Linking Information and Decision Making in Canadian National Parks

by

Kim Margaret Karen Lemky

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I dedicate this thesis to Archie and Savannah.

Abstract

This thesis explores the linkages between data, decision makers and decision-making processes to explain how decisions are made in the Parks Canada Agency (PCA) with respect to visitor management. The adaptive interactive approach was used to evaluate this relationship. Initially the literature was reviewed to evaluate hiking trail assessment techniques. Several techniques were applied on-site in Cape Breton Highlands National Park to inventory and evaluate trail structures and impacts on the hiking trail system. Four products resulted which were expected to assist trail management. However, participant observation at trail team meetings suggested that they were not as fully incorporated into trail management as they could have been. This resulted in a new direction of research and the question: *How are data and information incorporated into the decision-making process in PCA?*

To answer this question, four steps were taken. First, the literature was reevaluated to determine the theoretical influences on the PCA from major disciplines of planning, ecosystem science and decision theory. Generally it was found that decision-making in the PCA fell within a spectrum of the three disciplines. It was strongly influenced by the synoptic planning approach which requires the use of scientific data and professionals. However, some of the more recent issues have used a civics approach which requires input at an early stage from a variety of stakeholders and which uses other types of information such as traditional knowledge. Ecosystem science has a strong influence on decision making in the PCA as part of the mandate of the Canada National Parks Act is to protect the environment. The adaptive management approach has been officially adopted by the PCA to influence the decision making. Finally, decision theory has the potential to influence how decisions are made in the PCA, but to date the relationship between the data, decision maker and decision-making process is not clearly defined and this discipline is more useful in analysing decision making rather than specifically influencing it.

Second, visitor management models were evaluated and compared to determine how these frameworks address the data, decision maker, and decision-making process. Although the models clearly outline a decision-making process, decision makers and data, and have great potential for use in the PCA, to date they are rarely used. Some of the reasons range from the high complexity of the models that results in high costs in both human and financial resources. As well, the length of time to follow through on the results is often not acceptable in the short time-line of PCA management.

Third, results from a literature review, participant observation, informal interviews, and e-mail discussions with PCA staff at three levels of the organization were placed into an Institutional Analysis and Development (IAD) framework. The IAD framework facilitates a consistent comparison of various elements of a decision context or action arena. Differences from the PCA literature and results from contacts with park staff resulted in a further development of a theoretical action arena and an actual action arena. This information was analysed to verify the role of the three primary action arenas in the PCA, the Parks Canada Agency National Office (National Office), the Service Centre and the Field Unit. The elements of the action arena comprised the role, participants, positions, information inputs, the decision-making structure, payoffs, and potential outcomes. As well, the influence of each action arena on decision making with

respect to visitor management was examined. The analysis was further complicated by the changes in the reporting structure of the PCA over the course of research. Currently the National Office and the Field Units have very clear roles to play within the PCA, and the Service Centre role has been diminished due to the change in reporting structure (Field Units now report to an eastern or western Director rather than to one of the five Service Centres). It was found that the National Office prepares the conceptual framework or sets the rules within which the Service Centres and Field Units work.

The final task was to use a specific case study of trail management to examine more specifically how data are incorporated into decision making in Cape Breton Highlands National Park (CBHNP). The participant observation and discussions with park staff at CBHNP led to an understanding of what was most influential towards decision making. The decision makers from all three sections of park management, i.e., Heritage Presentation and Visitor Services, Natural Heritage Protection and General Works are generally aware of all types of information that are available about trail issues. However, each section has a different focus in their decision making, which results in a different emphasis on different types of data. As well, different issues in trail management require different types of data.

Decisions are made under the umbrella of the conceptual framework provided by the NPCAO, but the way in which data are used and valued is largely up to the discretion of the decision makers in the individual Field Units.

Visitor management in the Parks Canada Agency can be improved at each of the three levels. At the Field Unit level it is important to document the decision-making process (even informal), the decision makers and the types of data that feed into the process. As well, it is important that decision makers identify the types of data lacking and how this will improve the decision-making process relating to a particular issue.

The Service Centres should set up a database identifying visitor management issues associated with each Field Unit that they are providing services to. This would allow them to have a better idea of the similarities and differences faced by each Field Unit as well as the data, decision makers and decision-making process used to address each issue. This information could then be shared amongst the Field Units and help to avoid duplication spending on research to address issues and the sharing of solutions.

The National Office although not promoting a single visitor management model should set up a database that documents the application of the various visitor management models to the Canadian National Park context. This database should include information such as the success of the various models to address visitor management issues and constraints to applications.

Researchers should ensure that they make potential users aware of benefits of their studies to management issues. They should also inform themselves of the best way to present data to facilitate its use in decision making.

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1 Introduction

Canadian national parks management is an evolving and often contradictory process (Dearden, P & Rollins, R, 1993; Parks Canada Agency, 2000a; Wright, R. G., 1996). The *Canada National Parks Act* states that national parks are to be managed to ensure ecological integrity and for the benefit and enjoyment of visitors. Since the inception of the first national park in 1885, Canadian national park management has wavered between an emphasis on the visitor and on the environment (McNamee, K., 1993). This dual emphasis has resulted in inconsistent decision making that has not always been successful (Slocombe, D. S., 1992). Numerous studies have been conducted in Canadian national parks to help managers improve their understanding of the environment (Graham, R. & Lawrence, P., 1990; Skibicki, A., Stadel, A., Welch, D., & Nelson, J. G., 1994) and visitors (Payne, R. J. & Nilsen, P., 1994). Theoretically, these studies improve a decision maker's understanding of an issue and thereby improving the decision-making process.

Data and information collected through systematic observation and experimentation on the biophysical environment and on the people who have an impact on it, are important to explain complex natural processes and to make predictions concerning human-environment relationships (Berkes, F. & Folke, C., 1998; Lemons, J., 1994; Norton, B. G., 1998). It is reasonable to assume that such knowledge can be used to provide guidance to decision makers on how to make good decisions that protect the natural environment. A review of the literature on decision-making processes in governments and other organizations, however, reveals that decision making in national parks is based not only on data relating to the natural environment but also on other types of information such as perceptions, values, budgets and the politics surrounding an issue. These latter types of information often have a greater influence on decision-making and policy processes relating to environmental management than the former (Doern, G. B. & Phidd, R. W., 1992; Lemons, J. & Junker, K., 1996; Needham, R. D. & Rapport, D. J., 1992a; Peterson, D. L., 1996).

Two important goals for the Parks Canada Agency (PCA)[1] are to ensure the ecological integrity of the natural environment and to incorporate "science" into decision making (Parks Canada Agency 2000). These goals both require scientific knowledge and research results to improve decision making (National Research Council, 1992). In practice, however, the results of

[1] The Parks Canada Agency has changed names frequently since a management system of Canadian national parks was put in place. The new name, Parks Canada Agency, came into being in 1998. Previously this organization was entitled Parks Canada and Canadian Parks Service. The PCA was until 1992 part of Environment Canada. It was then moved to the Department of Canadian Heritage. The term Parks Canada Agency (PCA) will be used throughout this thesis to refer to the organization that manages Canadian national parks.

many studies are not incorporated into park management (Davis, G. E. & Halvorson, W. L., 1996; Murray, C., 1998; Wright, R. G., 1996).

