred to as expressed motives (Mannell and Kleiber, 1997). The list of reasons for visiting, provided in the survey, consisted of an a-priori combination of benefits related to:

i) trip and site attributes (i.e. quality shopping, hotels, and restaurants, easy access, developed trails, outdoor experiences and modern comforts, close to home and reasonable cost),

ii) social (meet other people and time with family/friends),

iii) psychological (experience solitude, learning, get away from crowds, see natural environment, rest and relax, quiet setting, view wildlife and view scenery),

iv) physiological (challenge, exercise and preferred activity), and

v) physical settings.

For the purposes of this research, the above reasons for visiting are referred to as the trip motivations. The research also assessed the level to which visitors were able to fulfill their motivations. By acquiring data on both motivation and fulfillment, it was possible to compare the two elements. It also provided the opportunity to assess the performance of Parks Canada in its support of the motivations over which it has some control.

i) visit motivation importance

The research interest in assessing the motivations of visitors was two-fold. Firstly, if parks are trying to provide a range of opportunities that meet the needs of visitors, it is

important to understand what these needs are. Based on this knowledge, park managers can affect those needs over which it has some influence by providing appropriate recreational and social activities, settings, services and facilities. It is also important to understand the relationship of motives to enjoyment impacts. For example, if a visitor is motivated to be in a peaceful, quiet setting and they expect a location in a park to provide opportunities consistent with this motivation, then when these conditions are not realized their motivations may go unmet and their experience negatively impacted.

The second reason for studying motivations is that factor and cluster analysis of the data has been used in previous research to segment visitors into different groups to identify niches within the visitor population and to define patterns of visitor activity. This use of motivational data as a determinant of patterns of visitor use will be explored further in section 4.3.

Twenty motivations were evaluated in the study (Figure 4-24). The motivations that had a mean importance score over 4.0 (i.e. important and very important) included: viewing scenery, viewing wildlife, being in a peaceful quiet setting, resting and relaxing, taking part in my preferred activity and seeing an environment unchanged by humans.

The comparison between the mean importance and achievement scores showed that the motivations that were most important to visitors generally had the highest achievement results (Table 4-7).

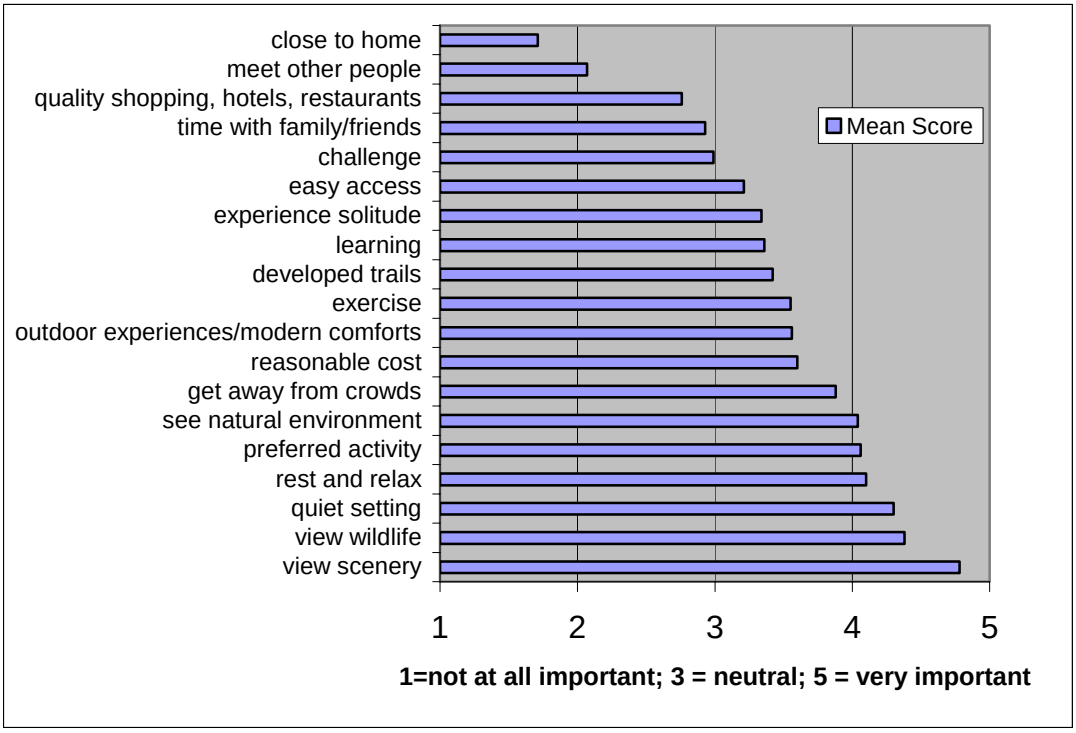


Figure 4-24. Mean scores for motivation importance.

Table 4-7. Comparison of mean motivation and satisfaction scores.

Motivation	Mean Score	Mean Achievement
view scenery	4.78	94.93
view wildlife	4.38	66.10
quiet setting	4.30	76.50
rest and relax	4.10	83.22
preferred activity	4.06	86.03
see natural environment	4.04	71.18
get away from crowds	3.88	59.08
Reasonable cost	3.60	73.23
outdoor exp/modern comforts	3.56	82.59
exercise	3.55	80.32
Developed trails	3.42	78.90
learning	3.36	72.27
experience solitude	3.34	56.92
other	3.23	77.37
easy access	3.21	77.84
challenge	2.99	72.97
time with family/friends	2.93	76.41
quality shopping, hotels, rest	2.76	74.99
meet other people	2.07	58.21
close to home	1.71	48.73

When the data are viewed as an x,y scattergram (Figure 4-25), performance related information is provided (Business Services Group – Canadian Heritage, 1995; Kelly and Wright, 1997). This type of analysis is important for those motives over which the study area manger has some control, because it can be used to guide the delivery of services, facilities and visitor opportunities. Motives outside of the influence of park management, may be influenced by other stakeholders within or adjacent to the parks.

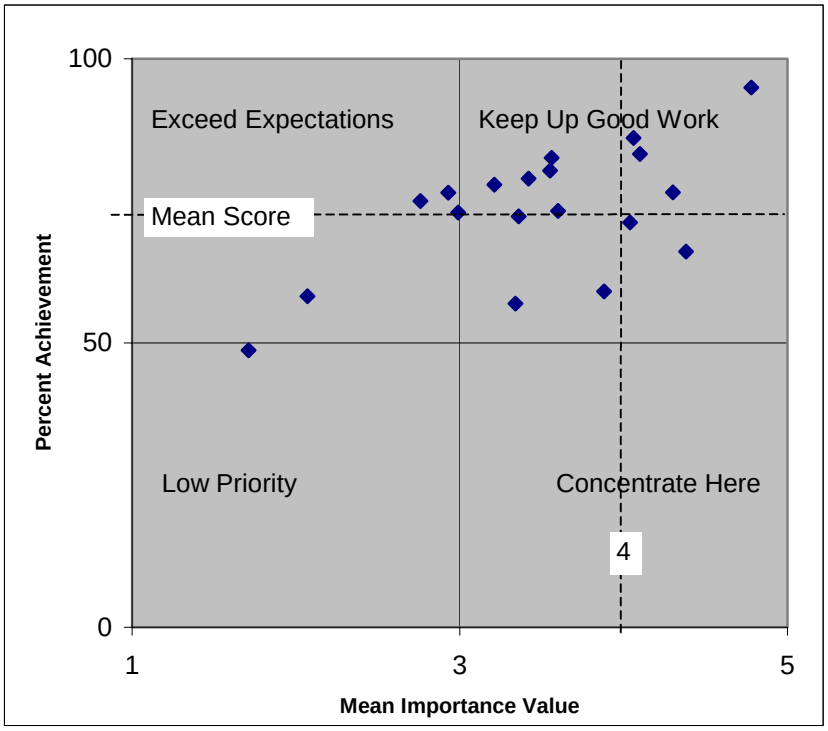


Figure 4-25. Motivation achievement/importance matrix.

Figure 4-25 concludes that with a 50% achievement and median importance as threshold values, 14 of 19 motives in the survey are both important and are being achieved by visitors. This is reflected in the data points within the upper right quadrant of Figure 4-25 (as denoted by solid grid lines). From a management performance perspective, the conclusion would be to 'keep up the good work'. If however the mean achievement value (73%) and a top-box approach (> 4 importance value) are used as the thresholds (as denoted by dashed grid lines), the results change significantly. In this latter scenario only four of 19 motives are both of importance and being fully satisfied. These four motives include view scenery, be in a peaceful quiet setting, rest and relax and take part in my preferred activity. Motives that were important

but were not being achieved (bottom right)included view wildlife and see an environment unchanged by humans. Park managers may want to consider focusing their efforts on improving the achievement of these latter two motives. The thresholds used in this example are for illustrative purposes and do not imply an established Parks Canada management threshold. The bottom left quadrant contains six motivations that are of little importance to the visitors and although achievement is currently low, they are of little visitor importance. For park managers, these motives are of 'low priority'. The top left quadrant represents seven motivations that are of little importance to the visitors, but that are being fully satisfied (reasonable cost, mix of outdoor experiences and modern comforts, exercise, developed trails and campsites, easy access to the area, spend time with friends and/or family, and good quality shopping, hotels and restaurants). For park managers, these motives are 'exceeding expectations'. The latter conclusion could imply an inappropriate level of financial or operational support and could be an area to evaluate for more efficient delivery of services or facilities.

Although not analyzed in this research, the assessment and monitoring of visitor motivations and benefits could also be used to evaluate whether visitor's experiences are in line with a Park mission and mandate.

ii) importance and use of information sources

The other component of the decision making process that was assessed in the travel diary was the importance and timing of information usage. It was found that the two most important sources of information were Parks Canada brochures/publications/maps and recommendations from travel/guide books (Figure 4-26). The next most important information source was highway signage followed by two variables for which there is little park management control, available time and weather. Six of the sixteen information sources included in the survey were determined to be of little or no importance to visitors' decision making processes related to where they were going to go in the parks.

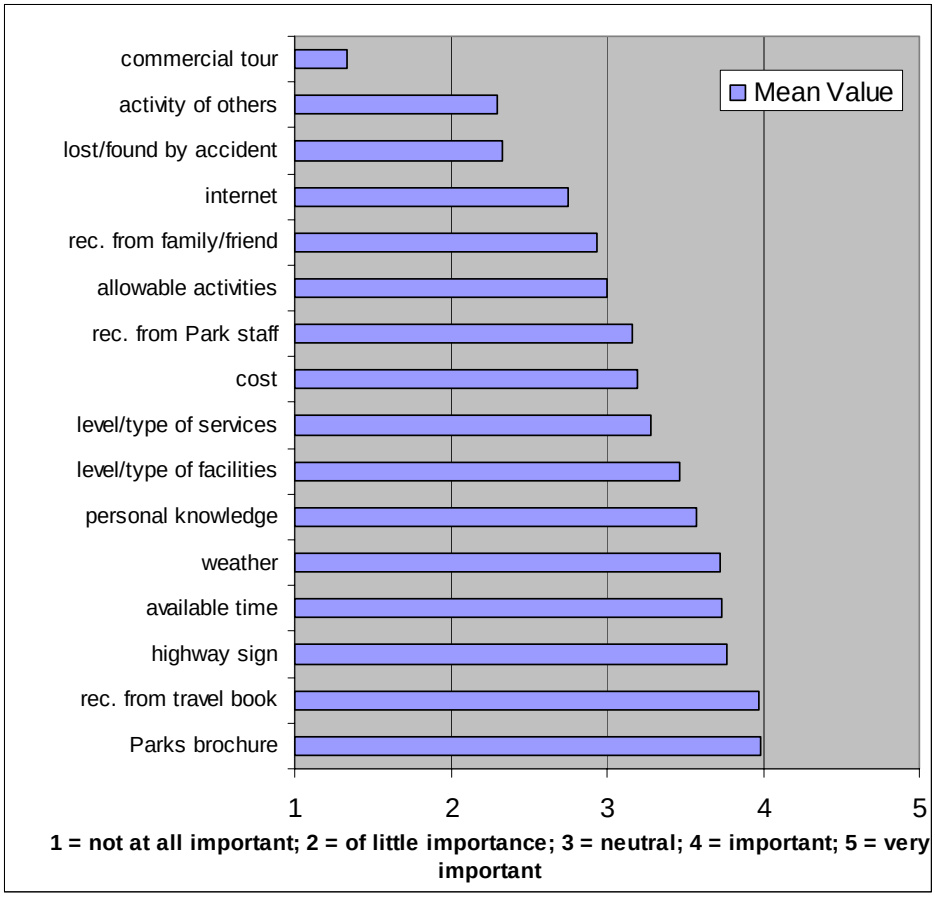


Figure 4-26. Mean importance scores for sources of information used in the decision making process.

While it is important to know what information sources are important in the decision making process, it is also important to know when the information is being accessed. Knowledge of these two variables can result in a more proactive and effective information and communication program. The information importance and timing matrix (Figure 4-27) concludes that most of the important information sources are being used while on-site. These sources include recommendation from travel books, available time, cost, level/type of service and facilities, recommendations from Park staff, weather, parks brochures and highway signs. The only important information source that was accessed before arrival was personal knowledge.

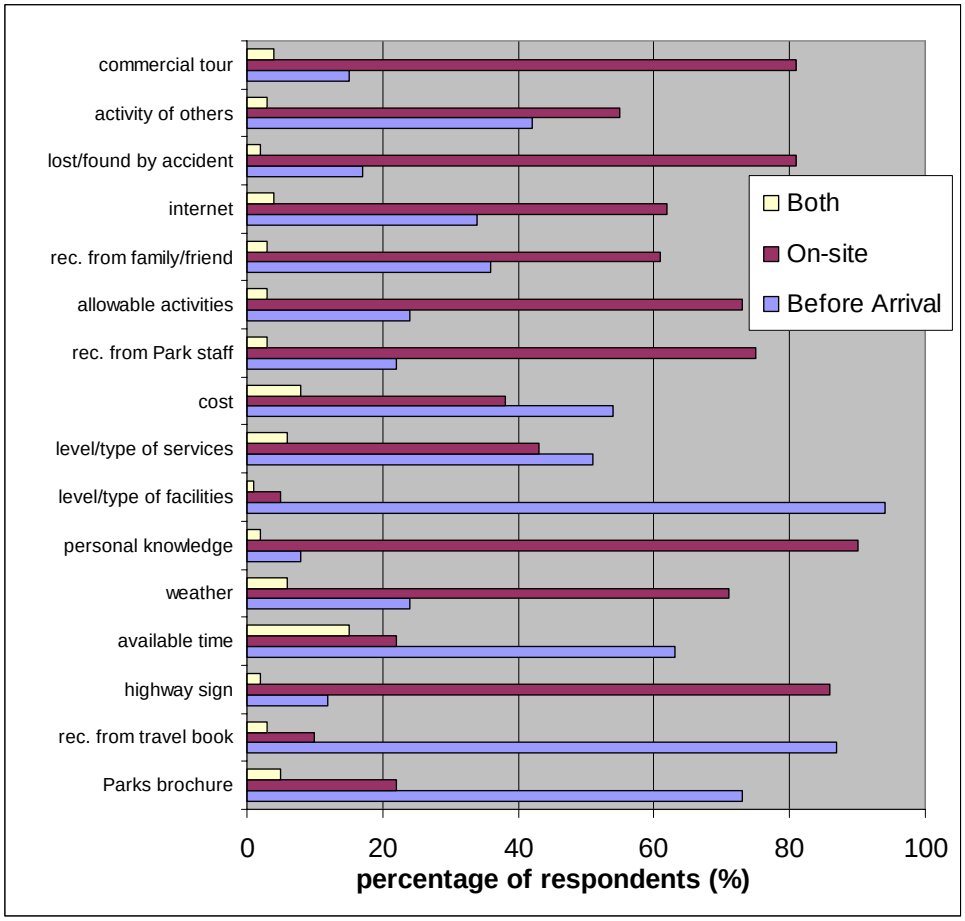


Figure 4-27. Information importance/time of use matrix.

With respect to a summary of trip experience and decision making profiles, the diary discovered that:

i) 28% of FIT respondents encountered more people than expected,

ii) the situation was most severe in parking lots and townsites and least severe in day-use areas and on backcountry trails,

iii) encounter levels reduced enjoyment at parking lots, Banff Town and Upper Lake Louise,

iv) there was a correlation between expectations and enjoyment,

v) visitors were negatively impacted by bus tours/large groups at pullouts/interpretive displays/picnic areas and by mountain bikers and large groups on trails,

vi) visitors were driven by the motivation to view scenery, and

vii) visitors gain most of their information for trip decision making from on-site use of park brochures and travel books.

4.3 Spatial Patterning

4.3.1 Travel Log Response

The total number of visitors represented by the completed surveys was 647. Of the 259 returned surveys, 238 (92%) had completed travel log components. Of these, 113 (47%) were received from U.S. visitors, 59 (25%) from visitors of international origin and 56 (24%) from Canadian visitors (Figure 4-28). This frequency data for the travel log respondents was similar to the visitor origin results for the overall travel diary survey (section 4.2.1). Of the survey respondents that did not complete the travel log, 31% were from the United States, 44% from international origins and 25% from Canada.