Data are collected in all Canadian national parks (Skibicki, A., Stadel, A., Welch, D., & Nelson, J. G., 1994). These data result from resource inventories of the flora, fauna, soils and geology within each national park, thus providing base-line data and benchmarks (Slocombe, D. S., 1992). As well, research is conducted to explain complex natural processes and to monitor change. Research on visitors is invaluable for addressing whether or not visitor needs are being met and the ways in which preferences change over time, in addition to identifying the possible impacts of visitors on the natural environment (Graham, R. & Lawrence, P., 1990; Payne, R. J. & Nilsen, P., 1994) . The results of these studies are incorporated generally into the *State-of-the-Parks Report* every two years[2]; however, specific details are normally not provided (Canadian Heritage, 1998; Canadian Parks Service, 1991a; Canadian Park Service, 1991b). Although, in principle, the current planning structure states that the results of research are important for decision making, in practice, however, it is difficult to determine how or if such information is incorporated into decision making for Canadian national parks.

The incorporation of data and information, collected through both natural and social studies, into decision making is limited or assisted by, the nature of data, the decision makers and the process. Within the PCA, many decision makers exist at each level of the organization. Although some of their responsibilities are legislated, decision makers have considerable discretionary power (*Canada National Parks Act*, 2000). Managing the PCA is a highly politicized process, complicated by many levels of administration and a dual mandate (i.e., visitor use and preservation). Other influences based on public pressure and financial and human resource constraints might prove to be more important in the decision-making process than data and information collected to improve the understanding of natural processes and explain the potential impacts of humans on the natural environment.

1.1 Thesis Statement

Research on the impact of visitors on the biophysical environment is commonly carried out in national parks (Wright, G. R., 1999). This research results in the generation of data on specific problems and improves the understanding of environmental processes and the impact of humans on the environment in national parks. The ways in which this scientific knowledge and information is incorporated into the decision-making processes is not clear. Often information and data collected on the natural environment are not used in decision making (Murray 1998;

[2] The Parks Canada Agency prepares a questionnaire that forms the basis of the *State-of-the-Parks Report*. This questionnaire is completed by Field Units and subsequently summarized into a table.

Smith, M. E., 1996). The literature is unclear about which factor (i.e., data, decision maker or decision-making process) has the most influence on the outcome of the decision-making process. The decision-making process with respect to visitor management in national parks needs to be clarified in order to understand the ways in which data are incorporated into the process and potentially to increase the use of this information in decision making. Otherwise the status quo will remain, relevant information will be underutilized and decision making may not be as effective as it might be at ensuring the protection of the environment.

How are decisions relating to visitor management issues made in the PCA?

1.2 Objectives and Goals

The broad goal of this thesis is to determine the mechanisms used to incorporate knowledge and information into the decision-making process for national parks management in Canada. National parks have a management process that links visitor management and ecosystem conservation. The various management plans are interconnected theoretically; however, in reality it is difficult to determine who is responsible for environmental management at each decision point and what types of data are required to solve a problem. The decision-making context is also changing as the PCA evolves as an organization (Parks Canada Agency, 2000a).

The main tasks necessary to achieve this broad goal are four-fold. Firstly, the main decision-making frameworks used in planning and environmental research are evaluated to determine the relative importance of data, the decision maker and the decision-making process involved in management of environmental impacts as well as to set national park decision making into context. Secondly, visitor management models are evaluated to determine how they incorporate data and information into their suggested decision-making processes. Thirdly, the decision-making processes in the PCA are analysed using an Institutional Analysis and Development (IAD) framework to determine the key elements of the action arena and to identify the ways in which research data are incorporated into the process. Fourthly, a case study of the management of a hiking trail system in Cape Breton Highlands National Park is used to demonstrate the ways in which data and information are incorporated into the decision-making process in practice.

1.3 Study Area and Case Study

Cape Breton Highlands National Park (CBHNP), Nova Scotia, Canada, was chosen as a study area. The justification for this choice is as follows: environmental impacts resulting from visitor use and visitor infrastructure are present on the parks' hiking trail system; and second, CBHNP management agreed to support research on hiking trails and was willing to cooperate and support the research endeavour. This national park is located in northern Cape Breton Island,

Nova Scotia, Canada. It comprises a variety of forest regions including the Acadian, Boreal, Taiga and Deciduous. The terrain is rugged comprising a plateau at an elevation of 400 m which is cut at the edges by canyons that reach to the ocean. It receives approximately 350,000 visitor days annually of which about 70 % use the hiking trail system (P.G.Whiting and Associates, 1992a; P.G.Whiting and Associates, 1992b). Visitation days have remained consistent over the last 10 years (Contact Person 5, 2001).

The case study focuses on the ways in which data and information collected from studies on hiking trails are incorporated into their management. Hiking trail management was chosen as a research topic because trails require input from different management sections in the National Park process: Heritage Presentation and Visitor Services, Natural Heritage Protection and General Works. The presence of these trails impacts the park environment and, in turn, they are impacted upon by visitors that use them. Different types of information are required for making informed decisions: knowledge of the biophysical environment is necessary as well as knowledge of visitor behaviours and uses.

1.4 Thesis Format

The thesis is developed in detail in the next six chapters.

Chapter Two: The Research Process

Methods used to gather data and information to support the thesis statement are discussed in Chapter Two. This chapter presents the rationale for the choice of methods, a personal account of the way in which the research evolved, the variety of methods used to obtain information from park staff and finally, the rationale for the decision to compare visitor management models.

Chapter Three: Incorporating Scientific Data into Environmental Decision Making

The literature review of decision-making processes sets the context for understanding the incorporation of data and information into decision making. Different types of knowledge and their possible uses are evaluated in this chapter. The main positions in the literature regarding the relationship between the use of knowledge and decision making are identified. The main concepts that exemplify these relationships are also illustrated. Mechanisms, in the form of theoretical and conceptual frameworks developed to facilitate the incorporation of scientific knowledge into decision making in environmental management, are outlined and compared with respect to data, decision makers and decision-making process.

Chapter Four: An Evaluation of the Visitor Management Frameworks

Visitor management frameworks are compared and analysed in this chapter, to determine the types of data required to drive the models, identify the decision makers and evaluate the decision-making process. The potential influence that a decision-making framework has on

decision making with respect to environmental impact assessment and the potential use of these models within the PCA is evaluated.

Chapter Five: The Parks Canada Agency Decision-Making Process.

The formal conceptual framework used to evaluate decision making is the Institutional Analysis and Development (IAD) framework which provides a systematic format to evaluate each step in decision making and helps to develop an understanding of an action arena. This Chapter will also examine the Parks Canada Agency (PCA) management process through the application of the IAD framework. Specific visitor management mechanisms (both formal and informal) used in national parks to assist managers are examined, to determine the ways in which they incorporate data and information into decision making.

Chapter Six: The Case Study of the Hiking Trail System in Cape Breton Highlands National Park

A case study of decision making on hiking trails in CBHNP is used, to identify the types of data and information available to decision makers, the people involved in decision making, and the decision-making process. The interrelationships between these three factors are evaluated. Detailed field work and informal interviews with parks staff comprise the majority of data used in this case study. The case study demonstrates how data collected to assist management of hiking trails are incorporated into the decision-making process in one national park.

Chapter Seven: Conclusions and Recommendations

Through this research, the formal decision-making models available to planning and environmental management are reviewed to identify the relative importance of the data, decision-maker and the decision-making process. The constraints and benefits of six of the most frequently used visitor management frameworks are determined. Specific detail on the ways in which these frameworks improve or facilitate the decision-making processes are outlined. A detailed analysis of the PCA is conducted through the use of the IAD framework. These theoretical decision-making processes are contrasted with an actual case study of hiking trail management to determine how to improve the incorporation of information into this decision-making process within the PCA. As well, recommendations for improving the incorporation of data into the decision-making process are provided, including directions for further research.