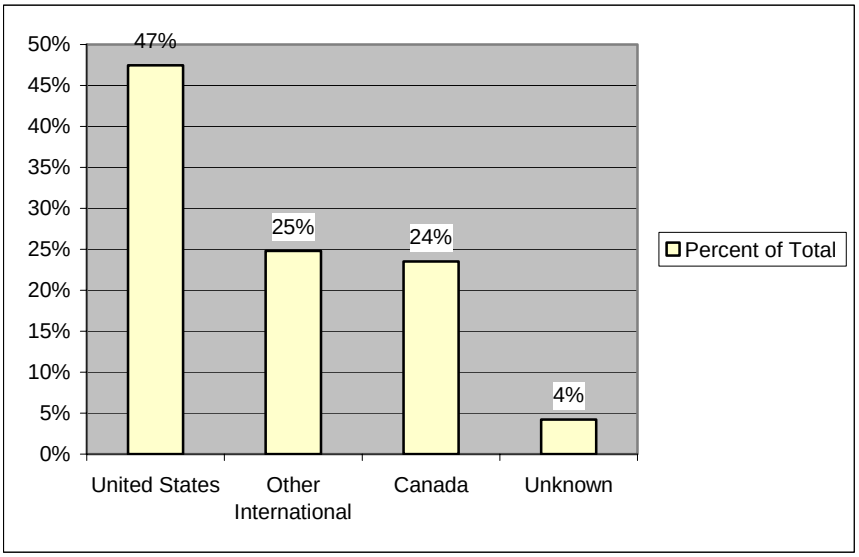


Figure 4-28. Travel log respondent origin.

Of the 56 logs received from Canadian travelers, 10 (18%) were from British Columbia, 28 (50%) from Alberta and 18 (32%) from other parts of Canada. Of those from Alberta and British Columbia, 13 surveys (Alberta = 12, BC =1) were from the regional markets (within a two hour drive). When assessed against the overall travel log results, the

regional Alberta market represented only 5% of the responses. The results can therefore not be considered representative of the regional visitor market.

Another trip variable believed to be potentially relevant to the analysis of visitor patterns of use was whether the travel log represented a first time or repeat visitor. Of the completed travel logs, 144 (60%) were first time and 94 (40%) were repeat visitors. These results are similar to the proportion of overall survey responses, so would suggest that there was little difference in travel log response rates between first time and repeat visitors.

The total number of log entries for the 238 surveys was 2,564. The number of log entries, per survey, ranged from 1 - 49 (average of 11.7 [s.d. 16.4]) (Figure 4-29).

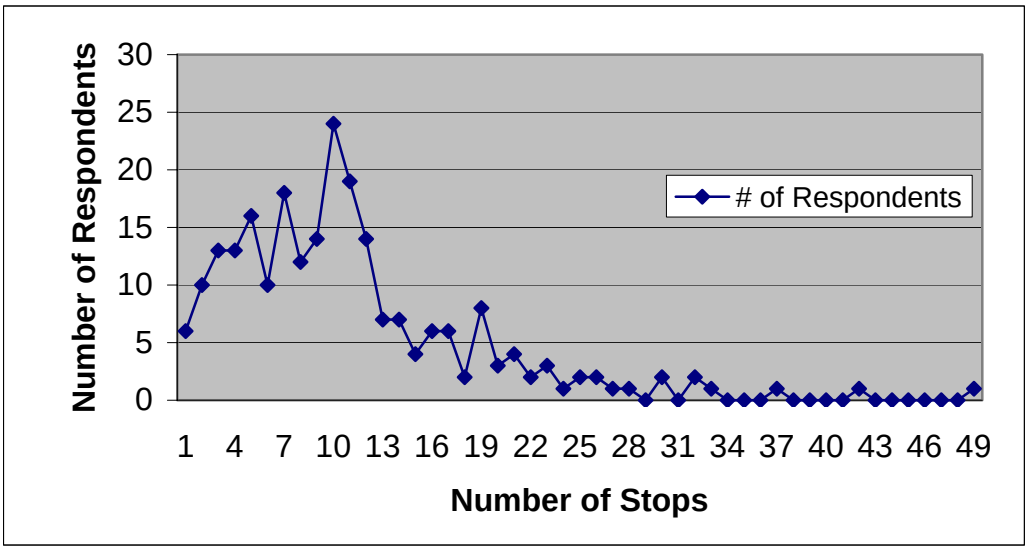


Figure 4-29. Frequency of stops per survey respondent.

4.3.2 Trip Profiles

Of the travel log respondents, 144 arrived through the Banff east gate, 24 through Kootenay, 24 through Yoho, 22 through Jasper, 2 through Highway #11, and 22 had an unreported entry point. The small sample size for entry points other than Banff limits the ability for meaningful visitor segmentation based on point of entry.

The instructions provided in the survey for completion of the travel logs requested that during their travels through the parks, visitors make a diary entry every time they made a stop longer than 15 minutes. The travel log results related to trip profile are summarized in Table 4-8.

Table 4-8. Summary of trip profile results.

Variable	Result	Comment
Trip Length (figure 4-31)	average 5.2 days/survey (s.d. 15.6)	- range of 1-32 days - most common trip length was 3 or 4 days (19 & 18% respectively) - 1,234 visitor days captured in diaries
Travel Log Entries	average 2.5 log entries/day (s.d. 1.5)	- implies 2.5 stops on average were recorded by each traveler for each day of their trip
Distance Traveled	average 582 km/visit party	- range of 103 – 2305 km.

As expected, the cumulative number of reported stops generally increases relative to overall trip length (Figure 4-30). Of greater research interest is the relationship between trip length and stops made per day. Figure 4-31 illustrates that there appears to be steady decline in the number of stops reported per day as overall trip length increases. This may be due to either a change in travel behaviour (i.e. a more relaxed pace on longer trips or engagement in activities of a longer duration) or to reporting fatigue.

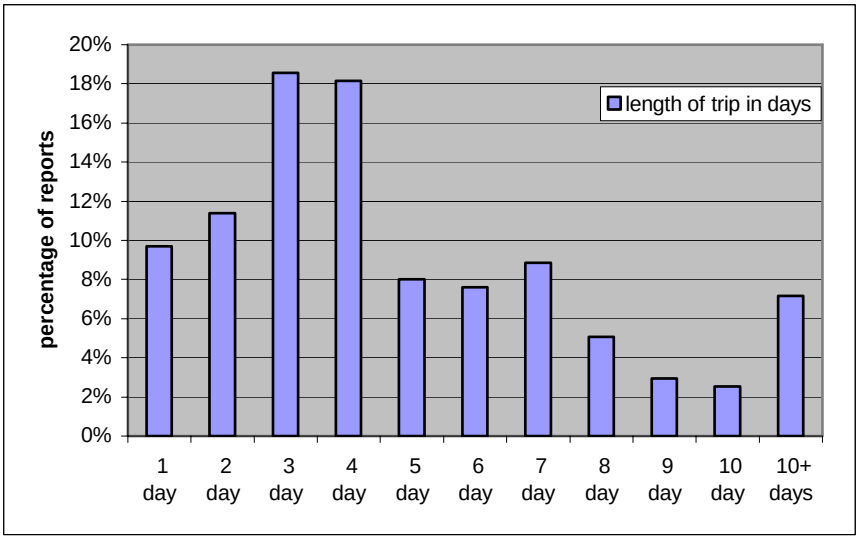


Figure 4-30. Reported trip length.

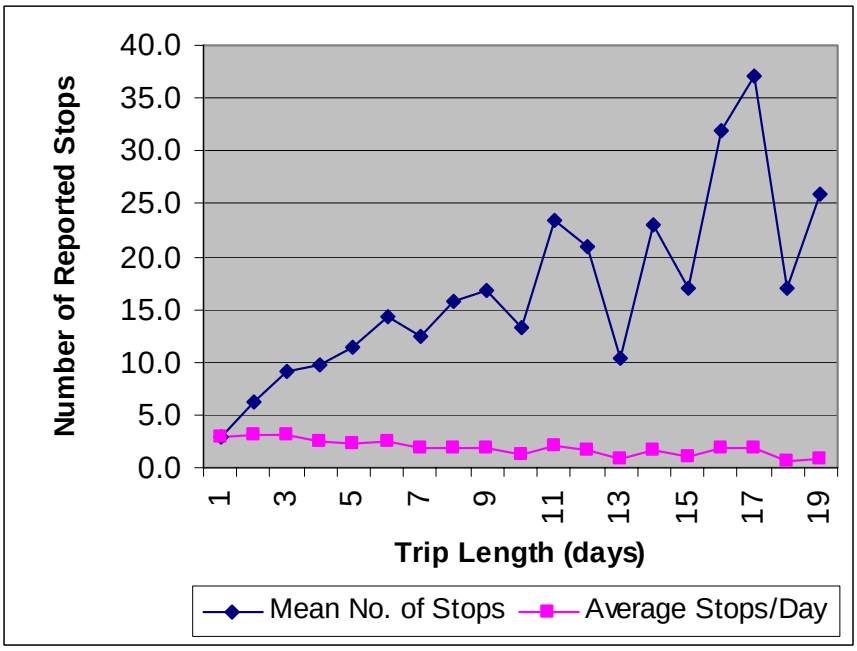


Figure 4-31. Average reported stops by overall trip length in days.

4.3.3 Diary Receipt

As the diaries were distributed at various locations in the parks, and not solely at park entry points, there is the potential that the diary would not be received on the first day of a trip. Based on analysis of the data, it was determined that on average, visitors received

the travel diary survey 3.7 days after the start of their trip to the study area (Figure 4-32). Thirty-three percent received the survey on the first day of their trip, 22% on the second and 77% within the first four days. As there was no survey question that asked for the length of the overall trip, there was no way to compare travel log entries to trip length to determine if diaries were completed from the time of entry into the park or from the time of the receipt of the survey. Review of the data reveals however that 92% of the diaries began recording route segments at an entry point into the parks. This may suggest, although unconfirmed, that the survey respondents began recording their travels from the time they entered the park as opposed to when they actually received the survey.

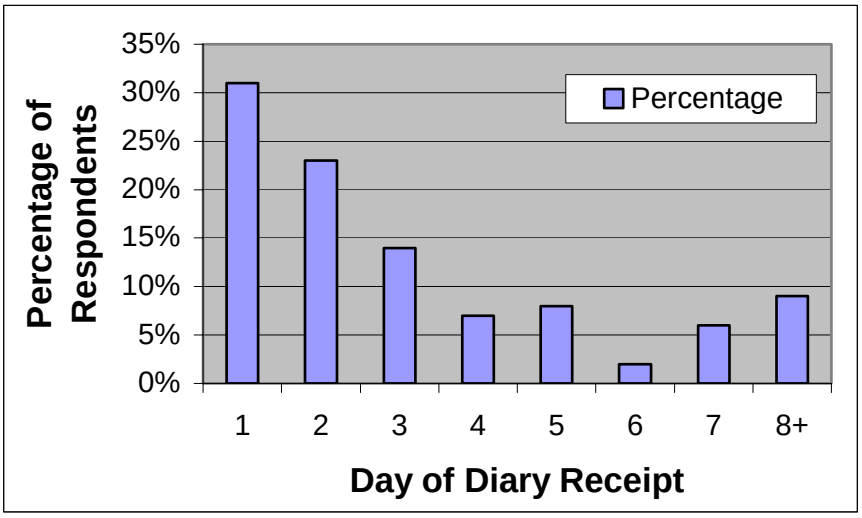


Figure 4-32. Day of trip when travel diary survey was received.

4.3.4 Travel Log Map

The survey requested that respondents use the map provided in the questionnaire to record the route and direction of their travel in the parks as well as the location of stops made. This request received a poor response. Even for those who did complete the task, the scale of the map and the redundancy and overlap of route lines made the data of little value for describing and understanding patterns of visitor use.

4.3.5 Activity Summaries

Of the 2,564 stops recorded in the survey travel logs, 2415 entries were related to participation in an activity. Respondents were required to describe their activities in terminology of their choosing. This approach resulted in a total of 25 unique activities being reported. There were several overlaps between some of the activities (i.e. food and eating, walking and strolling). To minimize the overlaps, the original list of 25 was reduced to 16 by consolidating similar activity types and by eliminating those activities that had reporting frequencies of <0.5% (Figure 4-33). The eliminated activities included: 'tour', 'bathroom', 'relaxing', 'all terrain vehicle tour', 'golfing', 'supplies', 'picnic', 'museum' and 'biking'. The three main activities reported were hiking, overnighting and sightseeing. They represented 60.8% of the total activity occurrences (Figure 4-33).

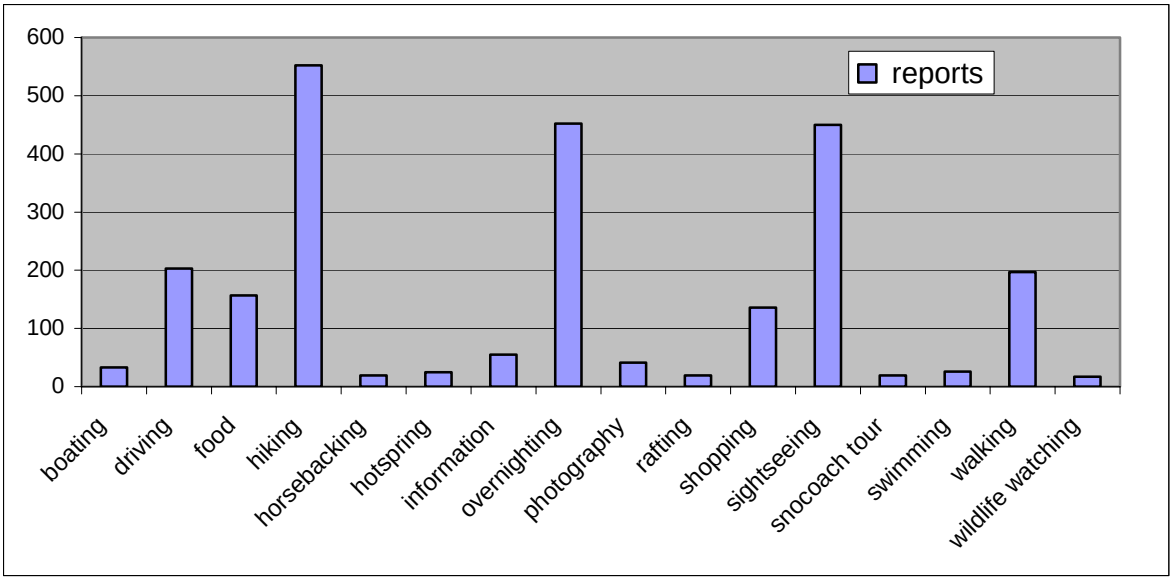


Figure 4-33. Number of reports by activity type.

Activity duration

Visitors reported the most amount of time (84%) engaged in food, hiking, shopping, sightseeing and walking activities (Figure 4-34). Overnighting, although recorded as an activity, was excluded from the analysis due to a lack of duration data in the surveys. The longest average duration for a single activity was rafting (198 minutes per user); followed by hiking (141 minutes) and horsebacking (130 minutes) (Figure 4-35).

Visitors reported 179,049 minutes (2,984.2 hours) engaged in activities over the 1,234 travel log visitor days. This results in an average of 145 minutes being recorded per visitor day.

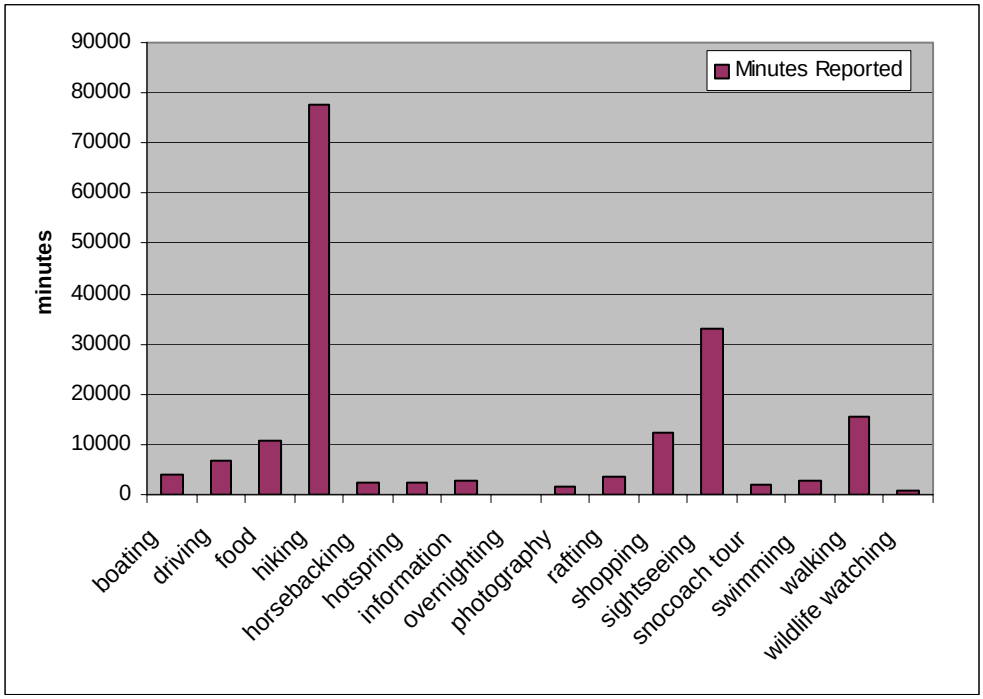


Figure 4-34. Total time (in minutes) reported in travel logs by activity type.

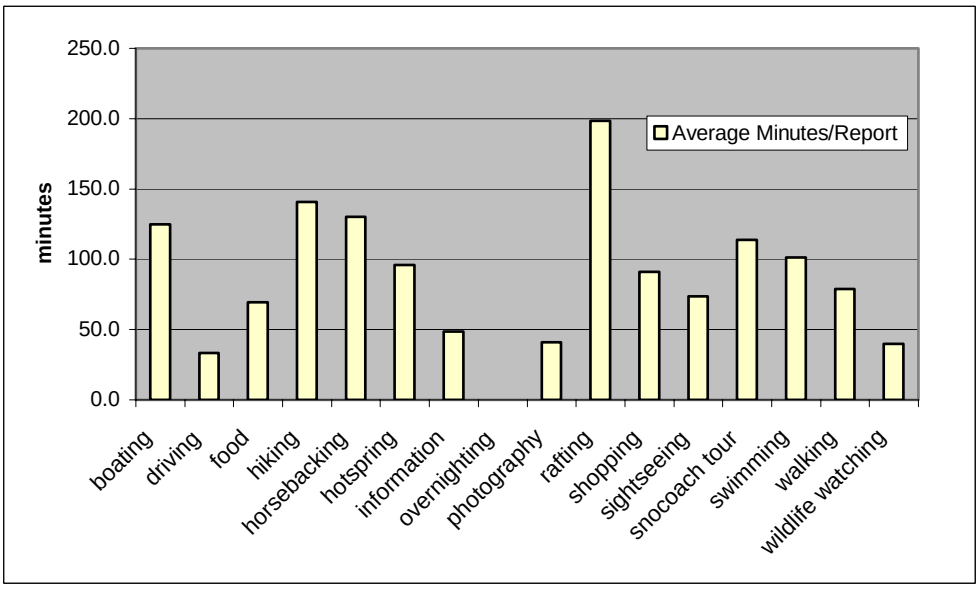


Figure 4-35. Average time spent (in minutes) by activity type.

Activity locations

Table 4-9 presents the number of travel log records by activity type and location. Table 4-10 presents the amount of time reported in the travel logs by activity type and location. It is necessary to merge the two tables in order to determine the relationship between activity reports/time spent and activity locations. This assessment is important in order to determine which locations within the study area are of most importance for specific activities. While there is generally a positive relationship between the number of reports and time spent engaged in an activity at a particular location, the relationship is not always direct. As a result, some activities could be occurring more frequently, but for a shorter duration at one location versus another. When this happens, it is more difficult to select a single location of overall importance. Table 4-11 presents the results of the assessment of both time and reports on location importance.

Table 4-9. Number of activity reports by location in travel logs.

ACTIVITY	banff b/c	banff day-use	banff town	bow valley pkwy	columbia icefields	emerald valley	icefields pkwy	Jasper park	kootenay b/c	kootenay day-use	lake louise town	moraine lake	takakkaw falls	upper lake louise	yoho b/c	yoho day-use
hiking	24	40	38	52	7	27	41	41	3	63	4	71	23	87	21	8
sightseeing	1	61	77	13	24	20	39	49		14	8	23	22	80		11
shopping		3	77		1			6		1	21			3		
horsebacking		6	6					5						2		
photography		5	1			4	8	5		5		1	1	6		4
wildlife watching	1	5	2	7		1	2			1		1				1
walking	1	30	20	13	3	10	16	11		9	4	25	7	35	1	1
overnighting		26	73	19	3	6	22	64	11		65	24	5	21	2	22
information		2	13		6		1			2	12			2		2
swimming			12											1		
boating		6				2		1						1		
driving		40	15	14	3		10	21			11	5	1	8	1	5
Food			3							1				1		

Table 4-10. Amount of time (in minutes) reported by activity and location in travel logs.

ACTIVITY	banff b/c	banff day-use	banff town	bow valley pkwy	columbia icefields	emerald valley	icefields pkwy	jasper park	kootenay b/c	kootenay day-use	lake louise town	moraine lake	takakkaw falls	upper lake louise	yoho b/c	yoho day-use
hiking	5855	5065	4285	7275	775	3175	4935	7524	250	5287	420	7990	2400	14965	5925	900
sightseeing	20	2900	10295	1625	2308	695	1080	2324		615	690	1345	1155	6850		330

shopping		510	9300					500		45	1000			120		
horsebacking		780	850					570						270		
photography		135	45			95	155	330		170		15	30	315		90
wildlife watching	30	270	80	380		20	25			180		90				20
walking	360	1735	1615	1525	145	1015	660	980		400	450	1975	300	3280	15	
overnighting																
information			725		525		60			30	595			105		130
swimming			875											60		
boating		570				225		180						120		
driving		1145	80	350	15		660	1350				60		705	180	30
Food			180							60				30		

Table 4-11. Relationship between activity and location importance.

Activity	Location Importance	
	Based on # of Reports	Based on Time Spent
wildlife watching	Bow Valley Parkway	
photography	Icefields Parkway	Upper Lake Louise
horsebacking	Town of Banff Banff day-use areas	Town of Banff
shopping	Town of Banff	
hiking	Upper Lake Louise	
sightseeing	Upper Lake Louise	Town of Banff
walking	Upper Lake Louise	
overnighting	Town of Banff	
driving	Banff day-use areas	
food	Town of Banff	
boating	Banff day-use	
swimming	Town of Banff	

4.3.6 Route Summaries

Section 3.4.2 discussed the approach taken to complete the analysis of the movement data contained within the travel logs. The approach involved the conversion of point and linear travel log information to a solely linear form consisting of route segments. The segments generally started and ended at either major attractions (i.e. Upper Lake Louise) or major intersections in the road network (i.e. junction of Highway 93S and Trans-Canada Highway). Eighteen route segments were defined for the study area (Figure 4-36). In addition to the geographical description of the route segment, each segment was given a numerical identification code. For convenience in presenting the results, the route segments are identified by their numerical ID code instead of their longer geographical description.

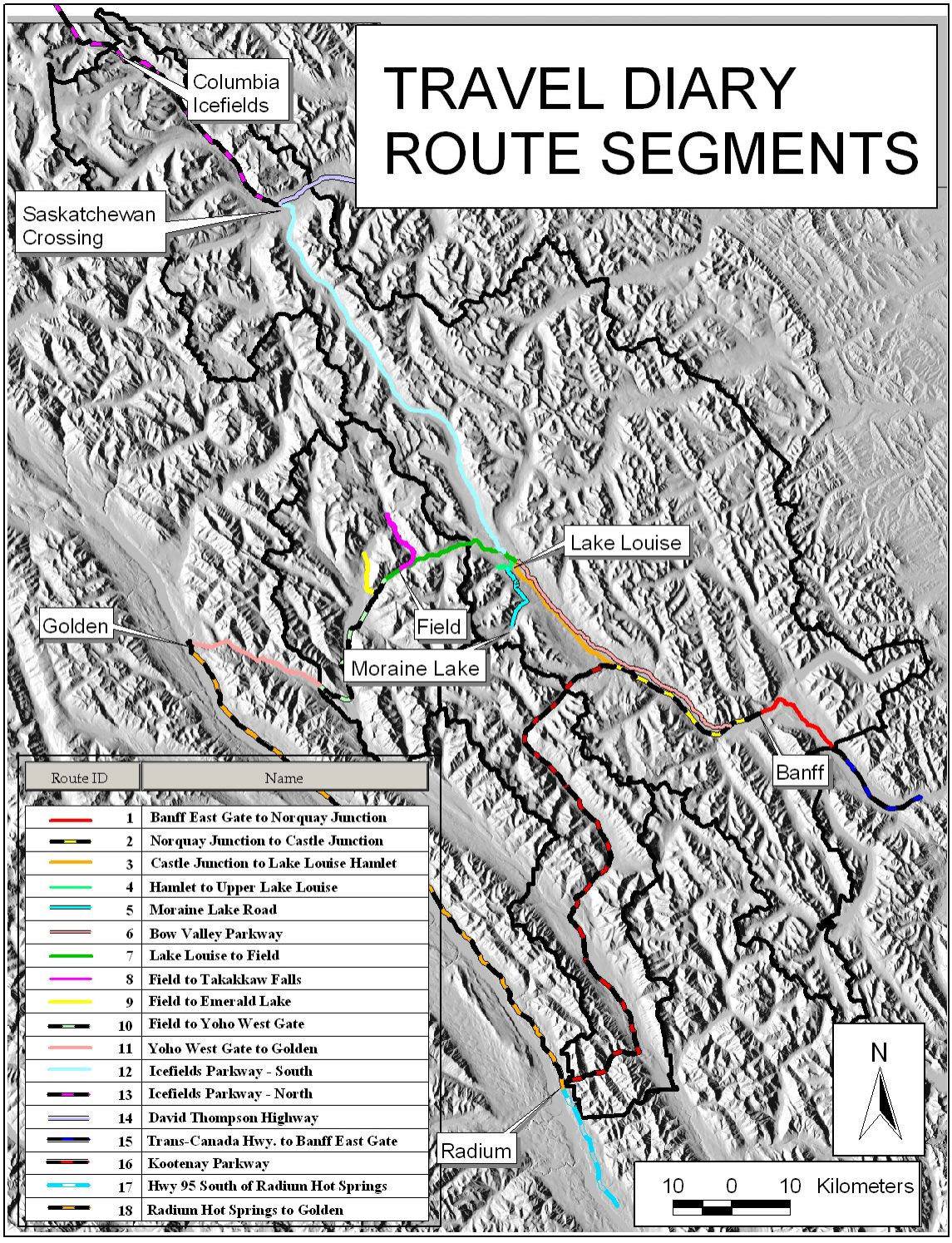


Figure 4-36. Travel diary route segments.

Another term that is used in the analysis that should be defined is 'trip segment'. A trip segment relates to the sequence of movements within a trip. Each trip segment will have

an associated route segment that, when reported together, will describe the sequence and location of visitor travels. Table 4-12 contains a portion of the database that was developed for the analysis of the travel log information. Within this database, each row represents one completed travel log. Each row is identified by a Visitor ID number which allows for cross-referencing to the other portions of the travel diary survey data already presented in this document (visitor profiles, trip profiles, motivations etc.). Each column in Table 4-12 represents a sequentially numbered segment of the trip. This captures the sequence of visitor movements. Each cell within Table 4-12 identifies the route segment number that was traveled during a particular trip segment.

Table 4-12. Selected illustrations of travel log database.

Visitor ID	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	Seg 9	Seg 10	Seg 11	Seg 12	etc. …
503	1	2	3	4	3	2	2	3	12	12			
512	11	10	3	2	6	4	4	5	5	12	13		
513	11	10	4	4	5	5	4	4	4	4	3	2	
515	12	3	4	4	7	10							
518	15	1	2	3	4	4	12	13					
520	11	18	16	3	4	4	12	13	13	12	4	4	
523	2	3	3	2	1	15							
525	1	2	3	4	4								
533	1	2	6	6	3	2	2	3	1	12	13	13	
549	1	2	3	4	4	4							
550	1	2	3	3	2	2	3	7	7	12	13		
559	16	3	7	8	8	9	9	8	8	7	5	5	
560	16	2											
561	1	2	3	5	5	7	9	9	8	8	7	4	
562	1	2	3	7	8	8	7	12	13	12		6	

The following discussion reports the results of the analysis of travel data from four different perspectives. Firstly, aggregate use level information is summarized individually for route and trip segments to assess the scope of visitor travel patterns within the study area. Secondly, route and trip segment frequency information are integrated in order to begin exploration of the question of whether spatial patterns of visitor use can be detected from the data. Thirdly, a specific question related to the nature of day trips is addressed. Fourthly, route segment information is linked to clusters of activity and decision making variables derived from multivariate analysis. The latter

analysis provides the basis for describing spatial patterns of visitor travel and allows for a comparison of behavioural and spatial approaches to understanding patterns of use.

Aggregate Use

This analysis describes the amount of aggregate use that each route segment received by all survey respondents over the duration of the survey period. Route segments 3 (Castle Junction to Lake Louise Hamlet), 2 (Norquay Junction to Castle Junction) and 4 (Lake Louise Hamlet to Upper Lake Louise) accounted for 16%, 15% and 12% of the recorded use respectively (Figure 4-37). These results may seem to contradict an earlier conclusion based on the predominance of arrivals through the Banff East Gate, suggesting that route segment 1 (Banff East Gate to Town of Banff) should receive the highest level of use. This contradiction is dismissed by considering the nature of visitor movements in the parks whereby once a visitor has gained entry into the park, it is unlikely that they would travel the route segment leading back to the entry point unless there was an attraction or activity en-route that warranted it. As a result, most travel movement once inside the parks occurs on routes more central to the study area. This is consistent with the results presented in Figure 4-38 and with the GIS based presentation in Figure 4-39 where the greatest frequency of aggregate route data is towards the center of the study area (i.e. Castle Junction and Lake Louise area).

The number of completed trip segments by individual visit parties ranged from 1 to 55. Most visit parties (74%) completed 19 or fewer segments during their travels within the study area. This seems consistent with the previous conclusion that approximately 68% of trips were less than 5 days in length.

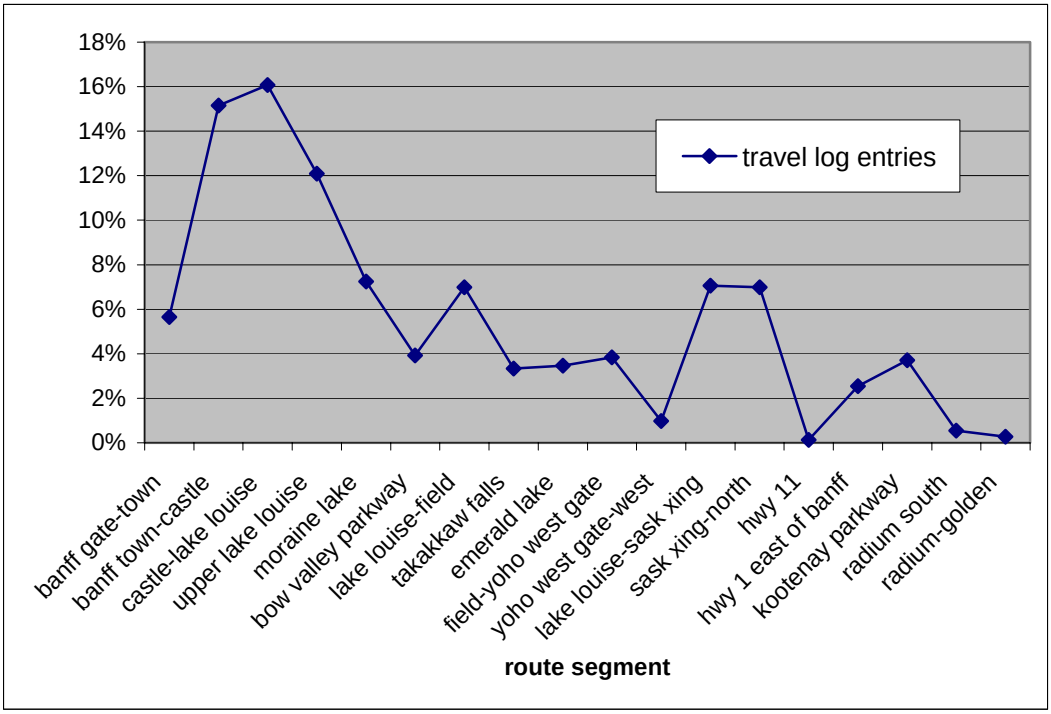


Figure 4-37. Aggregate frequencies by route segment.