2 The Research Process

2.1 Introduction

The research process used in this thesis is not linear. Instead, this thesis uses an adaptive interactive approach. This approach recognizes that research is conducted in a world in which not all parameters and problems associated with the initial research objectives can be determined at the onset of the research endeavour (Nelson, J. G., 1991). These unknowns may lead to initial research results that are unexpected and that may require a change in research direction and/or a reevaluation of the research project. The initial research objectives may still be incorporated into the final thesis; they may however, be given less weight. The research process is an iterative one, in which the research builds on the preliminary results. The research will often then be more useful than would be the case through following a strict pre-determined approach with little flexibility (Nelson 1989).

Research was conducted in two stages. The first stage focussed on assessing and evaluating hiking trails. The second stage focussed on the decision-making process and the incorporation of data and information into this process in terms of trail management. The data required to address trail management are diverse, as are the methods of data collection. These included a review of the literature, on-site fieldwork, participant observation at meetings, informal interviews, e-mail discussions, and the application of a framework to analyse the decision-making process in the PCA.

2.2 Stage 1

Hiking trail management was the focus of the research. In the first stage, the author believed that a strong positivist approach was necessary to improve trail management. The author argued (as many other researchers argue) that quantitative environmental data would "enable faster identification of problems, greater understanding of causes and effects, and better insights about prevention, mitigation and management of problems" (National Research Council 1992 in Murray 1998: 586). As well, a preliminary review of the literature led to the author's initial premise that 'incomplete information on trail impacts results in poor trail quality and impacts to the environment'. Once sufficient quantitative data and information were available (e.g., the degree, extent and type of trail impacts and the type and extent of trail structures used for mitigation), trail management would improve, given adequate funding and other factors influencing implementation.

Following this line of thought, several steps were taken towards improving the authors' understanding of trail impacts and the merits of different trail impact evaluation techniques. Initially an empirical approach was used to study hiking trails. The literature was reviewed to identify the methods and techniques used to evaluate hiking trails and to determine the benefits and limitations of these methods. Many monitoring and assessment methods were identified in the literature. Guidance on when to use certain techniques, what types of data result, and the benefits and limitations of each method was not given in these studies. The research, therefore, focussed on clarifying some of these issues through the field testing of different methods.

On-site visits were taken to Fundy, Kouchibouguac, Prince Edward Island, Gros Morne, Cape Breton Highlands and Kejimkujik National Parks (in Atlantic Canada) to determine a location to conduct fieldwork. A site was chosen based on the suitability of the park for trail research. Discussions were carried out with Park Ecologists in three of the parks and with park staff from the Parks Canada Agency National Office (National Office), and the Atlantic Service Centre (ASC) at the 1996 Ecological Monitoring and Assessment Network (EMAN) Conference. CBHNP was chosen because it had an adequate trails system on which fieldwork could be carried out, the trail system was deteriorating and park management wanted research to be conducted. As well, a three-year contract was procured from the Ecosystem Science Fund to inventory and evaluate the hiking trails in CBHNP.

Finally, the author participated in a one-week course on trail and campsite assessment in Isle Royale National Park with the U.S. National Park Service staff and another graduate student. The course was designed to teach park staff how to evaluate impacts from visitor use and to recognize impacts caused by poor maintenance. The course instructor was Dr. Jeff Marion, a specialist in recreation ecology.

2.2.1 Fieldwork in Cape Breton Highlands National Park

A fieldwork component took place over two field seasons (May to August 1996-1997). A number of tasks were completed: the trail system was inventoried and evaluated, several assessment methods were tested, the trail system was placed into a Geographical Information System (GIS), and the author participated in trail team meetings taking place in the park.

A trail inventory and trail evaluation were conducted, with the help of an assistant over a two-month period. One hundred and nine kms of hiking trails in CBHNP were surveyed. Two methods were used. The first was a rapid assessment survey which identified the type, extent and degree of environmental impacts and the type and extent of maintenance structures along the trail. Second, a perpendicular transect survey was undertaken every 100 m along the length of the trail to collect detailed data on the trail's width, incision depth and surface.

Two other methods identified in the literature as being useful for monitoring vegetation change in a small area were also evaluated. Six study areas were chosen based on a diversity of vegetation, potential environmental impacts and visitor use. A perpendicular line transect was used to assess vegetation. Second, six 1 X .5 m vegetation quadrats were set perpendicular to the trail starting on the trail to 3 m from the trail and a final one 10 m away from the trail to assess the change in vegetation as one moves away from the trail (Adkison, G. P. & Jackson, M. T., 1996).

The geographical location of each trail was placed into electronic format. Trails were walked with a Global Positioning System (GPS) and UTM data points were collected every metre. These data were downloaded into a computer program and corrected for use with the park Geographical Information System (GIS).

During this period, the author participated in weekly trail team meetings. The trail team comprises the Assistant Manager of Visitor Activities, the Heritage Presentation and Trails Coordinator, the Manager of Natural Heritage Protection and District Fire Coordinator, General Works staff, and the Trail Crew. The goals of these meetings were to 1) ensure that there was general agreement on the types of maintenance conducted on the hiking trails and 2) to assign maintenance schedules for the Trail Crew. Trails were also visited on-site by the trail team when required to determine major changes such as rerouting, modification or closure.

Data were subsequently placed into spreadsheet format and analysed. Several documents were prepared for in-park use.

2.2.2 Results and Setbacks

The data resulting from the trail assessment and evaluation were used to prepare a trail inventory. This document was provided to the CBHNP Park Ecologist and the Heritage Presentation and Trails Coordinator, along with a state of the trails report. The trail assessment methods were compared and contrasted for their usefulness in evaluating impacts on hiking trails.

The evaluation of the two vegetation monitoring techniques in a variety of habitats proved to be very time consuming. Most of the literature stated that monitoring is required every five to ten years. This depth of research is not feasible during the short time frame of a Ph.D. thesis (typically a maximum of three field seasons). This limitation meant that a comprehensive evaluation of the methods for monitoring purposes was not possible during the research for this particular thesis.

The *Trail Inventory*, the *Trail Catalogue* and the GPS data of trail locations were used to develop a GIS model. The GIS model was created in collaboration with park staff in May of 1998 with D. Allen, a GIS expert at the Atlantic Service Centre in Halifax, and J. Bridgland, the

CBHNP Park Ecologist (Bridgland, J., Lemky, K., & Allen, D., 2000). The GIS is used to depict areas that are suitable or unsuitable for the construction of future hiking trails.

The author was able to gain insight into the types of data, the decision makers and the decision-making process for hiking trail management in the park by playing the role of participant observer at trail meetings. In addition, a greater understanding of the constraints on trail management was gained.

The author noted that the *Trail Inventory* provided to the trail team was not used to its fullest extent. The *Trail Inventory* was used mainly to locate maintenance features. The information on the extent and degree of impacts in certain areas was not used. The author realized that the *Trail Inventory* and evaluation do not by themselves necessarily improve management of the trail system. The GIS, in contrast, is expected to be useful for the trail planning process, but not necessarily for day-to-day trail management. These observations led to a new train of thought. Perhaps a more useful contribution could be made to the improvement of trail management by understanding the decision-making process in the PCA. This could be done by:

1) Clarifying the decision-making process for trail management;
2) Identifying the decision makers, their role in the process and the types of information they use to make decisions;
3) Clarifying the types of data and information required at each stage of the trail management process;
4) Ensuring that appropriate study results are incorporated into the decision-making process at the right time; and,
5) Determining what other types of data and information influence the decision-making process

Some research questions are:

What is the decision-making process in the PCA with respect to visitor management and trail impact management?