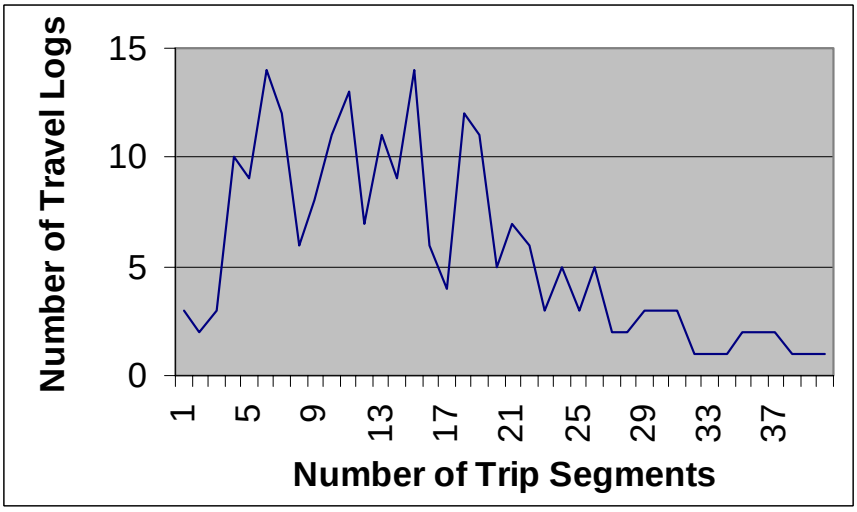
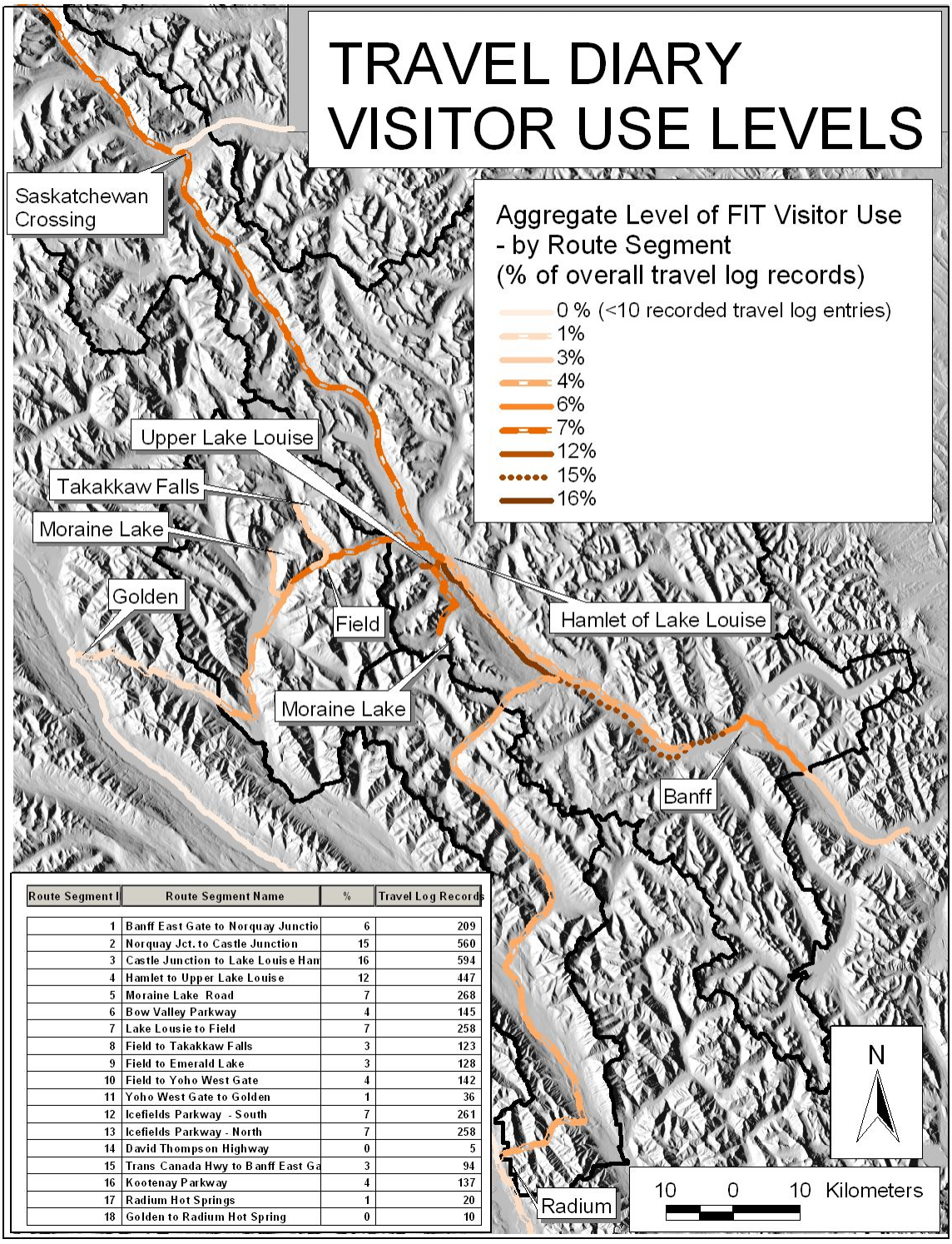


Figure 4-38. Trip segment frequencies from travel logs.



Route Segment I	Route Segment Name	%	Travel Log Records
1	Banff East Gate to Norquay Junctio	6	209
2	Norquay Jct. to Castle Junction	15	560
3	Castle Junction to Lake Louise Han	16	594
4	Hamlet to Upper Lake Louise	12	447
5	Moraine Lake Road	7	268
6	Bow Valley Parkway	4	145
7	Lake Lousie to Field	7	258
8	Field to Takakkaw Falls	3	123
9	Field to Emerald Lake	3	128
10	Field to Yoho West Gate	4	142
11	Yoho West Gate to Golden	1	36
12	Icefields Parkway - South	7	261
13	Icefields Parkway - North	7	258
14	David Thompson Highway	0	5
15	Trans Canada Hwy to Banff East Ga	3	94
16	Kootenay Parkway	4	137
17	Radium Hot Springs	1	20
18	Golden to Radium Hot Spring	0	10

Figure 4-39. Aggregate visitor use levels by route segment.

Route/Trip Segment Frequencies - This analysis compared route and trip segment frequency information for each of the 18 route segments that were identified for the study area. This analysis was undertaken in an attempt to integrate the spatial and sequence information thereby enabling a more complete understanding of patterns of visitor use. Table 4-13 displays a portion of the overall trip frequency data from the travel logs (six route segments x 15 trip segments). For illustration, the most commonly reported first trip segment was from the Banff east gate to the Town of Banff. For trip segment two, the most frequently reported route segment was from the Town of Banff to Castle junction on Hwy #1. For the third trip segment, the route segment from Castle Junction to Lake Louise was most often reported, and for the fourth, Lake Louise to Upper Lake Louise is most often reported. However from this segment on, the data becomes less clear as visitors' movements become more dispersed throughout the study area. From this data therefore, the most frequent trip sequence is to visit the area from Banff east gate to Upper Lake Louise first.

Table 4-13. Portion of trip/route segment frequency table.

	Route Segment					
Trip Segment	banff gate-town **1**	banff town-castle **2**	castle-lake louise **3**	upper lake louise **4**	moraine lake **5**	bow valley parkway **6**
1	112	5	3	5	4	1
2	26	103	21	5		13
3	3	31	109	32	7	7
4		25	43	71	18	10
5	5	26	30	48	24	9
6	2	38	27	28	27	4
7	4	29	35	33	16	9
5	5	26	22	30	14	11
9	3	28	27	22	17	8
10	4	19	28	21	17	8
11	4	19	17	22	22	5
12	3	18	21	17	15	6
13	3	19	29	11	12	3
14	2	19	17	11	6	8
15	3	18	14	9	3	6

A better understanding of the nature of **day trips** is an issue of interest to many park managers. Although many parks are managing the amount of overnight capacity that is being provided within their boundaries, this control does not extend into the adjacent

region. As a result of this situation, excess demand for overnight accommodation is being met by increasing the supply of facilities and services within adjacent communities. This, coupled with increasing regional resident populations, has the potential to result in changes to both the amount and type of visitation to protected areas. The most obvious change could be a shift toward more day-use oriented travel patterns. It is important to assess the current level of day use activity in the study area. For the travel diary, there appeared to be only 20 single day trips captured by the travel logs. Of these, five travel logs were received on a day that was other than the first day of the trip, suggesting that they were not reflecting a day trip. For six logs, it could be confirmed that they were received on the first day of a one-day trip. For the remaining nine, a review of the travel log entries was done to confirm whether they represented a closed trip through the parks. Those that did represent a closed trip were considered to reflect a day trip. For the remainder, it cannot be said whether they were a day trip, a representation of only one day of data entry, or a final day of a longer trip. In the end, there were nine travel logs that were felt to truly represent a day trip to the study area. For these trips one was completed in June, four in July, two in September and two in October. As was the case with the limitations for segmentation by entry point, the small sample size precludes any statistical analysis of the day-use data. For the nine day trips, the following patterns were recorded:

I. *banff east gate → upper lake louise (via hwy #1) → icefields parkway → jasper*
II. *trips of banff east gate → icefields parkway (via hwy #1) → jasper*
III. *banff east gate → kootenay parkway → upper lake louise → moraine lake → icefields parkway → jasper*
IV. *banff east gate → emerald lake (via hwy # 1) → banff east gate*
V. *kootenay gate → banff east gate*
VI. *kootenay gate → icefields parkway → jasper*
VII. *yoho park → emerald lake → takakkaw falls → upper lake louise → kootenay gate*
VIII. *hwy #11 → icefields parkway → moraine lake → icefields parkway → hwy #11*

In looking at these results there appears to be little conclusive information regarding the presence of any generalized patterns.

Spatial Patterns of Use

The primary research objective for this thesis was to determine spatial patterns of visitor use through the analysis of travel log data. Defining patterns of use based upon behavioural data has been a common output of social science research undertaken within the study area (see examples in Parks Canada Agency, 1999). The most recent example is the POVU study that utilized multivariate analysis of activity, expenditure and motivation variables to define the following five patterns of use within the summer independent visitors to the mountain national parks (Accord Research, 2002):

1. getaway visits (46% of visitors) - often day trips or 2-3 day visits that tend to focus on a specific activity or area,
2. comfort visits (31% of visitors) - include the parks' many hotels and restaurants… and its visitors spend the most money
3. nature's pace visits (2%) - most likely to 'stop and smell the flowers' - tend to enjoy the parks at a slower pace,
4. mountain experience visits (1%) - small group experiences the outdoors in many different ways - use hotels as their base - report a very active visit, and
5. camping visits (21%) - camping and recreational vehicle touring.

This information, while informative, does not provide any spatial context for the patterns of use being described. Understanding this spatial context of human use and the specific spatial relationships of human activity to the landscape within the study area is critical information for the effective management of Yoho, Kootenay and Banff National Parks.

The methods employed by the Travel Diary Study to generate spatial patterns of FIT use included the following steps (see also Section 3.4.2):

i) factor analysis (principal components) of the decision making and motivation variables to define potential key descriptors of spatial patterns of use,

ii) cluster analysis, utilizing factor component scores, to identify cluster membership,

iii) use of membership data to assign individual travel logs to specific clusters,

iv) development of a table of route frequency information for each cluster,

v) GIS mapping of route frequency information, and

vi) interpretation of frequency maps to explain spatial patterns of FIT visitor use.

The multivariate analysis undertaken (steps i and ii) duplicate the process utilized in the POVU study. This duplication was done in order that the results from the two approaches could be compared.

The Travel Diary study utilized the motive and decision process variables from the survey (Tables 4-14 and 4-15) as inputs for the multivariate analysis. These two sets of variables were determined to be the most important drivers, available from the survey, of spatial patterns of visitor use.

Table 4-14. Motivation variables from travel diary survey.

	Not at all Important ……				Very important
take part in my preferred activity	①	②	③	④	⑤
be in a peaceful, quiet setting	①	②	③	④	⑤
developed trails and campsites	①	②	③	④	⑤
learn about Canada's natural heritage	①	②	③	④	⑤
reasonable cost	①	②	③	④	⑤
close to where I live	①	②	③	④	⑤
easy access to the area	①	②	③	④	⑤
spend time with friends and/or family	①	②	③	④	⑤
view scenery	①	②	③	④	⑤
exercise	①	②	③	④	⑤
rest and relax	①	②	③	④	⑤
do something challenging	①	②	③	④	⑤
meet other people who share my interests	①	②	③	④	⑤
get away from crowds of people	①	②	③	④	⑤
view wildlife in a natural setting	①	②	③	④	⑤
experience solitude	①	②	③	④	⑤
see an environment unchanged by humans	①	②	③	④	⑤
mix outdoor experiences & modern comforts	①	②	③	④	⑤
good quality shopping, hotels, & restaurants	①	②	③	④	⑤
other: _____	①	②	③	④	⑤

Table 4-15. Decision making variables from travel diary survey.

	Very important				Not at all important
personal knowledge	①	②	③	④	⑤
recommendation from family/friend	①	②	③	④	⑤
recommendation from Parks staff	①	②	③	④	⑤
recommendation from travel/guide book	①	②	③	④	⑤
parks Canada brochure/publication/map	①	②	③	④	⑤
highway Signage	①	②	③	④	⑤
internet	①	②	③	④	⑤
part of commercial tour	①	②	③	④	⑤
cost	①	②	③	④	⑤
activity of others	①	②	③	④	⑤
allowable activities	①	②	③	④	⑤
level/type of services	①	②	③	④	⑤
level/type of facilities	①	②	③	④	⑤
lost/found by accident	①	②	③	④	⑤
available time	①	②	③	④	⑤
weather	①	②	③	④	⑤

The factor analysis grouped the thirty-five variables in Tables 4-14 and 4-15 into subsets that could be used to help define the factors, or drivers, that determine patterns of visitor use. Each variable was organized according to the factor category with the highest value. The analysis resulted in the identification of five factors. Table 4-16 identifies for each factor, the survey variables that it contains, the source of each of the variables and the loading scores. For the five factors, the following labels and descriptions were created:

- factor 1 “Relaxer” (18% of visitors). This group is the hardest to define. They appeared not to be driven by specific motives but instead had their use patterns determined by decisions that were based upon recommendations, published information, on-site services and facilities and available time. This would suggest a flexibility in their travel planning. It could be conceived that these visitors had as their main objective the desire to visit the Rocky Mountain National Parks, beyond which there were few specific personal objectives or motives driving their patterns of use. They are the group that could be most influenced by communications and information.

- factor 2 “Nature Seeker” (26% of visitors). This group is highly driven by educational and experiential motives. They appear to prefer the quiet, solitude and peacefulness of natural settings. They value the opportunity to view wildlife and experience environments that are unchanged by humans. This group would be most influenced by changing ecological or social conditions.

- factor 3 “Frequent User” (27% of visitors). This group is motivated by cost and proximity/access from home. They make their use decisions based upon personal knowledge, cost and weather and therefore appear to have the most flexibility in their travel planning. They also appear to be the most price sensitive. These attributes could be associated with local/regional users.

- factor 4 “Activist” (9% of visitors). This group is activity focused and motivated by exercise and challenge. Consistent with their activity motivations, they value developed trail and campsite infrastructure.

- factor 5 “Socialite” (20% of visitors). This group is motivated by social interaction and the desire for a mix of outdoor experiences and modern comforts. They make their use decisions based upon recommendations from family and friends, by the activity of others or made for them as part of a commercial tour. They are also the visitor group that is most likely to have their patterns of use determined by accidental causes (i.e. locations lost/found by accident). This group may therefore be the most likely to shadow and be influenced by the activities and patterns of use of other visitors.

Table 4-16. Factor analysis of motivation and decision making variables for defining patterns of visitor use.

Variable	Factor 1 Relaxer	Factor 2 Nature Seeker	Factor 3 Frequent User	Factor 4 Activist	Factor 5 Socialite
Relaxer					
decision variable rec. from park staff	.490	-.162	.121	.002	.290
decision variable rec. from travel guide/book	.538	-.076	.062	.002	-.121
decision variable PC_brochure	.672	-.040	.200	.009	-.062
decision variable highway signage	.647	-.073	-.204	.191	.004
decision variable internet	.442	-.041	.214	-.210	-.046
decision variable allowable activities	.436	.074	-.067	-.381	.375
decision variable level/type of services	.664	-.095	-.241	.000	.132
decision variable level/type of facilities	.678	-.032	-.265	.023	.084
decision variable available time	.450	.041	-.139	-.125	.110

Nature seeker					
motivation variable peaceful, quiet setting	-.012	.669	.122	.229	.120
motivation variable learn about Canada's heritage	-.165	.355	.208	-.042	-.197
motivation variable rest and relax	.010	.445	.164	.105	-.012
motivation variable get away from crowds	.009	.667	-.044	.225	-.105
motivation variable view wildlife in a natural setting	-.273	.613	.032	-.099	.014
motivation variable experience solitude	.001	.669	.034	.283	-.035
motivation variable see an env. unchanged by humans	-.109	.735	.053	.040	-.046
Frequent User					
motivation variable reasonable cost	.015	.149	.710	.063	-.003
motivation variable close to where I live	.318	-.118	.460	.243	-.193
motivation variable easy access to area	-.105	.231	.649	.163	.133
decision variable personal knowledge	-.040	-.211	-.465	.116	.116
decision variable cost	.294	.020	-.627	-.000	.381
decision variable weather	.301	-.034	-.363	-.197	.030
Activist					
motivation variable spend time with friends and/or family	-.109	-.019	.350	.373	-.003
motivation variable exercise	.090	.233	.023	.731	-.035
motivation variable developed trails and campsites	-.093	.171	.118	.621	.171
motivation variable take part in my preferred activity	.023	.112	.291	.553	.007
motivation variable do something challenging	-.023	.268	-.197	.703	-.190
Socialite					
motivation variable meet other people who share my interests	-.007	.253	.004	.290	-.337
motivation variable mix outdoor exp and modern comforts	-.327	.212	.124	.095	.342
motivation variable good quality shopping, hotels and restaurants	-.179	-.098	.143	.125	.295

decision variable rec. from family/friend	.178	.124	-.200	-.100	.467
decision variable part of commercial tour	-.053	-.124	-.034	.045	.550
decision variable activity of others	.034	.097	-.212	-.249	.558
decision variable lost/found by accident	.337	-.193	-.047	.132	.580

The component scores for each factor were then used to perform heirarchical and k-means cluster analysis. From the membership data of the cluster analysis, individual travel logs within each of the clusters were identified. The establishment of this association between a specific travel log and a cluster provided the opportunity to explore the relationship between determinants/drivers of use and the actual spatial patterns associated with each of the drivers.