Who are the decision makers in this process and what are their roles?

How and what types of data and information are incorporated into the decision-making process in Canadian national parks, specifically with regard to visitor management and hiking trails management?

2.3 Stage 2

2.3.1 Literature Review

The literature was re-examined to set the context of this line of study. Participant-observation in trail team meetings was continued and park staff members were contacted to clarify how they used data and information in the decision-making process in national parks in general and, more specifically, in terms of visitor management and hiking trail management.

A literature review was conducted to identify the main decision-making structures discussed in the literature and to determine the ways in which scientific data are incorporated and used in environmental decision-making processes. The positions, concepts and frameworks were evaluated for environmental management in general, in addition to specific applications to national park management.

2.3.2 An Evaluation of the Visitor Management Frameworks

The main, formal visitor management frameworks identified in the literature were evaluated for their decision-making processes. Although other authors have reviewed these visitor management frameworks (McArthur and Hall 1998; Nilsen and Tayler 1997; Payne and Graham 1993), the comparative criteria were mostly based on the theoretical bases of the frameworks, the legal and geographical application, and the ease of application. Criteria such as the types of information used in applying the frameworks, the types of data used to drive the models, the specific decision process, and their use by managers to assist decision making were not examined. These topics form the basis of the analysis of visitor management frameworks in Chapter 4.

2.3.3 Parks Canada Agency Decision-Making Process

The PCA decision-making process is complicated by the existence of multiple levels of government, roles and responsibility. The Institutional Analysis and Development (IAD) framework was used to analyse each level of the organization. The framework is useful for systematically evaluating the variety of actors, their role in the decision-making process, the information requirements and the results of their actions. Chapter 5 specifically details the action arena for the PCA. The data inputs into this process resulted from a literature review and discussions by e-mail or telephone, at each of the three levels of the organization. (a summary of the types of questions posed to interviewees is presented in Appendix 1). The PCA staff directed this researcher to relevant internal documents that explained the theoretical process of decision making and provided some insight as to the current situation. Information on the theoretical action arena was subsequently compared and contrasted to the information given by PCA employees.

2.3.4 Case Study

The deliverables produced in **Stage 1**: the *Trail Inventory*, a Catalogue of Hiking Trails and a GIS model were re-evaluated within the IAD conceptual framework to determine if they can be improved for use in decision making in national parks. The decision points of trail team meetings were then examined and evaluated to determine the role of different types of data and information in the decision-making process for managing hiking trails. The participants in the decision-making process were informally interviewed to determine: 1) their roles and responsibilities, 2) the types of decisions they make, 3) the types of information that aid them in their decision making, and 4) the processes or frameworks that assist them in making decisions. They were also asked what they view as the critical factors for incorporating data into the decision-making process.

2.4 Summary

The research process used in this thesis is an adaptive interactive approach. An evolution of thought processes occurred from a primarily positivist approach that emphasized the use of quantitative data, to an approach which recognizes that different types of data and information influence the decision-making process, not just the results of studies. This evolution resulted in a change in research from collecting primarily quantitative and qualitative field data on environmental impacts, to analysing the literature, and conducting informal interviews about the decision-making processes with park staff.

The Institutional Analysis and Development framework is applied to further clarify the decision-making processes within the PCA. The PCA comprises several organizational levels that are clarified with this analysis. Within an organization there is often a theoretical action arena and a practical action arena (what really happens). These differences and similarities are explored in the application of the IAD framework.

The case study provides a specific example of the ways in which the PCA organizational structure influences the specific decision-making processes surrounding hiking trail management. The comparative analysis is ultimately between the theoretical constructs that are in place to help decision makers to incorporate information into decision making and a practical on-site example of decision making in a national park. The case study on the decision-making processes surrounding the management of a hiking trail system in CBHNP exemplifies the contrast between the theoretical and practical decision-making process.

3 Approaches to Incorporating Science into Environmental Decision Making

3.1 Introduction

"A decision is a specific commitment to action, usually in conjunction with a commitment of resources. A decision process is a set of actions and dynamic factors that begins with the identification of stimulus for action and ends with a specific commitment to action (Minzberg *et al.* 1976 in Janssen 1992: 4)". Decision making, then, is concerned with a set of action (or inaction) alternatives for a given situation, with consequences to those alternatives and with valuation of consequences and alternatives. The conundrum is to select an acceptable alternative, because the optimal decision is largely subjective (Tuggle, F. D. & Barron, F. H., 1983). Typically, decision making comprises the following: multiple objectives, uncertainty, attitude to risk, a complex structure, sequential aspects of a problem and multiple stakeholders (Goodwin, P. & Wright, G., 1991). Determining the types of knowledge that should be used to make a decision and the weight it should be given in comparison to other competing concerns, such as economic, political and societal, is the choice or concern of a decision maker. "Decision makers are individuals or groups of individuals who directly or indirectly, provide value judgements or opinions on the decision process necessary to define and choose between alternative courses of action (Chankong and Haimes 1983 in Janssen 1992)."

The goal of this thesis is to clarify decision-making processes and the ways in which data and information are incorporated into these decision-making processes within the Parks Canada Agency (PCA). The way the author chose to bring about part of this understanding is to review the literature to address the three main themes of the decision-making process: the data and information inputs, the decision-making process and the decision maker. The data and information inputs form one of the bases for decision making. First, the author will define data and knowledge. Second, the positions in the literature about the relevance of scientific knowledge to the decision-making process are discussed. And third, the key factors influencing the degree to which different types of knowledge are incorporated into the decision-making process are outlined.

Planning frameworks, ecosystem-based frameworks and decision-theory based frameworks influence the decision-making process in the PCA. The synoptic, incremental and civics approaches are three of the most influential frameworks for planning. They are developed and applied to a degree at which it is possible to determine the data requirements and the decision

makers who are expected to apply the framework. They also help to explain the history of the decision-making process for environmental management. Ecosystem-based frameworks (ecosystem, integrated and adaptive), are then evaluated to characterize information requirements, the decision maker and process. The frameworks based on decision theory were consulted to determine what approaches could assist or improve the decision-making process in environmental management. The Institutional Analysis and Development (IAD) framework is presented as a tool to analyse the decision-making process in the PCA. Finally, the current and potential applications of these approaches within the Parks Canada Agency (PCA) are discussed.

3.2 Knowledge

It is important to identify the differences between the terms: data, information and knowledge as these terms are often used interchangeably. The differences of these terms can be illustrated through Roots' philosophers' staircase of knowing (Roots, E. F., 1992). The bottom step is the process of observing and measuring phenomena (this step could also include research, if done systematically). Data are then created by the verification of the results of this process. Information is created by the selection and testing of data. Knowledge is derived from the organization and interpretation of information. Comprehension and integration of this knowledge leads to understanding and the top step is wisdom. As one moves up the philosophers' step, human value is increasingly added as a researcher chooses which data to use to address a situation, and the analysis to be applied to a situation. But, as one moves down the philosophers' step there is also an increase in subjectivity, as it is a person's choice as to what phenomena they will observe and measure.