The analysis proceeded with the identification, and tabular summary, of route segment and trip sequence information within each cluster (Table 4-17). The data was further summarized within each cluster table by calculating the frequency of log records for each of the available 18 route segments.

Table 4-17. Selected illustrations of cluster 5 route segment data.

Visitor ID	Cluster ID	Segment ID	Segment ID	Segment ID	Segment ID	Segment ID
2	5	1	2	3	4	4
533	5	1	2	6	6	3
560	5	16	2			
577	5	10	7	3	2	6
900017	5	1	1	15	15	1
900029	5	1	2	3	4	4
900053	5	15	1	2	3	4
900082	5	15	1	2	3	4
900116	5	1		6	6	16
900130	5	1	6	3	2	
900147	5	15	1	2	3	4
900172	5	1	2	3	12	13
900180	5	10	7	4	4	3
900181	5	1	2	3	3	2
900214	5	10	7	3	2	2
900247	5	1	2	3	3	2

900281	5	1	2	3	5	5
900353	5	4	3	16	16	2
900381	5	1	2	3	4	4
900429	5	1	6	3	2	2
900439	5	15	1	2	3	5
900482	5	13	12	3	2	1
900969	5	1	2	3	7	8
900991	5	1	2	3	3	2

The route segment frequency data for each cluster was then merged into a single tabular summary (Table 4-18) and standardized, to account for sample size differences, by converting from record numbers to percentages. The resulting percentage data was then plotted in GIS to allow for the visual representation and interpretation of spatial patterns of FIT use. An example of the individual plot for cluster 5 is presented as Figure 4-40. To facilitate easier comparison amongst the clusters, a composite image with all five clusters was produced (Figure 4-41).

Table 4-18. Route segment cluster frequencies.

Number of Records by Cluster and Route Segment										
Cluster #	seg 1	seg 2	seg 3	seg 4	seg 5	seg 6	seg 7	seg 8	Seg 9	seg 10
cluster 1	17	44	53	37	22	20	18	10	12	16
cluster 2	26	67	65	54	25	16	31	17	13	17
cluster 3	22	64	81	64	43	13	44	20	20	25
cluster 4	9	27	24	19	18	9	5	4	7	5
cluster 5	27	74	72	51	24	17	18	12	6	10

seg 11	Seg 12	seg 13	seg 14	seg 15	seg 16	seg 17	seg 18
2	20	19	0	8	14	4	2
7	27	27	0	14	13	1	0
5	42	42	3	8	24	2	0
3	7	7	0	5	3	0	1
2	21	21	0	12	11	2	0

A visual interpretation of the cluster images reveals some general spatial patterns of activity that are specific to each group.

When the results of the factor/cluster analysis and GIS mapping of route frequency are integrated, it allows for an understanding of the relationship between the spatial patterns of use and the motivation/decision making variables that are creating them. This relationship of spatial patterns and causal variables for the Travel Diary survey are described as follows:

1. The "Relaxer" is most likely of all the clusters to travel Highway 1A, the Banff-Jasper Parkway (Hwy. 93N) and the Kootenay Parkway (Hwy 93S). These patterns would allow the traveler to visit most of the recognized/publicized locations in Yoho, Banff and Kootenay parks and is therefore consistent with their apparent reliance on information to drive their use decisions.
2. The "Nature Seeker" is most likely to spread their activity throughout the study area. They appear to potentially use either Banff Town or Lake Louise as a base from which to explore other areas of the parks. They also tend to favour less crowded locations (i.e. Takakkaw Falls) over those that are more crowded (i.e. Emerald Lake and Moraine Lake).
3. The "Frequent User" is most likely to make a single pass through the study area (although not necessarily a loop). This pattern of activity results in higher levels of use at the periphery and lower levels of use within the core of the study area. This suggests a stronger link with a place of origin outside of the parks than within. These patterns are consistent with a potential local/regional user segment.
4. The "Activist" is most likely to visit Moraine and Emerald Lakes and to travel the 1A Highway.
5. The "Socialite" is most likely to arrive through the Banff east gate and travel the section of highway between Banff and Lake Louise. This pattern of use, which is anchored by the developed Community/Town at either end, would be consistent with their motivation to mix outdoor experiences with modern comforts. Outside of the core area, their use patterns are relatively dispersed and consistent with general travel patterns, again illustrating consistency with their motive for social interaction.

It appears that visiting Upper Lake Louise is of high and equal importance to all clusters.

Since the cluster membership is tied to specific visitor surveys, detailed visitor profile information (origin, demographics, vehicle type, party size, visit history etc.) can be derived and reported for any of the spatial clusters discussed above. The motivational and spatial information for each of the clusters is presented in figure 4-42.

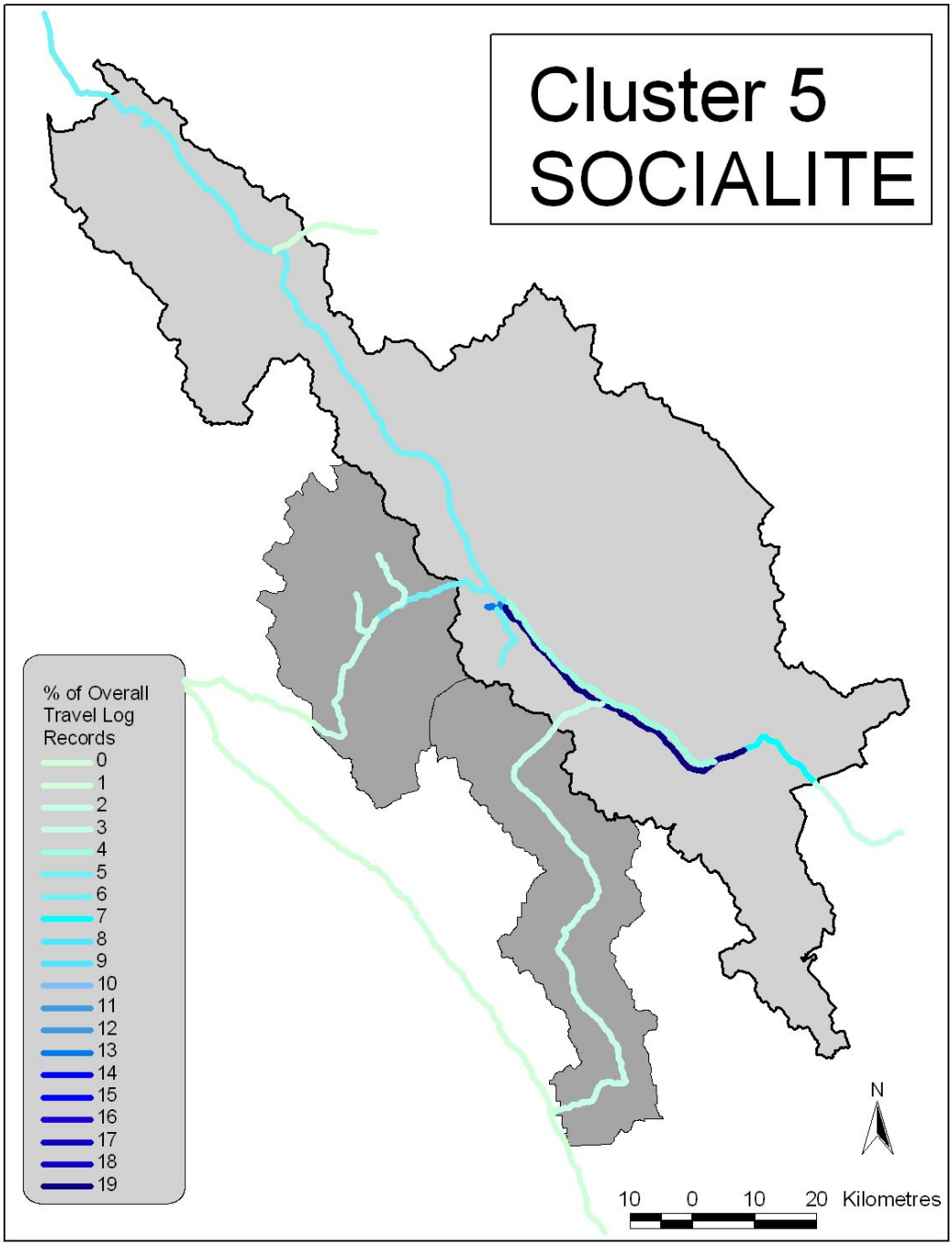


Figure 4-40. GIS plot of cluster five route frequencies.

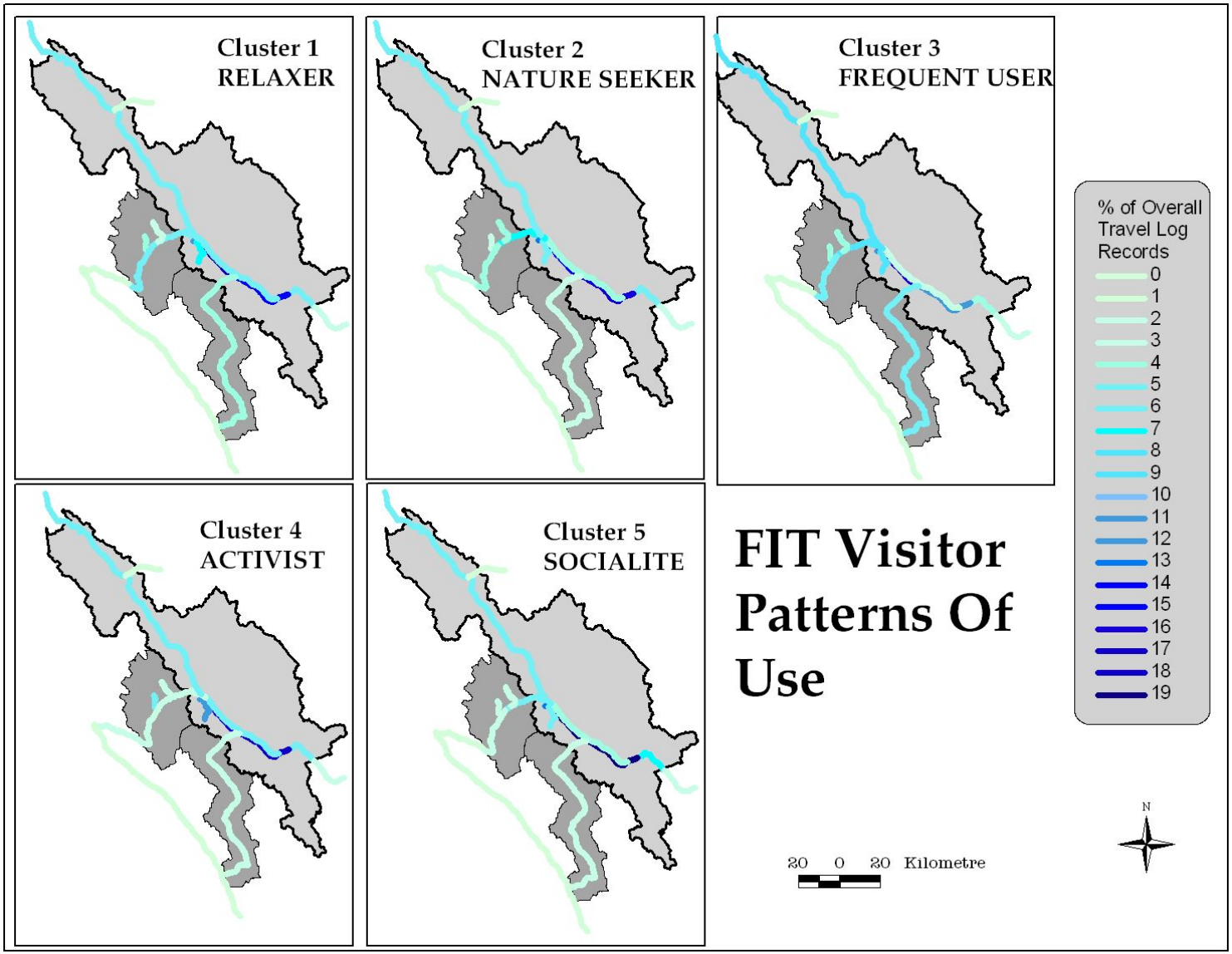


Figure 4-41. Route segments by cluster.

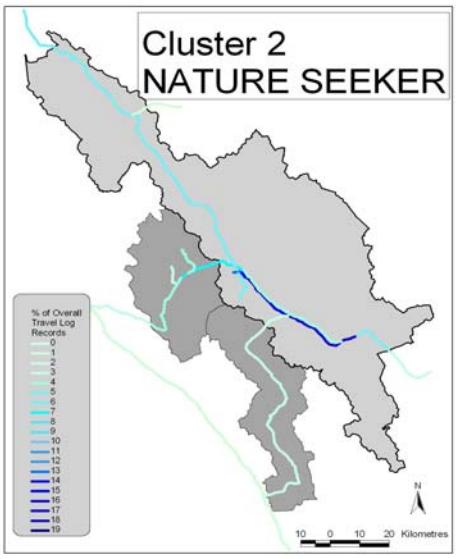
- 18% of visitors

- Patterns – most likely to travel Highway 1A, Banff-Jasper Parkway and Kootenay Parkway. Travel pattern tied to visitation of most of the recognized/publicized locations in the study area

- Motives – non-specific and flexible

- Drivers - patterns of use driven by decisions based on recommendations, published information, on-site services/facilities and available time. Main objective is to visit Rocky Mountain National Parks. Few specific trip objectives beyond this

- Trip Influences - communications and information



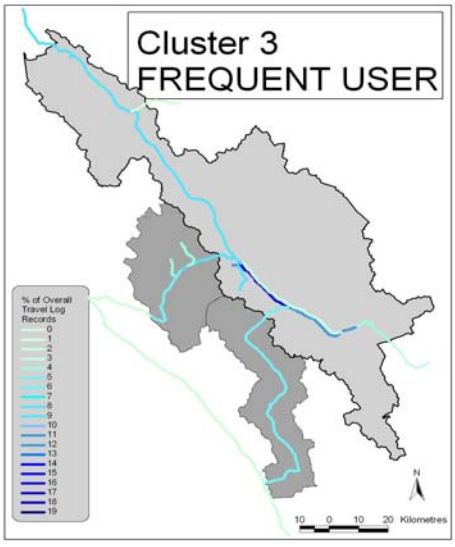
- 26% of visitors

- Patterns – activity is spread throughout the study area. Use either Banff Town or Lake Louise as a base from which to explore other areas. Favour less crowded locations

- Motives - educational and experiential

- Drivers - prefer quiet, solitude and peacefulness of natural settings. Value the opportunity to view wildlife and experience environments unchanged by humans

- Trip Influences - changing ecological or social conditions



- 27% of visitors

- Patterns – most likely to make a single pass through the study area resulting in more evenly distributed use between periphery and core. Place of origin is outside of study area.

- Motives – cost and proximity/access from home

- Drivers – personal knowledge, cost and weather. Could represent local/regional users

- Trip Influences – cost sensitive. Group most flexible in their travel plans

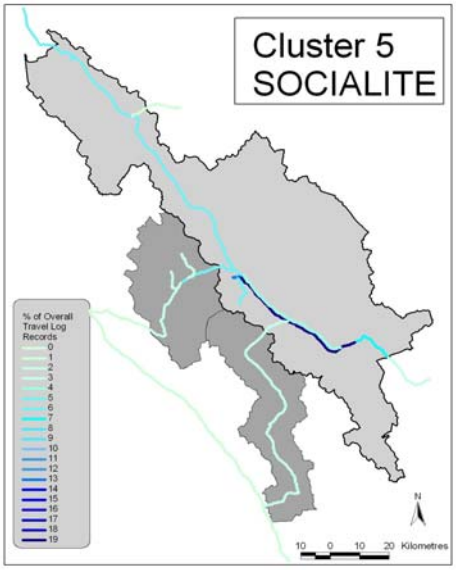
- 9% of visitors

- Patterns – most likely to visit Moraine and Emerald Lake and to travel the 1A Highway. Most likely to use off-highway services/facilities

- Motives – activity focused and motivated by exercise, challenge and desire to spend time with family/friends

- Drivers – developed trail and campsite infrastructure

- Trip Influences – availability of trail/campsite infrastructure, area/trail closures and activity of family/friends



- 20% of visitors

- Patterns – most likely to arrive through the Banff East Gate and travel the section of highway between Banff Town and Lake Louise. Outside of this core area, their use is dispersed and consistent with general visitor travel patterns

- Motives – social interaction and the desire for a mix of outdoor experiences and modern comforts

- Drivers – recommendations from family and friends, by the activity of others, by being part of a commercial tour or by accidental causes (locations lost/found by accident)

Trip Influences – activity of others

Figure 4-42. Summary of motivational and spatial cluster information.

4.4 Discussion

The results presented previously in this chapter have provided an overview of park visitors, their trips, their patterns of use, measures of the enjoyment of their experience and insights into the factors that affect their decision-making processes both pre-trip and on-site. This following section is intended to provide an opportunity to focus upon some

of the issues and potential implications of the results. This discussion addresses topics of sampling methods, spatial data quality, visitor motives and experience. General conclusions and recommendations are presented in chapter five.

Sampling Methods

There was concern at the initiation of the research that **response burden** would be high due to the time required to complete the travel log portion of the survey and that this may result in a poor response rate. Given the realized rate of return (62%) for the survey and the travel log, this concern was unwarranted. This response rate is consistent with other research where it has been suggested that it is realistic to obtain 60% response rates among professional interest groups and 55% among general population groups (Crompton and Tian-Cole, 1999). There is no valid way to determine the factors that contributed to the high response rate, although it could be speculated that the approach taken to survey design, administration and incentives may have been contributing factors. It may also be that the topic being addressed by the survey was of interest to the visitors.

The value of the research results is in a large way determined by the statistical and scientific credibility of two components; the first is the sampling methodology and the second is the survey instrument. Both of these components for this research had been vetted and tested and were determined to be credible prior to the initiation of the field work. Upon examination of the results and comparisons between the travel diary (TD) and other survey work occurring simultaneously (POVU), there were some concerns raised as to whether sampling or response biases might be impacting the accuracy of the data. The results in question related to several of the visitor profile attributes, namely:

i. ratio of visitors from USA (47% TD vs 34% USA in POVU)
ii. ratio of visitors from Canada (26% TD vs 40% Cdn in POVU)
iii. proportion of first time visitors (62% TD vs 50% 1st time in POVU)
iv. number of repeat visitors who had visited within the last 2 years (50% TD vs 66% in POVU)
v. proportion of visitors arriving via the Kootenay park gate (10% TD vs 16% POVU)

There is the potential that the differences in proportion of first time visitors, visitation history and arrival point are the result of the larger American segment of the sample.

There is also a concern that the travel diary's representation of *family groups* (15.5% of survey respondents)(10% of survey respondents for families of Canadian origin), *day use* by regional residents or visitors accommodated outside of the parks (10%) and *regional Alberta markets* (5% of travel log respondents) appears low relative to observed conditions in the field. Unfortunately these parameters were not analyzed as part of the POVU project so direct comparative empirical data is not available. Other research has been conducted, however, that does apply to the discussion. The Advisory Group (1997) undertook a study of the regional markets' (Calgary area) visitation to Banff-Lake Louise. This market study concluded that the average number of annual trips to Banff-Lake Louise, per Calgary area resident, was 2.72. The same study also concluded that over the course of the year, this market segment was least likely to travel to Banff-Lake Louise during the period between May long weekend and Labour Day weekend (1.44 mean # trips/year). This period of lower visitation coincides with the sample period of the travel diary research. Given the values provided in the Advisory Group study, there is the potential that the regional market could account for 443,000 visits (based on an estimated residential Calgary population at that time of 800,000, a visitation rate of 1.44 trips/resident, and an average group size of 2.6 persons/visit party). Given an overall visitation level of 1,800,000 (Accord Research, 2002) to Banff, Yoho and Kootenay during the same period, the regional market visits have the potential to account for 25% of the overall visitation. This is in contrast to the 5% that was presented by the travel diary study.

The actual causes of the differences between the POVU and travel diary data cannot be determined because there is no record of the place of origin for all of the visitors who received a travel diary survey. This is necessary to enable comparison of the responses and to assess and correct for any biases. There is the potential, however, that the biases may originate within the POVU data as opposed to the travel diary study. There is also the potential that the biases may be attributed in some proportion to each of the surveys.

Thus, although no specific cause or correction for the bias was undertaken, it is noted that in considering the results that are presented, the reader should recognize that there may be a potential overestimation of American and first time visitors and an underestimation of day users and the visitors from within the Alberta regional markets.

This discussion of bias raises an interesting research question concerning the situation that arises when social survey results, collected in a scientifically valid manner, are cited as accurate (within specified confidence limits) and are accepted as accurate, when they may in fact not be. It is not often the case that there are two social surveys (travel diary and patterns of use) occurring at the same time, at the same location, with the same sampling methodology and deploying similar questions that could facilitate such a comparison of datasets.

Spatial Data Quality

Analysis of the travel logs revealed concerns related to differences in the level of **detail** being provided by respondents. This is revealed in the results where, *on average*, the travel logs contained per day, only 2.5 entries and accounted for 145 minutes of activity time (despite a request to record all stops and all activities). Some logs would contain very detailed and precise information regarding travel movements and activities whereas others contained only vague information and what appeared to be sporadic entries. I believe that open-ended survey questions such as those used in the travel log are more prone to a more variable response than closed questions. The question that results from the lack of detailed data in some travel logs is whether there was missing data or simply no data to report. If the answer is the former, it would lead to the question about how representative the travel logs are of actual trips and consequently how well visitor travels and patterns are being explained by the data. These data quality findings are consistent with the conclusions of other diary based studies, where problems have included lack of reporting for short trips, poor data quality on travel, and missed data on trip times and destination locations (Stopher and Metcalf, 1996; Kalfs and Saris, 1998; Stecher, Bricka, and Goldenberg, 1996; Murakami and Wagner, 1999).

The analysis of travel route and trip segments required that several assumptions be made regarding the **sequencing** of travel log input data. Routes were identified which joined each travel log entry. This action presumed that there were no missed entries between those recorded in the log. Similarly, entries that spanned over two days were joined sequentially. This may have been done without a link to an overnight destination if that location was not recorded in the travel log.

Another concern over data quality resulted from the sampling design employed. In many instances, visitors received their travel diary survey on a day other than the first day of their trip. This has the potential to impact data quality in two ways: 1) logs may be incomplete and not representative of complete trips, and 2) visitors attempting to recall earlier phases of their trip may introduce recall biases into the data (Gartner and Hunt, 1988). The first potential impact may not have been realized as it appeared that respondents back dated their inputs to the point of entry into the study area.

Visitor Motives

To assess visitors' reasons for visiting the parks (**motives**), the travel diary provided a list of 19 response options (including an open-ended 'other' option). The list of selected options was consistent with previous survey projects in the study area to enable longitudinal assessment of changes to visitor motives. There was, however some question regarding the specific response options that were selected. Specifically, the response list was felt to be a mix of motivations and benefits and was representative of mainly passive forms of both. The resulting concern was that it may not accurately reflect the breadth of reasons that people have for visiting the study area.

Visitor Experience

A major element of the travel diary research explored was the topic of **visitor experience**. The research acknowledged the extensive body of published literature that exists on the topic of encounters, crowding and norms as they relate to recreational settings. The travel diary study aimed to contribute to this body of information by

exploring the relationship between expectations, encounters and effects on both enjoyment and experience. It was determined that while a measure of crowding is informative, it was questionable as to whether it was an effective indicator of the quality of a visitors' experience. The provision of a high quality visitor experience is the main social objective of the parks within the study area, and so it is important to have an indicator that effectively measures and reports on the achievement of this objective.

Within the study area, satisfaction had been selected as a better indicator of quality experience rather than crowding. Research by den Otter (2002) concluded that there was a tenuous link between crowding and satisfaction; despite high levels of satisfaction being reported, visitors were also reporting feeling very crowded.

Given the findings that encounters are related to crowding but that crowding was not effectively linked to satisfaction, it was questioned whether there may instead be a direct link between encounters and quality of experience. This was the focus of the travel diary research. It studied the effects of differing spatial (general and specific locations) and social (different user types) encounter situations on visitor experience and enjoyment. The research concluded that for each location or social encounter type, the responses covered the range of extremely negative to extremely positive effects on enjoyment and experience. The majority of responses in each question were, however, in the neutral category (no effect). These results raise the question of whether encounters really had no effect or whether encounters are not an important component for defining visitor enjoyment. The use of an importance-performance scale may be appropriate to answer the question of the importance of encounters for defining visitor enjoyment.

A pragmatic review of the encounter/experience data raises the question of how the results should be interpreted and what application, if any, they may have for visitor management. If a location (i.e. a frontcountry trail) has a current mean response of 3.07 (with 3 = neutral effect and 4 = increased enjoyment) on the question of effects of encounters on visitor enjoyment, the implication is that current encounters are almost at the level of negatively affecting experience. The management response to this situation

may be to undertake actions that would result in no increase to contact levels. This response, however, does not account for the possibility that more encounters may result in a further increase in enjoyment as a result of the encounters.

A caution should be noted with respect to the enjoyment analysis. Calculating and reporting a mean positive response does not suggest that there are not visitors who are dissatisfied with the current levels of encounters with other people. There is also concern that visitors unable to tolerate current levels of human activity may already have been displaced from certain locations and therefore are not represented in the survey sample.

Regardless of the limitations of the analysis, the issue of the relationship between expectations, encounters and experience is of interest and importance to park managers because it is often more effective to manage for and/or shape appropriate expectations (through communications) than to manage levels of encounter.

CHAPTER FIVE: RESEARCH CONCLUSIONS AND RECOMMENDATIONS

Overview

This research used a travel diary survey of fully independent travelers to address the need for acquiring a better understanding of visitors to Banff, Yoho and Kootenay National Parks. Specific information collected included details on visitor profiles, their reasons for visiting, their trips, their experience and their spatial patterns of use. The principal objective of the research was to determine detailed spatial patterns of visitor use. Fulfilling this objective required exploration and application of available tools associated with data collection and analysis. Spatial data for the FIT user group was gathered through a travel log. The log was part of a larger travel diary survey instrument that collected additional data on other visitor, trip and experience attributes.

An understanding of the visitor, trip, experience and spatial aspects of human activity within the study area is fundamental for understanding both existing social conditions and the nature of interactions between human activities and the natural systems that support them. Knowledge of these relationships has been shown to be important for effective park management decision-making (Parks Canada, 1994; Dunster and Dunster, 1996; Canadian Parks and Wilderness Society, 1998). My research has contributed data and information that have applied implications for both the management of the study area and for the methodological development of the travel log as an appropriate survey instrument for understanding spatial aspects of visitor use. This research, and the conclusions and recommendations drawn, support many of the policy objectives of the Parks Canada Agency. Examples of the policy objectives include an understanding of the human-environment relationship and ecosystem-based management concepts (Parks Canada, 1994), consideration of the roles that parks play in the recreational and intellectual pursuits of Canadians and other visitors (Manfredo and others, 1995; Dempsey and others, 2002) and development of the human dimension components of a generalized ecosystem model for Banff National Park (Parks Canada Agency, 2003a).

There were few published examples found of the application of a travel log approach to the collection of visitor information in high-use frontcountry settings within national parks. Because of this limited extent of reference literature upon which to draw direction, the research must be considered somewhat exploratory.

This chapter reports the key conclusions and recommendations of the research as they relate to both management of the national parks within the study area and the travel diary as a methodological approach to spatial patterns of use analysis. The reader should be aware that the conclusions and recommendations being presented are based on the analysis of data relating to only one of many park user groups; the fully independent traveler.

Conclusions

Management

What was learned about the profile of FIT visitors to Banff, Yoho and Kootenay National Parks? The FIT visitors are predominantly of USA origin, visiting for the first time, are over 35 years of age, evenly comprised of male and female, driving either a rental or owned/leased automobile and if not a first time visitor had visited numerous times over the past two years.

What was learned about the trip profiles of the FIT segment of visitors? FIT visitors most often arrive through the Banff east gate, spend three or four days in the parks; generally make 2.5 stops per day; spend about 145 minutes per day engaged in specific activities and travel an average distance of 582 kilometres within the parks during their visit. The most common activities engaged in are hiking, walking and sightseeing while the single activities occupying the greatest amount of time include rafting, hiking and horseback riding. The principal locations at which the activities are undertaken have been previously presented in section 4.3.5, so they are not summarized again here. The research findings provide guidance with respect to four elements of national park

management: 1) communications, 2) visitor experience, 3) marketing, and 4) visitor use. The important research findings that can contribute usable knowledge to park management are summarized below.

- ***Communications*** – The Banff East Gate will remain the principal point of visitor contact into the study area. If communication or orientation services are required, they should be focused at this location. The combination of being accommodated on-site or in adjacent communities, and staying for an extended period of time, provides a unique opportunity to work with commercial accommodation providers to reach park visitors with communication or interpretation messages. Given the high number of rental vehicles, a third communication opportunity may exist through partnerships with the rental agencies and vehicle outlets.

- ***Visitor Experience*** – Section 4.4 included a discussion of the travel diary results and their relationship to concepts of encounter theory. In contrast to the traditional research approach of relating levels of encounters to measures of crowding, this research explored the relationship between encounter expectations, encounter levels and encounter types directly on visitor enjoyment and experience. This approach was taken because of two beliefs: 1) that there is, at best, a tenuous link between measures of crowding and quality of experience (i.e. visitors can feel crowded while still reporting a positive visitor experience), and 2) crowding, therefore, is a poor measure of quality of experience. In response to these two beliefs this thesis investigated the linkage between various components of encounters (expectations, levels and types) and their impacts on quality of visitor experience. It further explored this encounter/experience relationship across a variety of spatial settings. The inclusion of the spatial element in the analysis is important for park management as conditions can vary widely between locations and summary data results applied generically across all locations could lead to inappropriate management responses at specific sites.

What the research concluded was that survey responses covered the range of extremely negative to extremely positive effects on enjoyment and experience, with the majority of responses being neutral. This range of responses, and a lack of management thresholds or targets for the social variables in the survey (expectations, encounters, enjoyment and effects on experience) makes interpretation and application of the results difficult. However, several conclusions can be drawn from the data. Overall, a higher percentage of visitors reported encountering more people than expected versus less than expected. For specific locations, visitors generally encountered less people than expected at day-use areas and on backcountry trails and more than expected at interpretive displays, on frontcountry trails, while driving and in townsites. When the question is extended to identify whether the levels of encounters affect enjoyment, the mean results conclude that the only locations being negatively affected by current encounter levels were in parking lots and townsites. The same question asked of 19 specific sites concluded that only Upper Lake Louise and Town of Banff had more respondents reporting negative impacts on experience than positive. This would suggest more clearly that there is an existing issue with encounter levels at these two locations.

The final component of the analysis of visitor experience data was with respect to the impacts of different user types on visitor experience. The research concluded that bus tours/large groups reduced enjoyment at pullouts, interpretive displays and picnic areas, but groups of families and cyclists (not mountain bikers) increased visitor's enjoyment. There was no way of determining from the data, which were the problematic locations.

Because the travel log portion of the survey contains date and time information for the locations visited, the encounter levels could be quantified by linking with visitor count data (i.e. traffic and trail counts). This analysis, although not undertaken for this thesis, could provide empirical data of actual use and

encounter levels and could facilitate the development of encounter thresholds and norms.

It is important to understand that a visitor's enjoyment of a particular site or activity is not determined solely from his/her expectations relative to that site or activity. The research concluded, for example, that there was a relationship between the expectations visitors had about how many people they would encounter in a parking lot and their reported enjoyment on frontcountry and backcountry trails, at interpretive displays, and in day-use areas. This relationship seems logical given that a parking lot is often the last point of departure for the locations noted above and any impacts at the parking lots may have psychological effects on the experience while at adjacent locations. Through exploration of the nature of the relationship, it may be possible to develop mechanisms that can use encounter information obtained at one location to predict social experience conditions at alternate and multiple sites.

The data comparing motive importance and achievement, supported the conclusion that Parks Canada and others are doing a good job in providing the support services and facilities necessary for the visitors to satisfy their reasons for visiting.

The study showed that only 26% of visitors reported using commercial recreational services and of these, 80% used either whitewater rafting or snocoach services. Although these low levels of participation may suggest that commercial opportunities are not important to visitors, such a conclusion assesses neither the level of demand nor the level of importance to the overall trip experience of commercial activities. Assessing both demand and importance should be done prior to any generalizations being made or decisions being made regarding the management of commercial activities.

- ***Marketing*** – Few youth/young people (12-24 years of age) and families are currently visiting the national parks within the study area. This will be the market segment that will provide the ongoing and future support for the maintenance and protection of the National Park System.

  It appears from the length of stay information that the Banff, Yoho and Kootenay National Parks study area functions as a tourism destination. This clarifies the areas' position and role within the regional, national and international marketplace and can provide direction for Parks Canada and stakeholder marketing efforts. Within this large destination, the role of the Hamlet of Lake Louise is less clear as to whether it functions as another destination or as a hub.

  There is potential latent demand for park use from the group of visitors who have visited parks previously, but prior to the last two years (50% of non first time visitors). There is a large group of visitors who have used the parks multiple times (+3) over the last two years. Although not confirmed, this likely represents the regional user markets that, because of close proximity, are likely to use the parks more frequently than destination or long-haul visitors.

- ***Patterns of Use*** – The research concluded that 10% of the respondents reported using the study area on a day-use only basis. This level of use for this segment has the most potential to change over time and should be validated and monitored.

  Only 8.3% of the traffic stream was recreational vehicles. Although they contribute disproportionately to issues of congestion and crowding on roadways and in parking lots, which may be the focus of traffic management actions, the survey results suggest that they are only a small component of the overall volume of vehicle traffic in the study area.

The data that visitors travel an average distance of 582 kilometres within the parks during their stay and make on average 2.5 stops per day may suggest that driving is a major recreational activity for visitors to the study area.

The results of the activity based analysis concluded that the Bow Valley Parkway was most important for wildlife watching and hiking and walking were the dominant activities in Upper Lake Louise.

Methodological

The methods used in this research involved four elements: 1) survey design, 2) survey distribution 3) data management, and 4) data analysis. Key conclusions related to each of these elements are presented below.