Knowledge, "is an amalgam of facts and values produced by both intellectual analytical processes and by social interaction among decision makers, their advisors and interests in and out of government ... it involves numerous types and sources of information" (Doern G.B. & Phidd, R.W. 1992: 214). Knowledge has been broadly categorized as scientific and traditional or indigenous (Forsyth, T., 1998), hard and soft (Berkes, F. & Folke, C., 1998), and fact and value based (Doern, G. B. & Phidd, R. W., 1992). The validity of these broad categorizations is currently being debated in the literature. Some researchers believe that it is sufficient just to recognize that there are different types of knowledge (Agrawal, A., 1995; Forsyth, T., 1998). As some types of knowledge are more useful for explaining natural processes (e.g., scientific, hard, or facts based) and other knowledge is more informing of human interactions with the environment (e.g., traditional, soft and values based), it is important to recognize these differences.

3.2.1 Scientific Knowledge

Scientific knowledge is gained from applying the scientific method (Machlis. G. & Soukup, M., 1997). It is often equated with "Western" knowledge, which is based on Newtonian physics and forms the basis from which modern resource management bureaucracies are expected to make their decisions (Holling, C. S., Berkes, F., & Folke, C., 1998). In the traditional sense, scientific knowledge is recognized as important for providing an understanding of the universe and revealing simple laws that explain it (Agrawal, A., 1995; Moore, J. A., 1994). This knowledge is primarily quantitative and relates to the natural world. Others recognize that the natural world comprises both a biophysical component of the earth itself and a social component resulting from humans acting on the natural world (Berg, B. L., 1995; Kehoe, A. B., 1998). Consequently, a more contemporary view is that scientific knowledge encompasses knowledge gained in both the social sciences and the natural sciences (Berg, B. L., 1995; Kehoe, A. B., 1998).

Scientific knowledge is obtained through intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment (Oxford Dictionary 1998). The results of this inquiry include proposing hypotheses that explain patterns and relationships observed and developing theories that summarize the state of the knowledge (Caldwell, L. K., 1996). The qualitative and softer sciences (e.g., sociology, anthropology) provide knowledge about the ways in which humans interact with the environment, with research typically comprising interviews, observation and value judgements.

Research in the quantitative and harder sciences (e.g., physics, chemistry) provides a greater understanding of natural or biophysical processes by conducting field observations, simulations and laboratory experiments. To explain the biophysical world, it tries to provide laws and theories that can be generalized across a broad range of environments (Berkes, F. & Folke, C., 1998). One claim is that scientific research can "enable faster identification of problems, greater understanding of causes and effects, and better insights about prevention, mitigation and management of problems" (National Research Council 1992 in Murray 1998: 586). Biology and environmental science are often characterized as having both soft and hard qualities. Within the PCA, work has been conducted to incorporate science into decision making within a public consultation process. However, "... participants to the process have concluded that science was of very little use to their negotiations" (Murray 1998; 584). Instead of being used to inform, it was used as an advocacy tool, information not supporting a particular position was invalidated and rejected (Murray, C., 1998).

Scientific knowledge comprises both qualitative and quantitative information and data (Kehoe, A. B., 1998). Measurement may be composed of one of four different levels: nominal, ordinal, interval and ratio. Typically it is difficult to measure social processes and behaviour at levels higher than ordinal, whereas biophysical data can usually be obtained at the higher levels, such as interval or ratio scales (Mitchell, B., 1979). But, how does scientific knowledge differ from other types of knowledge?

3.2.2 Traditional Knowledge

Traditional knowledge is most commonly juxtaposed against scientific knowledge to delimit differences in epistemologies, data and information (Forsyth, T., 1998). Traditional knowledge is identified as knowledge that is unique to a given culture or society. Often passed down by word of mouth, it is the basis of local-level decision making in resource management. This knowledge has value not only for the culture in which it evolves, but also for scientists and planners striving to improve conditions in rural societies (Warren, D. M., 1991).

Traditional knowledge is primarily concerned with those activities that are intimately connected with the livelihoods of people rather than with abstract ideas. Traditional knowledge is therefore highly detailed and richly complex, whereas scientific information aims at a more analytical and abstract representation of the world, "which results in insights that can be used for problem solving in many different contexts (Agrawal, A., 1995)".

Traditional knowledge is passed on through generations in the form of experiences and traditions. Researchers have tried to collect this knowledge through interviews with local people, to create a knowledge database. This type of knowledge is difficult to collect because traditional knowledge is continuously changing through time as the culture evolves and, as a dynamic entity, it cannot be generalized temporally or spatially (Agrawal, A., 1995). As well, much traditional knowledge is passed on through stories, which are difficult for scientists to interpret, and/or are not expressed in a manner that can be statistically analysed (Stadel, A. V. & Nelson, J. G., 1995). Despite this lack of quantification and the quality of being locally rather than regionally or globally applicable, traditional knowledge is increasingly being called upon to aid in the understanding of natural phenomena (Duffield, C, Gardner, J. S., Berkes, F., & Singh, R. B., 1998; Pinkerton, E., 1998; Critchley, W., 1999).

Basic processes are explained and understood within fairly short time frames (e.g., 100-200 years) using scientific information; however, longer-term phenomena resulting from human-environment interactions are difficult to explain with scientific knowledge (Forsyth, T., 1998). For example, traditional knowledge documents the histories and long-term impacts on local environments in a given area for thousands of years and this knowledge can be used to come to a

better understanding of long-term processes (Stadel, A. V. & Nelson, J. G., 1995). The use of both types of knowledge has been termed hybrid knowledge (Sillitoe, P., 1993).

3.2.3 Other Knowledge, Information and Data

Decisions are often based on political knowledge gained through interaction and informal discussion with other decision makers. This knowledge is not necessarily quantifiable or readily definable, but it may have a strong influence on the outcome of a final decision. Political information may also be gained through public opinion polls. This information has been defined as 'hard' because it is collected systematically and is quantifiable (Doern, G. B. & Phidd, R. W., 1992). Finally, economic information and budgetary information also play a very important role in the decision-making process, but this information is again not based on either category of knowledge outlined above.

3.2.4 Discussion

Two main types of knowledge are identified in the literature: scientific knowledge and traditional knowledge. It is difficult to find substantive, methodological or contextual grounds to verify that a particular piece of knowledge is either traditional or scientific. Agrawal (1995) argues that knowledge should be discussed as multiple domains and types of knowledge, with differing logics and epistemologies. As noted in *Section 3.1.3* , there are other types of knowledge and information that are not easily categorized into these two types.

It is now widely recognized that many types of knowledge are required for decision making in natural areas. Whether they are collected through observing or experimenting on natural phenomena or gathered through oral history, the information derived from either method is acceptable for use in the decision-making process. For this thesis, the use of the term "scientific knowledge" will refer to knowledge based on data and information collected from systematic research on the natural environment and on the impacts of people acting on the environment. A further qualification of 'natural' or 'social' will be provided where required.

3.3 The Relationship Between Scientific Knowledge and Decision Making

The relationship between scientific knowledge and decision making is not clear even though this relationship is considered very important (Canter, L. W., 1996; Davis, G. E. & Halvorson, W. L., 1996; Lemons, J., 1996; Machlis, G. & Soukup, M., 1997). Modern resource management is based on the assumption that better and more long-lasting decisions are made with scientific data than based on personal perceptions (Davis, G. E. & Halvorson, W. L., 1996). Such data are often not integrated into the decision-making processes, however (Machlis, G. & Soukup, M., 1997). A spectrum of positions on the importance of scientific knowledge to decision making exists in the literature.

3.4 Main Positions

Three main positions in the literature illustrate the strength of the relationship between scientific knowledge and decision making (Needham, R. D. & Rapport, D. J., 1992b; Shrader-Frechette, K. & McCoy, E. D., 1994; Woodley, S., 1997). These positions illustrate a continuum of importance of scientific knowledge from very important to somewhat important:

1) good scientific information forms the basis of good decisions (Woodley, S., 1997);
2) scientific knowledge is important to decision making but there are significant barriers to incorporating it, creating a rift (Needham, R. D. & Rapport, D. J., 1992b); and,
3) scientific information is inherently biased and it is difficult to make good decisions based on this flawed information. It is better, therefore, to focus on using one's best professional judgement (Schrader-Frechette 1993).

3.4.1 Position 1

The first position states that more scientific information (resulting from increased effort, more scientists and more funding) will result in better decision making in environmental management (Committee for the National Institute for the Environment (CNIE), 1994; Jordan, C. F. & Miller, C., 1996; Korfmacher, K. S., 1998; Woodley, S., 1997). This position is commonly held by researchers and advocates of the ecosystem science approach. The reasons identified to support their position are that science:

1) informs and supports management;
2) informs public opinion and creates support;
3) critiques or assesses policy;
4) guides actions;
5) supports solutions that are defensible;
6) demonstrates the incorporation and assessment of the multifaceted nature of the environment; and,
7) identifies all data and information at the time of decision making and demonstrates that the best decision was made given the circumstances.

Caldwell (1996) states that in a society threatened by environmental crisis, scientific research is required for reliable knowledge and understanding. Scientific researchers therefore, have a unique responsibility to inform the decision-making process as comprehensively as possible and to aid in the dissemination of relevant information to the public, government and other researchers.

3.4.2 Position 2

The second position states that there is a rift between actual research and the use of the results in decision making (CNIE, 1994; Needham, R. D. & Rapport, D. J., 1992b; Norton, B. G., 1998). The rift is caused by four main factors: scientific information, communication, policy and decision makers. Scientific data and information contribute to the rift because there is an inadequate database available for solving problems and because the applications of these data to decision making are not clear (CNIE, 1994; Needham, R. D. & Rapport, D. J., 1992b; Norton, B. G., 1998). Research is conducted in order to gain an understanding of ecosystems, not necessarily to aid managers in making decisions (Korfmacher, K. S., 1998). At times, during negotiations, scientific data may be used to advocate a position. If scientific input is contradictory or uncertain it may not be used (Murray, C., 1998).

Communication is the second identified problem for the rift. Often, managers do not clearly state what types of information are required and scientists do not clearly state how information collected applies to a management problem (Needham and Rapport 1992; CNIE 1994;). Scientists are reluctant to move into guiding decision making because they believe that it is value based and subjective (a direct contrast of their perspective on science) (Findlay, S., 1992; Norton, B. G., 1998).

Policy is the third reason for the rift because it can also create a weak linkage between the scientific data and decision making. For example, in British Columbia, the forest companies prefer the status quo and have helped to develop a policy process that does not allow the incorporation of new scientific knowledge into the decision-making process and practices (Pinkerton, E., 1998). Similarly, in a public consultation process for the appropriate use of the Maligne Valley in Jasper National Park, scientific knowledge was used to advocate various positions instead of explaining the impacts of visitor use on the environment. These circumstances meant that scientific knowledge was not incorporated into the decision-making process (Murray, C., 1998).

Finally, decision makers and researchers are influenced by experiential knowledge gained within their work environments. They therefore may develop different value systems that contradict each other (Norgaard, R. B., 1992) and/or a different vernacular which is not always easily transferable to other disciplines. Most researchers believe that stronger linkages between scientific knowledge and decision making can be created by recognizing problems and developing mechanisms to overcome these problems (CNIE 1994), and developing frameworks or models that illustrate where scientific knowledge fits into the decision-making process (Castillo, A., 2000).

3.4.3 Position 3

The third belief held by many is that there are too many limitations to relying on scientific data exclusively for decision making (Jordan, C. F. & Miller, C., 1996; Shrader-Frechette, K. & McCoy, E. D., 1994). The relationship between scientific knowledge and decision making should remain weak because:

1) ecosystems are far more complex than any other system;
2) ecology has many informing concepts that are useful generally, but that fail to qualify as analytical concepts;
3) research typically is limited by short temporal and small spatial scales;
4) researchers typically only measure part of the ecosystem;
5) the science/manager linkage is critical in choosing indicator species, but they cannot specify prescriptions; and,
6) science alone cannot solve problems for there are too many uncertainties but it can clarify problems and potential risks of actions.

From these limitations, the researchers representing this third perspective believe that scientific information only brings decision makers so far. They identify many difficulties inherent in using scientific knowledge in decision making and believe that decision makers should rely on other types of information and professional knowledge. They criticize the importance that researchers place on scientific knowledge, given the inherent uncertainty in the quality of data.

3.4.4 Discussion

The positions discussed here place scientific knowledge on a gradient from very important to not important for decision making. They identify a range of perceptions on the value of scientific knowledge in decision making. The first position identifies scientific knowledge as extremely important; the second position identifies knowledge as very important but notes limitations; and the third position states that scientific knowledge is somewhat important but that other forces should take precedence, such as professional judgement. The lack of consensus suggests a need for caution in the use of different types of data in the decision-making process. These positions also demonstrate that, in many cases, the understanding of the natural environment is limited, and therefore making a decision based on scientific knowledge is not possible. Instead, best professional judgement takes precedence over other factors.

3.5 Main Factors Influencing the Use of Knowledge in the Decision-Making Process

The use of data and knowledge in the decision-making process is influenced by five factors. These five factors range from scientific uncertainty and scientific complexity to values

and decision analysis. Not surprisingly, communication is also one of the most important factors that influence the decision-making process.

3.5.1 Scientific Uncertainty

Scientific uncertainty is a term used to describe a situation in which lack of knowledge makes it difficult to make decisions (Lemons, J., 1996). In decisions under risk (a less serious form of uncertainty), alternatives are given relating to a probability of an outcome. So little is known about decisions that involve uncertainty that a definite probability cannot be assigned to an alternative choice (Faucheux, S., Froger, G., & Munda, G., 1997). If decisions are made based on scientific data and researchers do not clearly outline the limitations of their conclusions, then a poor decision may result. If applied in certain decision-making models, such as cost-benefit analysis or risk analysis, the uncertainty might be magnified and bias the solution in the wrong direction (Lemons, J., 1996). Biases and scientific uncertainty of data and information need to be made known to decision makers, in order for them to incorporate this uncertainty into their decision making.

Three types of uncertainty have been identified in the literature (Carpenter, R. A., 1996). The first type of uncertainty is that which cannot be eliminated or reduced but whose magnitude and relative importance can be estimated. The second type is related to the lack of ecological understanding of principles on which dependable predictive models can be constructed. The third type is related to the data quality in determining parameters most relevant to decisions. Decision makers should be involved with data quality management in order to express their views on an acceptable decision error rate.

Problems of scientific uncertainty can be reduced by: the use of interdisciplinary efforts, the solicitation of public involvement in decision making, the use of effective risk communication techniques, the recognition of limitations in modeling and the incorporation of systematic decision tools (Caldwell, L. K., 1996). One problem with the recognition of scientific uncertainty is that some decision makers do not want to make decisions until the odds are better. It has to be recognized that sometimes the uncertainty does not change regardless of how much information is available. Phidd and Doern (1991) suggest, for example, that when politicians require more research, this typically means that they want to put off making a decision until the climate is friendlier or in order to make a decision that is more politically correct.