- ***Survey Design*** – If response rate is an appropriate measure of survey design success, then the use of a pencil and paper open-ended coil-bound travel diary/log, coupled with self-addressed and stamped return envelopes and an incentive for completion was a successful survey instrument. The high response rate may also suggest a general endorsement of the use of a travel log for the collection of spatial and temporal visitor use information.

  The maps included with the travel log may have had some utility to the respondents in their entry of diary information, but as a method for recording visitor movements it was both poorly responded to and very difficult to analyze.

  There is a requirement that social research undertaken in national parks be able to provide the survey instrument in both official languages. This need was accommodated by having the travel diary translated into French. During the distribution of the survey, no requests, however, were made for the French version.

- ***Survey Administration*** - The data presented in this research is intended to represent the fully independent traveler (FIT) only. Information on tourists traveling as part of a group tour, visitors arriving by commercial carriers (i.e. bus and train) or residents within the parks was not included in the sampling frame and is not represented in the results of the travel diary study. Even for the component studied, data were collected for only one visitor season in one year. For an element as dynamic as visitor use, this is problematic. Use data collected over a single year may not be representative (of average conditions, of a trend etc.) due to a variety of confounding variables (i.e. weather, economics, changing demands, marketing, global events, safety, health etc.).

  The sample size of responses provided acceptable confidence levels for aggregate level analyses, but was too small to allow for any statistically valid segmentation (i.e. by visitor origin, by point of entry etc.). This was most problematic in not being able to segment the summer visitors from the fall visitors. Had the initial sampling distribution target of 1015 surveys (versus the realized number of 418) been met, additional confidence would have been achieved and further segmentation possible.

  Previous discussion has alerted the reader to the concern over potential sampling and/or response bias in the data. Not being able to detect for and mitigate response bias presented a problem in assessing the representivity of some of the results. Unfortunately, any bias of the input data perpetuates through the analysis and reporting of results. While the study results related to visitor and trip profiles generally endorsed the findings of other social science research, done for the study area, there were some concerns (noted in section 4.4) related to visitor origin, American and first time visitors.

- ***Data Management*** – The use of a relational database structure and a visual interface form for data entry both proved to be acceptable approaches. This form of manual data entry was, however, very labour intensive and while manageable

given the sample size for this research, would be difficult to sustain with a large research project. Most of the data entry time was incurred in the input of the travel log data.

- ***Data Analysis*** - The literature review identified several approaches to data analysis that were being used in areas of tourism, transportation planning, environmental modeling and geography. Specific analytical approaches included pattern recognition algorithms and geovisualization in geography (Kwan, 2002), activity-based demand modeling in transportation planning (Keuleers et al., 2001; Wen and Koppelman, 2000; Pendyala and Goulias, 2002), itinerary-based and discrete choice modeling, route building algorithms, and network analysis in tourism (Lew and McKercher, 2002; Gartner and Hunt, Forer, 2002; Mings and McHugh, 1992; Vaillancourt, 1991; van der Knaap, 1999, Wasserman and Faust, 1994), pattern recognition using multivariate analysis and frequency mapping (Ma and Goulias, 1997; Accord Research, 2002; Wistowsky, 1998; Kelly and Wright, 1997), and regression and simulation modeling (Cole, 2002; Wang and Manning, 1999; Lawson et al, 2002; Itami, Raulings, MacLaren, Hirst, Gimblett, Zanon; Chladek, 2002; Kebel, Klupfel, Meyer-Konig, and Schreckenberg, 2002).

  The main concern with the extension of several of these approaches to this research related to how they were perceived to relate to the analysis of holiday oriented travel. In transportation research, travel is perceived as a mechanism which moves individuals or families to locations at which activities are undertaken. Transportation research also uses the scheduling of activities as the driver of travel patterns and suggests that these activities are subject to a number of different constraints (i.e. opening/closing times, school/work start times, appointment times etc.). It seems there may be five key differences with respect to holiday travel. First, the travel itself may be one of the principle activities undertaken during a holiday. Secondly, people on holidays may tend to avoid encumbering themselves with schedules. As a result, travel patterns are likely driven more by the goal of fulfilling basic needs (i.e. food, shelter, washrooms,

fuel), by unpredictable variables (i.e. weather) and by knowledge variables (of site attractions, routes etc.) than by schedules. Thirdly, activities undertaken may be a derivative of driving and not a motivator (i.e. wildlife watching may occur as a result of driving and not as a reason for driving). A fourth difference relates to the objective of transportation planning to find patterns (rigidities) in the daily scheduling of travel. This is an appropriate research question considering the intent of predicting urban travel demand. For holiday travel however, because of the diversity of motives and directions already identified, there are likely few patterns that develop over the short duration of a holiday trip. Finally, the scheduling challenges for recreational travel are likely not as complex as normal daily travel because the visitor group is potentially more cohesive, has fewer competing objectives and fewer time constraints than normal households. Given these differences, it seems that a direct application of transportation planning methodologies to holiday travel research may be questioned.

Tourism approaches to travel itinerary research and analysis have limited direct application because of scale and objectives issues. For most tourism organizations, the interest in travel relates to understanding overall travel patterns of a regional, national or international scale. The tourism sector seeks this knowledge to better understand market conditions (i.e. clustering of experiences, attractions and activities; benefits; promotion etc.). Thus a shared tourism and travel interest may relate to the market position of Banff National Park relative to other national or international locations as opposed to visitor movements within this destination area.

This research advanced three approaches to data analysis. The first approach assessed visitor use information against activities. Visitors were conscientious about reporting an activity for each of the stops made in the study area. There was general consistency in the activity names that were used, however, there was a concern given the low number of stops recorded per day, that visitors may have had different views on what constituted an activity and therefore what should be

entered into the log. For example, one visitor may report eating and shopping as activities whereas another may only report recreational activities, etc. This disparity may have been partially due to a lack of clear and comprehensive directions for completion of the travel log. The second approach to data analysis used route and trip segments to assess visitor use. This approach relied on the reporting of frequency information for aggregate visitor use and concluded that the portion of Highway # 1 from Banff to Lake Louise was the most heavily used route segment in the study area. An attempt was made, based upon frequency information, to assess the spatial nature of day use trips. The data allowed for the identification of the route and sequence information for individual trips, but with only ten trips in the sample, few conclusions could be made about what a 'typical' day trip would be. The third approach linked cluster analysis of motivation and decision–making variables to spatial route/trip segments information. Visual interpretation of the resulting spatial clusters of visitor movements allowed for the identification and naming of generalized patterns of visitor use.

Other approaches were not selected for a variety of reasons. Transportation planning research seemed to operate at a finer resolution and did not seem to adequately capture holiday oriented travel activities. Tourism research operated at a courser resolution and its direct utility for detecting spatial travel patterns at a single destination was not obvious.

Although multivariate analysis using behavioural attributes is fairly common within the tourism and recreational literature, few studies have extended the relationship to incorporate the spatial dimension. The travel diary's linkage of spatial and behavioural data was a positive contribution to research into methods to define patterns of visitor use.

Although the research confirmed that multivariate statistics and use of behavioural (motives and decision making) attributes to derive spatial clusters was an appropriate analytical technique, there is some question as to whether

these attributes are key, or the best, drivers of visitor activity. Is visitor use behaviour driven (i.e. motives or decision making knowledge, marketing, signage, information etc.), or is it driven by environmental variables (i.e. weather), or is it driven by trip duration (i.e. available time), or is it driven by cost, by some demographic variable (i.e. age) or by something else?

There was also some concern raised with the analysis that linked visitor activities to locations, because for most activities (i.e. hiking) there are multiple locations available to supply the activity needs. To link a visitor's motivation to go hiking to a particular travel movement or selection of stop location may be tenuous (their hiking activity may not determine their choice of a particular stop location). Alternatively, there may be specific hiking attributes that they are looking for (i.e. access to alpine, short strolls) etc. that may be able to be linked to a particular spatial location and which may determine their movements and stop location.

The advantage of the spatial approach and of the data provided by the travel log is that both outputs contribute to an understanding of the dynamic element of visitor use. While this may be partially possible with static traffic data (i.e. traffic counters), the latter output would provide no insights into the route sequencing and timing of individual users.

The research collected two forms of temporal information: departure time (for tracking movement between stops) and activity duration (for understanding activity importance). Only the activity duration data was analyzed and reported in the results section. The travel diary's temporal movement data would be useful for the development of simulation models and for understanding and addressing certain park management issues (i.e. traffic and parking congestion) (Kalton, 1990).

There were concerns regarding the level of detailed travel information that was provided by many respondents (i.e. only identifying 2.5 stops per day and 145

minutes of time spent engaged in activities). This may be attributed to the lack of instructions provided in the survey regarding the type and detail of information being requested in the travel log.

Recommendations

The recommendations presented in this section flow from the results of the data analysis, and the previous discussion and conclusions. Most of the management related recommendations are directed to Parks Canada for implementation.

Management

- ***Communications*** – *Emphasize the use of the Banff East Gate for providing visitor information*, especially information focusing on orientation and trip planning. *Work with commercial accommodation providers* within the parks and in adjacent communities, and vehicle rental agencies to assist with delivery of communication messages to park visitors. Ensure that *accurate, timely and appropriate information* is being included in Parks Canada brochures, in travel books produced by others and on highway signage as all of these sources of information were important to visitors making decisions with regard to where to travel while in the parks. Because most information of importance to trip decision making is used while on-site, there may be the potential to *re-evaluate the role and contents of pre-trip planning mail-outs*.

- ***Marketing*** – Parks Canada should focus its marketing efforts on *increasing the use of the parks by young people and family groups (especially Canadians)*. This will be the market segment that will provide the ongoing and future support for the maintenance and protection of the National Park System. Efforts should be made to ensure that the study area maintains its function as a *tourism destination*. *Regional population growth should be tracked* to better understand and predict the dynamics and consequences of this important market segment on visitor activity in the parks. If a social objective is to increase park visitation, there is

latent capacity within the segment of users who have visited parks prior to the last two years.

- ***Patterns of Use*** – *Traffic counts and partition studies* should be undertaken to verify the survey results regarding vehicle composition (i.e. especially the composition of traffic stream that is oversize vehicles/RV's). Existing levels of *day-use activity* should be confirmed and monitored for change.

- ***Experience*** – Parks Canada is doing a good job of providing the support services and facilities necessary to allow visitors a high level of achievement related to their reasons for visiting. For the two principal motives cited (viewing scenery and wildlife), there is little direct management involvement by Parks Canada. However, providing opportunities such as pull-outs at scenic vistas and viewpoints obviously is important. Parks should ensure that it *monitors the reasons people have for visiting* so that it can respond to changing service and facility needs. The research has profiled the importance of driving as an activity within the study area. Parks should ensure that this activity is supported by providing basic and essential highway services (i.e. washrooms, pull-outs etc.) along highway corridors.

  The thesis makes the following recommendations to address issues of expectations and encounters: 1) *establish management targets* for appropriate expectations, encounter levels, and effects on experience, 2) use traffic and trail counter data and temporal diary information to *establish empirical thresholds* for encounter levels, 3) ensure that visitors have *appropriate expectations* regarding encounter levels in the Town of Banff and in parking lots, 4) *minimize the negative impacts* on enjoyment resulting from high encounter levels in the Town of Banff, in parking lots, at Upper Lake Louise and with bus tours/large groups at pullouts, interpretive displays and picnic areas, 4) recognize that quality of experience reported at one site is often affected by the experience encountered at other sites, and 5) realize that there will always be a range of responses to survey

questions about the impacts of levels of encounters on visitor enjoyment or experience. Park managers may want to provide for a *range of encounter levels* that consider the needs of visitors who may already have been displaced due to unacceptable levels of encounters.

Methodological

- ***Survey Design –*** One survey design that could be considered would be a *printable on-line version* that people access during pre-trip travel planning or while on-site through computer access from Visitor Reception Centres, hotel/motel rooms, internet cafes etc. Regardless of the design selected, *clear instructions* should be provided for completion of the travel log. These instructions should include the types, details and examples of the information to be included. At a minimum, a survey should *represent a closed trip* (from study area entrance to exit), should *include overnight locations* and should identify *driving as an activity*.

  A single map should be included with the log as a reference for respondents. The use of maps to record itineraries may be utilized for some applications (i.e. trail use information) or through the use of different technologies (i.e. computer based surveys), but should not be undertaken in a pencil and paper format for highway-based travel. If language were to become a barrier to survey completion, translation into multiple languages may be justified.

  It is critical to *determine the importance of the spatial and temporal information and the mechanism for analysis and reporting before committing to a travel log approach* to data collection. If this detailed movement information is not critically important, traditional social surveys should be used. Eliminating the use of a travel log would minimize both response burden and data entry/processing costs.

- ***Survey Administration –*** Other approaches to survey administration should be considered that achieve sampling objectives for sample size, representivity and segmentation. This would include, at a minimum, *larger sample sizes* that would

allow segmentation of park users, and between group measures. Information on the *regional market, day-users, and families* should be targeted through the development and implementation of specific sampling designs. A *stratified sampling program* may need to be considered to ensure that these populations of users are adequately sampled. This could be accomplished through the use of *screening questions* in the interview phase of survey distribution.

An approach that results in the respondent *receiving their survey prior to, or upon entry into, the study area* would be preferred. This could be accomplished through interviews, on-line surveys, surveys distributed with pass sales or with parks brochures. Surveys should be administered over *multiple years* to accommodate longitudinal analyses and within year variations in visitation.

One specific option for survey administration would be to ask visitors to keep a *very detailed accounting of their activities and movements, but only for a portion of their trip*. With ~ 60% of trips being four or less days, visitors may be willing to keep more detailed records for that length of time. Ettema, Timmermans, and van Vehel (1996) conclude that trip reporting fatigue sets in after two days. A caution with the proposed approach is that without multiple days of data, the day-to-day variability of activity and travel behaviour cannot be understood (Pendyala and Pas, 1997). Consideration must be given to the potential trade-off between survey detail and response rate. There is the potential for *technology* to facilitate this need for more detailed data through the use of location-based services (i.e. GPS equipment for automated locational data collection (Center of Spatially Integrated Social Science, 2001) and computer assisted surveying (Murakami and Wagner, 1999).

- ***Data Management –*** Data entry should be *automated*. Access should continue to be used as the database structure for data entry, storage and retrieval.

- ***Data Analysis -*** Continue exploring the applicability of *network analysis, route building and pattern recognition algorithms and simulation modeling* as approaches to data analysis. Survey results should be *weighted* to the population of visitors so that absolute visitor numbers can be reported.

  Existing *traffic counter information should be correlated with the travel diary data.* This would allow the static counters to both serve as proxy measure of visitor travel patterns and as an index of crowding once the relationship between diary encounter and traffic volume levels is established.

  Ultimately, survey design and data analysis need to be driven by a *clear set of research questions*. While the objectives of the travel diary research were stated, they lacked sufficient detail to provide clear direction on the selection of survey methodology and analysis. When this detail is not provided, the researcher is forced to determine what analysis is important and relevant. The advantage of most social science research is that the datasets are usually comprehensive and robust and allow for considerable data mining as other research questions are asked.

Further Research

Several research topics and data analyses were identified in the thesis that would enhance both the understanding of the travel diary results as they relate to the study area and to the use of travel diaries as a methodological tool to understanding general patterns of visitor use. These topics are summarized below for the benefit of those who may desire to advance this area of research:

Survey Methodology – evaluate other approaches to survey design and administration (i.e. differing survey instructions, shortening period of data collection, printable on-line surveys, location based services [GPS] and computer assisted surveying as alternatives to paper-and-pencil survey instruments).

Sampling Frame – extend sample to include other park user groups (group tours and residents), undertake across multiple-years and achieve larger sample sizes.

Temporal Analysis – develop techniques for analyzing and presenting temporal data.

Motivations – evaluate trip motivations through the use of open-ended questioning techniques. Continue exploration of leisure and travel oriented motivations.

Encounter Theory – assess the importance of encounters as a component of quality of experience. Develop techniques for linking static visitor count data with survey encounter information – thereby developing emperical encounter thresholds and norms. Continue to explore the relationship between encounter expectations at one location and effects on enjoyment/experience at other locations.

Commercial Activity – explore the demand and value of commercial activities to trip experience.

Marketing – investigate whether the reasons why there are so few youth/young people represented in the survey sample was due to limitations in the sampling frame of the thesis or is in-fact representative of a genuine lack of park participation by these demographic groups. Undertake research to understand how the tourism industry markets the parks and what that means for visitor expectations and activities.

Day Use – confirm the relative contribution of day use to overall park visitation and analyze the spatial and temporal patterns of existing day use activity.

Holiday Travel – explore the concept of 'holiday' oriented travel and assess its relationships to 'recreation' and 'leisure' travel.

Data Analysis – evaluate network, route building and pattern recognition algorithms, geovisualization and simulation modeling as alternative methods for the analysis of spatial travel data.

Drivers of Visitor Activity – continue to explore the drivers of patterns of visitor use (beyond motive and decision making variables).

The travel diary was a successful research initiative that has the capability of answering the five "W's" of human activity (who is going, where are they going, when are they going, why are they going, and what they are doing while they are there).

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Appendix A - Travel Diary Questionnaire

Banff, Yoho, and Kootenay National Parks
Travel Diary Study

Parks Canada Parcs Canada

Canada

Dear Banff, Yoho, Kootenay National Park Visitor!