3.5.2 Scientific complexity

Scientific complexity refers to incomplete knowledge due to lack of information which stems from inherent indeterminacies in social-ecological processes (Faucheux, S., Froger, G., & Munda, G., 1997). Simple explanations for how ecological systems work and predictions about

how the actions of humans will make them change are not available. This has major implications for decision making in the policy realm. Incorporating substantial irreducible uncertainties or indeterminacies will always remain as barriers to comprehensive descriptions and predictions of ecosystem function. Research demonstrates that ecosystems possess greater complexities and are harder to define and predict than previously thought. It is often assumed that 'sound science' will ultimately provide the central basis for environmental legislation, but pure and applied knowledge will always be incomplete and, thus, only form part of responsible policy and management systems (Santillo, D., Johnston, P., & Stringer, R., 1999).

3.5.3 Values

Values are inherently linked to the entire process of incorporating scientific information into decision making. Values are often in competition with each other in organizations as decision makers struggle to arrive at appropriate decisions and determine the kinds and degrees of environmental action that will be taken (Mangun, W. R. & Henning, D. H., 1999). Decision makers' values influence who can bring information to the fore, what types of information will be included, and the weight to be accorded to scientific information relative to other types of information. These values are formed based on the experience and education of the decision makers, as well as on the emphasis society places on scientific information versus other types of information. The steps or linkages between values and decision making as stipulated by Mangun & Henning (1999), are outlined below:

Values → Human Interaction → Power or Authority → Decision or Policy

Within a decision-making process, values influence types of analysis and conflict related to alternatives and options. Human interaction relates to values of the individuals and groups that are directly involved with values. Power and authority relate to the formal and informal authority spheres around the information and, finally, the decision or policy is determined. In essence, then "...values and value judgements enter at every stage of environmental decision making and this affects the outcome in a real continuous profound way...There is no value free inquiry"(Cothern, C. R., 1996).

3.5.4 Decision Analysis

Decision analysis is another important concept or technique that is used to explain the relationship between scientific knowledge and decision making. It recognizes that decision making is not always clear and, at times, an analysis is required to clarify the process. Decision analysis identifies the process of decision making and the relative importance of information used

in the process (Goodwin, P. & Wright, G., 1991). Decision analysis provides an effective mechanism for accommodating and integrating critical information from various disciplines into a needed multidisciplinary analysis (Keeney, R. L., 1983).

3.5.5 Communication

Communication is identified as a central concept for explaining the relationship between scientific knowledge and decision making (Castillo, A., 2000). This relationship has been weakened by poor communication between researchers and decision makers (Findlay, S., 1992). Norton (1998) suggests that one of the main reasons for this lack of communication is the lack of a common vernacular. This problem can be rectified by ensuring terms, indicators and measures used in ecological science are explained in terms applicable to management science. This can help to structure disciplines in collecting that information which is relevant to the resolution of multi-sectoral and multidisciplinary problems (Manning, E. W., 1992). However, the unwillingness of scientists to address themselves to larger social issues and the political implications of their research has also been identified as a key constraint (Findlay, S., 1992; Korfmacher, K. S., 1998). Castillo (2000) offers a model for improving communication amongst researchers. She suggests that continuous feedback mechanisms should be set up among three primary groups: the researchers, the decision makers and the implementers. This three-way flow of information will result in improved communication and understanding of the needs and roles of each group. Mechanisms such as these recognize that many types of information are required to implement decisions and to help explain the relationships between scientific knowledge and decision making.

3.5.6 Discussion

The five concepts discussed identify some of the key opportunities and/or constraints towards strengthening the role of scientific knowledge in decision making. Scientific uncertainty and complexity recognize inherent problems with the incorporation of natural science data into the decision-making process. Complete knowledge is not possible. The values of a decision maker are related to the emphasis placed on types of information used for decision making. Decision analysis is used to explain the link between decision makers' values and scientific knowledge. Finally, communication is a common thread throughout the decision-making process. Without thorough discussion of the applicability of scientific knowledge between scientists and decision makers, and a communication of the decision-making process, it is unlikely that there will be an improvement of the incorporation of information into the decision-making process.

3.6 Frameworks Illustrating the Incorporation of Knowledge into Decision Making

Frameworks have been developed to deal with complex, interdisciplinary problems in environmental management. These frameworks have varying degrees of success (Nelson, J. G. & Serafin, R., 1995). National park management comprises many facets of the disciplines of planning, ecosystem science and decision theory. These disciplines are all drawn upon to develop frameworks which help managers (Mitchell, B., 1997; Mitchell, B., 1979; Smith, L. G., 1993). Each type brings a unique perspective to understanding the ways in which scientific information is (or is not) incorporated into decision making. The changes to the *Canada National Parks Act* in 1988 and 2001 resulted in the strengthening of the primary role of the Parks Canada Agency to maintain ecological integrity. In this section, frameworks used to explain decision making in national parks are defined. Three contrasting frameworks from each discipline are compared and contrasted to illustrate the range of possibilities for incorporating scientific knowledge into decision making. The importance of each perspective towards improving our understanding of how scientific knowledge is incorporated into decision making is highlighted for the PCA.

Decision making may be both informal and/or formal. Informal decision making has been coined as BOGSAT (Bunch of Gals/Guys Sitting Around a Table) method (Peterson, D. L., 1996). An advantage of BOGSAT is that decision makers can make decisions quickly and effectively, without trying to fit into a formal process. One disadvantage of this method is that the decision may not be easy to document or defend. BOGSAT is also based mainly on intuition rather than scientific knowledge (Peterson, D. L., 1996). This factor may lead to litigation against the government agency following this approach if solutions taken are not science-based (Lemons, J. & Junker, K., 1996). If ecosystem management decisions are belief-based rather than science-based, then they may not be as long lasting (Davis, G. E. & Halvorson, W. L., 1996).

A formal framework, in contrast, provides a step-by-step process for decision making (Mitchell, B., 1997). Frameworks seek to simplify the complexity of the real world by selectively emphasizing the fundamental aspects of a system at the expense of incidental detail. In presenting an approximate view of reality, a model must remain simple enough to be understood and used, yet complex enough to be representative of the system being studied (Anderson, M. G. & Burt, T. P., 1985; Mitchell, B., 1979).

3.6.1 Planning Frameworks

Planners have developed frameworks that reflect the main philosophies in this field at a given point in time (Nelson, J. G. & Serafin, R., 1995). These frameworks are located on a continuum, with rationalism at one end and pure intuition on the other (Weston, J., 2000). The

synoptic or comprehensive rational planning framework is located at the rational end of the continuum and has dominated planning for four decades (Nelson, J. G. & Serafin, R., 1995). The incremental planning framework is located in the middle of the continuum and is one of the more recent frameworks applied in planning, while the civics framework embraces intuition. The latter two types of frameworks have been developed as a criticism of the first framework (Mangun, W. R. & Henning, D. H., 1999; Mitchell, B., 1997; Nelson, J. G. & Serafin, R., 1995).

These three types of planning frameworks illustrate a paradigm shift in thinking. The synoptic framework is exclusively driven by scientific data and knowledge, whereas the civics framework is inclusive of all types of knowledge and may place more emphasis on intuition than scientific knowledge (Nelson, J. G. & Serafin, R., 1995). The incremental planning framework recognizes the difficulty of obtaining complete knowledge, and a requirement to take small steps towards change. The planning frameworks therefore differ on three main fronts: the types of information that drive them, the actual decision-making process and the decision makers themselves.