The Travel Diary Study is a project being conducted cooperatively by Parks Canada and the University of Calgary. We are interested in understanding where you go, why you go there, what you do while you are there and the kind of experience that you have. **This kind of detailed information is critical for Parks Canada to be able to continue providing you with a quality visitor opportunity**. You **do not need any special knowledge** to complete this questionnaire – we are just interested in learning about your current visit. As it is important to survey a cross section of visitors, we ask that the person in your group who is at least 16 years of age and is having the next birthday complete this survey.

Completing the survey is voluntary, and your answers will be treated in accordance with the Access to Information and Privacy Acts. You can withdraw from completing the survey or refuse to answer specific questions at any time.

The attached survey consists of general questions and a travel diary. We recognize that the diary approach is new and will require an ongoing commitment from you during your visit. **We emphasize the importance of this information in the hope that you will agree to complete all components of the survey**. As an added **incentive** for completing the survey, you may enter your name in a draw to win one of three prize packages each containing a fleece vest and a beautiful photographic book of these National Parks. In addition, if requested, we would be happy to provide you with a copy of the diary portion of your survey.

If you have additional comments or questions, feel free to call Derek Petersen at (250) 343-6324.

Sincerely, Francais au verso

Derek Petersen, Dip. Ren.Res., B.E.S., M.Sc candidate
Survey Coordinator Parks Canada/University of Calgary (Faculty of Resources & the Environment)

If you have any questions or issues concerning this project that are not related to the specifics of the research, you may also contact the Research Services Office at (403) 220-3782 and ask for Mrs. Patricia Evans.

About This Trip

*** Throughout the survey, Yoho, Kootenay and Banff National Parks will be referred to as "these Parks" ** Please use the pen supplied to shade in the circles representing your answers.*

If you were given this survey as part of a highway stop, please proceed directly to question # 6

1. Through which park did you **enter** on this visit?

❍ Banff via Hwy # 1 ❍ Banff via Rocky Mtn. House (Hwy # 11) ❍ Kootenay ❍ Jasper ❍ Yoho

2. What type of **vehicle** did you arrive in? (check one)

❍ automobile/van ❍ truck ❍ RV/motorhome ❍ motorcycle
❍ truck camper ❍ bus ❍ bicycle ❍ other

_____

3. Is your vehicle **towing** anything?

❍ nothing ❍ tent trailer ❍ travel trailer ❍ horse trailer
❍ utility trailer ❍ boat ❍ second vehicle ❍ other

_____

4. Does this **vehicle belong** to anyone in the group, or was it rented for this trip?

❍ rented ❍ owned or lease (long term) ❍ other

_____

5. On **which day** of your trip to these Parks did you receive this survey? (please provide the number – i.e. 1st, 2nd, 3rd etc.) _____

6. For the Park that you are currently in, was this your **first visit** to this Park?

❍Yes (skip to question 7)

❍ No (see below)
IF NO: How many times did you visit in 1998 and 1999 (combined, excluding this year)?

❍ None ❍ 1 ❍ 2 ❍ 3-5 ❍ 6+

7. **During this visit**, did you spend any **nights** in these Parks?

❍ No, day use only (skip to question 8)

❍ Yes, I spent one or more nights in these Parks (see below)
IF YES, please indicate the number of nights.

❍ 1 ❍ 2 ❍ 3 ❍ 4-6 ❍ 7-13 ❍ 14+ nights

❍ No, stayed outside these Parks (see below)

7b. If you stayed outside these Parks, did you stay overnight within 80km/50 miles?

❍ No

❍ Yes (see below)
If Yes, how many nights did you spend in each of the following locations?

Canmore, Alberta _____
Radium Hot Springs, British Columbia _____
Golden, British Columbia _____
Other (please specify) _____

8. Did you participate in any recreational activity with a **commercial** company, paid guide or leader?
❍ No

❍ Yes (see below)
If yes, please shade all that apply
❍ fishing ❍ mountaineering ❍ guided hike ❍ horseback riding
❍ multi-day bus trip ❍ nature study ❍ single day bus trip/sightseeing tour
❍ canoeing/kayaking ❍ other (please specify) _____

The next section of the survey involves the completion of a travel diary. Following the diary, there is a final series of questions that relate to the experiences that you had during your visit.

Your Travels

We would like to understand the details of your travels through these Parks. On the maps provided on the next pages, we ask that you provide the following information:

- use a line with arrows to mark the route and direction of your travel in the Parks (see example on next page)
- put an x at each of the places that you stop
- for each of the stops that you make which are longer than 15 minutes, please provide an entry in the diary travel log in this survey. For convenience, we ask that you make the log entry just before departing from each location (see example below). Please place any comments that you wish in the comment section.

Example:

DATE	STOP DETAILS				COMMENTS
	Departure Time	Location	Activity	Time Spent At Stop (minutes)	

Please begin entering information in the survey as soon as you receive it.

Example of map entry

Diary Travel Log

DATE	STOP DETAILS				COMMENTS
	Departure Time	Location	Activity	Time Spent At Stop (minutes)	

About Your Experience

9. How did your** encounters with other people **affect your visit at each of the following locations? Please indicate how the number of other people you encountered compared to your expectations and the extent to which these encounters affected your enjoyment.

	N/A	Compared to What I expected, I saw:			Greatly increased my enjoyment				Greatly reduced my enjoyment
		More	Same	Less					
Example	○	○		○	①	②		④	⑤
In parking lots (outside of Banff and Lake Louise townsites)	○	○	○	○	①	②	③	④	⑤
At interpretive displays/exhibits	○	○	○	○	①	②	③	④	⑤
On the trails near the parking areas	○	○	○	○	①	②	③	④	⑤
On backcountry trails (>1km from parking areas)	○	○	○	○	①	②	③	④	⑤
While driving	○	○	○	○	①	②	③	④	⑤
In townsites	○	○	○	○	①	②	③	④	⑤

At day use areas/picnic sites/pullouts	○	○	○	○	①	②	③	④	⑤

***10. Please indicate how the number of other visitors affected your experience at the** following specific locations:*

Banff	Did Not Visit		Positively affected my experience				Negatively affected my experience
Lake Minnewanka	○	or	①	②	③	④	⑤
Cascade Valley	○	or	①	②	③	④	⑤
Banff townsite	○	or	①	②	③	④	⑤
Spray Valley	○	or	①	②	③	④	⑤
Johnston Canyon	○	or	①	②	③	④	⑤
Lake Louise townsite	○	or	①	②	③	④	⑤
Lake Louise	○	or	①	②	③	④	⑤
Moraine Lake	○	or	①	②	③	④	⑤
Larch Valley	○	or	①	②	③	④	⑤
Skoki Valley	○	or	①	②	③	④	⑤
Yoho							
Emerald Lake	○	or	①	②	③	④	⑤
Takakkaw Falls	○	or	①	②	③	④	⑤
Yoho Valley	○	or	①	②	③	④	⑤
Lake O'Hara Valley	○	or	①	②	③	④	⑤
Kootenay							
Marble Canyon	○	or	①	②	③	④	⑤
Paint Pots	○	or	①	②	③	④	⑤
Radium Hot Springs Pool	○	or	①	②	③	④	⑤
Icefields Parkway							
Bow Lake	○	or	①	②	③	④	⑤
Peyto Lake	○	or	①	②	③	④	⑤

11. How did the presence of** different types of users **affect your enjoyment of these parks?

AT PULLOUTS/INTERPRETIVE DISPLAYS/PICNIC AREAS

	N/A		Greatly increased my enjoyment				Greatly reduced my enjoyment
Bus tours/large groups	○	or	①	②	③	④	⑤
Other groups (please specify) _____	○	or	①	②	③	④	⑤

ON TRAILS

Large groups	○	or	①	②	③	④	⑤
Mountain bikers	○	or	①	②	③	④	⑤
Horse riders	○	or	①	②	③	④	⑤
Hikers with dogs	○	or	①	②	③	④	⑤
Others (please specify)							

_____ ○ or ① ② ③ ④ ⑤

This section relates to management options for these Parks.

12. As visitation increases to these Parks, there may be a need to introduce *changes to the way recreational opportunities are managed****. How do you feel about the following?***

	Strongly Oppose				Strongly Support	
➢ when necessary to protect plant and animal species, visitor access into some areas should be limited	①	②	③	④	⑤	
➢ access within the parks should ensure opportunities to enjoy the area while reducing congestion	①	②	③	④	⑤	
➢ establish quota on # of vehicles entering the parks	①	②	③	④	⑤	
➢ place a quota on # of people entering the parks	①	②	③	④	⑤	
➢ establish quotas on amount of day use in the parks	①	②	③	④	⑤	
➢ allow access through public transportation only	①	②	③	④	⑤	
➢ use voluntary closures/restrictions	①	②	③	④	⑤	
➢ increases in the amount of parking spaces to accommodate demand in congested areas	①	②	③	④	⑤	
➢ separate different activities to reduce conflicts		①	②	③	④	⑤
➢ restrict the length of stay at day use sites		①	②	③	④	⑤
➢ use fee increases as a method of managing use	①	②	③	④	⑤	
➢ use of permanent closures of particular areas		①	②	③	④	⑤
➢ place limits on the types of activities that are allowed in certain areas	①	②	③	④	⑤	
➢ the travelling speed on Hwy #1 should be reduced	①	②	③	④	⑤	

suggestions:

_____

13. Did you encounter any *human use management actions* ***that affected your trip to these Parks (i.e. trail or area closures, quotas on use numbers, activity restrictions, timing restrictions etc.)?*** ***○ yes*** ***○ no***

13b. If yes, please describe type and location:

_____
_____
_____

13c. How well did you understand the reasons for the actions you described in question13b?

○ very poorly ○ poorly ○ somewhat ○ good ○ excellent

14. One job of Parks Canada is to protect natural resources, such as water and vegetation, from misuse, overuse or activities that may damage the natural conditions of these resources. Overall how would you rate *Parks Canada's current performance****?***

○ very poor ○ poor ○ fair ○ good ○ excellent

Motivations

15. Each visitor has different** reasons for visiting **National Parks.
In** PART A**, indicate how important each of the following items were as reasons for your current visit?
In** PART B**, answer to what extent were you able to achieve the following items from your visit by writing the percentage of achievement from 0-100%.

	PART A					***PART B***
	Not at all Important.....				Very Important	Percentage Achievement (0 – 100%)
Example	①	❷	③	④	⑤	35%
take part in my preferred activity	①	②	③	④	⑤	
be in a peaceful, quiet setting	①	②	③	④	⑤	
developed trails and campsites	①	②	③	④	⑤	
learn about Canada's natural heritage	①	②	③	④	⑤	
reasonable cost	①	②	③	④	⑤	
close to where I live	①	②	③	④	⑤	
easy access to the area	①	②	③	④	⑤	
spend time with friends and/or family	①	②	③	④	⑤	
view scenery	①	②	③	④	⑤	
exercise	①	②	③	④	⑤	
rest and relax	①	②	③	④	⑤	
do something challenging	①	②	③	④	⑤	
meet other people who share my interests	①	②	③	④	⑤	
get away from crowds of people	①	②	③	④	⑤	
view wildlife in a natural setting	①	②	③	④	⑤	
experience solitude	①	②	③	④	⑤	
see an environment unchanged by humans	①	②	③	④	⑤	
mix outdoor experiences & modern comforts	①	②	③	④	⑤	
good quality shopping, hotels, & restaurants	①	②	③	④	⑤	
other: _____	①	②	③	④	⑤	

Decision Process

16. Please indicate the level of importance of the following factors or sources of information in deciding where you went in these Parks. Also indicate whether the item was more important prior to your arrival or during your visit.

	Very Important.....				Not At All Important	Before Arrival	On-site
Personal knowledge	①	②	③	④	⑤	○	○
Recommendation from family/friend	①	②	③	④	⑤	○	○
Recommendation from Parks staff	①	②	③	④	⑤	○	○
Recommendation from travel/guide book	①	②	③	④	⑤	○	○
Parks Canada brochure/publication/map	①	②	③	④	⑤	○	○
Highway Signage	①	②	③	④	⑤	○	○
Internet	①	②	③	④	⑤	○	○

Part of commercial tour	①	②	③	④	⑤	○	○
Cost	①	②	③	④	⑤	○	○
Activity of others	①	②	③	④	⑤	○	○
Allowable activities	①	②	③	④	⑤	○	○
Level/type of services	①	②	③	④	⑤	○	○
Level/type of facilities	①	②	③	④	⑤	○	○
Lost/found by accident	①	②	③	④	⑤	○	○
Available time	①	②	③	④	⑤	○	○
Weather	①	②	③	④	⑤	○	○

About You and/or Your Group

17. *Please tell us about yourself and your travelling group. List the year of birth, sex, and place of residence of each person in your travelling group. Include the* ***first three characters of their Postal Code*** *for Canadian residents, the* ***Zip Code*** *for American residents or* ***country*** *for residents of other countries.*

Person	**Year of Birth**	**Sex**	**FOR CANADIAN RESIDENTS: 1st 3 Postal Code characters**		**FOR USA RESIDENTS: Zip Code**	**FOR ALL OTHERS: Country of Residence**
Yourself	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 2	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 3	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 4	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 5	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 6	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 7	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____
Person 8	_____	❍F ❍M	____ ____ ____	or→	_____	or→ _____

Are there more than 8 members in your group? ❍ no ❍ yes if yes, how many more __

18. What is the main **purpose** of this trip? (check one)
❍ pleasure ❍ business ❍ combination

Comments

19. If you have any** comments **that you would like to bring to the attention of Parks Canada, please include these in the box below.

_____

_____

_____

_____

_____

_____

_____

_____

We thank-you for your participation in this survey. If, for your reference, you would like a copy of the travel log portion of this survey, please indicate this on the prize draw entry form.

We would appreciate** you completing the survey before you leave **and return it, in the envelope provided, to the nearest parks Canada Visitor reception centre (Banff, Lake Louise and Jasper townsites). If you prefer to complete the survey off-site, please return it before October 15, 2000 using the enclosed stamped, self addressed envelope.

APPENDIX B: Example of network analysis database

	Banff Town & Area	Banff Back-country	Icefields Parkway Other	Bow Lake & Summit	Columbia Icefields	Saskatchewan Crossing
Banff Town & Area	198	7	49	30	58	19
Banff Backcountry	7	7	3	1	1	1
Icefields Parkway Other	49	3	78	21	29	9
Bow Lake & Summit	30	1	21	37	13	4
Columbia Icefields	58	1	29	13	71	9
Saskatchewan Crossing	19	1	9	4	9	21
Bow Valley Parkway Other	46	2	12	8	21	3
Johnston Canyon	57	2	24	13	24	5
Lk Minnewanka Area	63	2	21	9	23	8
Lake Louise	127	6	45	23	50	15
Upper Lake Louise Area	31	2	13	7	16	3
Moraine Lake & Area	90	4	41	22	42	11

Appendix C: Chi-square values for cross tabulation of expectation effects on experience

Chi-square Output of Expectations versus Enjoyment - by location

EXPECTATION LOCATION	ENJOYMENT LOCATION	CHI-SQUARE VALUE
In parking lots	in parking lots	113.51
In parking lots	at interpretive displays/exhibits	22.23
In parking lots	frontcountry trails	28.83
In parking lots	backcountry trails	14.26
In parking lots	while driving	29.92
In parking lots	in townsites	6.34
In parking lots	day-use areas	29.63
at interpretive displays/exhibits	in parking lots	14.85
at interpretive displays/exhibits	at interpretive displays/exhibits	84.89
at interpretive displays/exhibits	frontcountry trails	4.56
at interpretive displays/exhibits	backcountry trails	19.94
at interpretive displays/exhibits	while driving	18.07
at interpretive displays/exhibits	in townsites	17.80
at interpretive displays/exhibits	day-use areas	9.08
frontcountry trails	in parking lots	50.10
frontcountry trails	at interpretive displays/exhibits	17.03
frontcountry trails	frontcountry trails	107.57
frontcountry trails	backcountry trails	17.80
frontcountry trails	while driving	25.82
frontcountry trails	in townsites	10.36
frontcountry trails	day-use areas	39.33
backcountry trails	in parking lots	15.78
backcountry trails	at interpretive displays/exhibits	16.20
backcountry trails	frontcountry trails	22.83
backcountry trails	backcountry trails	42.74
backcountry trails	while driving	10.66
backcountry trails	in townsites	16.97
backcountry trails	day-use areas	10.55
while driving	in parking lots	27.27
while driving	at interpretive displays/exhibits	16.06
while driving	frontcountry trails	20.38
while driving	backcountry trails	11.57
while driving	while driving	105.49
while driving	in townsites	29.74
while driving	day-use areas	29.34

In townsites	in parking lots	18.45
In townsites	at interpretive displays/exhibits	14.86
In townsites	frontcountry trails	10.26
In townsites	backcountry trails	6.51
In townsites	while driving	12.10
In townsites	in townsites	57.58
In townsites	day-use areas	13.47
day-use areas	in parking lots	42.91
day-use areas	at interpretive displays/exhibits	17.78
day-use areas	frontcountry trails	31.13
day-use areas	backcountry trails	12.45
day-use areas	while driving	51.03
day-use areas	in townsites	18.40
day-use areas	day-use areas	119.59