The synoptic planning framework has a set process (refer to Figure 1, Appendix 2), which is implemented by professionals and experts. The type of data required to drive the process is scientific and supposedly objective. The information and data produced from this planning framework are distributed to those affected, but to inform them rather than to solicit public input or participation into the planning process. The main criticism of this planning framework is that it is difficult to get enough data to gain complete knowledge or understanding of a complex environmental problem (Mitchell, B., 1997; Nelson, J. G. & Serafin, R., 1995) and this factor makes the framework difficult to apply. Another criticism is that the framework does not include the public and is considered elitist because only professionals and experts are allowed to implement it (Nelson, J. G. & Serafin, R., 1995).

The incremental planning approach was developed as an alternative to the synoptic planning framework (Mitchell, B., 1997). It recognizes that complete knowledge about a problem is often not possible and that an optimal solution rather than a perfect solution is acceptable (Mangun, W. R. & Henning, D. H., 1999). The process is not as clearly defined as in the synoptic framework. It tries to mimic real decision-making processes in which small steps are taken away from the *status quo* (refer to Figure 2, Appendix 2). This approach tries to incorporate multiple perspectives and values from different stakeholders. The main criticisms of the incremental approach are that it does not consider a wide range of alternatives and that it may be difficult to apply well.

The civics framework is characterized by strong public involvement and capacity building (Nelson, J. G. & Serafin, R., 1995). This framework attempts to include all information produced at the local and regional level as well as scientific information. The basic premise is that, by including local involvement at the onset of the process, the solutions found will be acceptable to the majority of the people and will be implemented more easily. The process is not clearly defined, but is built and developed through consensus amongst all stakeholders (refer to Figure 3, Appendix 2). The main limitations are the time and costs involved in implementing the process (Nelson, J. G. & Serafin, R., 1995). More specific detail on each of these planning frameworks is provided in Table 3.1.

Table 3.1: Comparison of Planning Frameworks

Criteria	Synoptic Approach	Incremental Planning Approach	Civics Planning Approach
Definition	An approach where the "... planner should examine all components and all relationships in project" (Mitchell 1997:56).	An approach where planning..." is "bounded" because not all detail and complexity is considered" (Mitchell 1997:86).	Consensus based planning that involves the public, comes from the bottom up rather than top down.
Philosophical underpinning	Based on scientific theory, systematic search for a solution or single answer. Produced from the top of a hierarchy, relies on scientific information, and is comprehensive.	Based on reality of making decisions in real world, change is only slightly different from the *status quo*; it occurs by small steps. Use a strategy to analyze problem rather than complete scientific knowledge, evolutionary approach (Mangun, W. R. & Henning, D. H., 1999).	Based on mixed scanning approach (which examines a number of alternatives and choosing the best) and transactive planning which involves constant and ongoing interaction among different stakeholders. Prepares individuals and groups to participate in decision making in mutually beneficial ways.
Basic principles	Relies on expertise, scientific knowledge, deductive logic, measurement and a clear replicable system. Implementers have characteristics of an economic person who can identify and rank goals, values and objectives and can choose between them by systematic evaluation to maximize returns (Mitchell, B., 1997);(Pal, L. A., 1997). Enough scientific knowledge can be collected to understand and control a situation.	Analysis limited to alternatives similar to *status quo*. Simplify and focus strategies. Intertwine analysis of policy goals with values and empirical aspects of problem. Greater analytical preoccupation with ills to be remedied than positive goals to be sought. Sequence of trials, errors and revised trials. Analysis explores some but not all of the possible consequences of an alternative (Lindblom, C.	Based on cooperation, accommodation and adaptation. Recognizes value differences. Encourages communication. Sets the decision-making context. Interaction among participants results in mutual learning. Information produced at a regional or local level and is prepared by and for a range of interest groups. Information is therefore more varied.

Table 3.1: Comparison of Planning Frameworks

Criteria	Synoptic Approach	Incremental Planning Approach	Civics Planning Approach
		E., 1979).	
How scientific information is incorporated	Scientific knowledge is very important and the basis for making decisions, considered the norm for addressing current natural resource problems and environmental assessment	Recognized as an important part of the process but that there are limitations to available knowledge, a complete knowledge of problem is not possible.	More emphasis placed on information that is based on perceptions, attitudes and values rather than scientific based. If scientific knowledge used, it is agreed upon through consensus
Decision-making process	Top down, cost-benefit analysis based.	Multistakeholder.	Based on consensus amongst a variety of interest groups.
Main benefits	Tries to get complete understanding of problem, provides a standard planning process.	Designed incompleteness through strategic analysis. Mimics reality.	Ensures that all types of information are considered and that all interest groups are listened to, promotes a win/win situation.
Main constraints	Does not apply in situations where uncertainty exists. Lack of public participation. In the real world, multiple decision makers with conflicting perspectives and priorities make decisions. Information often not available or contradictory, and it is never comprehensive (Doern, G. B. & Phidd, R. W., 1992; Pal, L. A., 1997;).	Not all people can apply incrementalism well. It does not consider much more distant and perhaps better alternatives. Does not look at the ideal but more at the achievable.	Costs are high, both in terms of time, and money. Sometimes local people do not have time or interest to become involved in the decision-making process.
Stakeholders	Scientific experts.	Governments, stakeholders, public.	All interested individuals and groups and government.
Main decision makers	Experts.	Governments, stakeholders, public.	All interested individuals and groups and government.

3.6.2 Ecosystem - Based Management Approaches

Ecosystem-based management approaches have been developed to aid decision makers. They recognize that a more holistic approach is required for environmental management. The ecosystem-based management approaches most commonly identified in the literature are: the ecosystem, the integrated environmental and adaptive. The approaches have been widely applied; however, they are still being developed. These approaches are all driven by the requirement for scientific knowledge, though the importance of other types of knowledge is also recognized

(Korfmacher, K. S., 1998). Where they differ is on the degree of comprehensiveness and the strategy (or lack thereof) for management. Details of these approaches are presented in Table 3.2. The PCA encourages ecosystem-based approaches to ensure ecological integrity is maintained in its national parks (Feick, J, 1998).

The ecosystem management approach is very comprehensive and has been compared to the synoptic framework (Mitchell, B., 1997). It attempts to integrate scientific knowledge of ecological relationships within a complex socio-political process and values framework (Franklin, J. F., 1997; Grumbine, R. E., 1994). A main benefit of this approach is that it attempts to evaluate environmental problems holistically, rather than from a single species' perspective. It has been criticized for being too cumbersome and for assuming that complete knowledge about an ecosystem is possible (Fitzsimmons, A. K., 1996). It has also been difficult to apply because no clear guidelines have been developed for its application in the PCA.

The integrated environmental management approach, in contrast, identifies the most important elements of a problem and concentrates effort on them. It is not driven by comprehensive scientific knowledge, but rather identifies the key types of knowledge required. It falls between comprehensive and incremental planning (Born, S. M. & Sonzogni, W. C., 1995). The integrated environmental approach comprises four main dimensions: comprehensive/inclusive, interconnective, strategic/reductive, and interactive/coordinative. The first three define the problem and set the context, while the final one demonstrates how the approach is applied to management. It focuses on trying to incorporate the main stakeholders into the process including the public. The main criticism of this approach is that, in order to work, it needs to be implemented very early in the management process.

The adaptive management approach is based on a system of trial and error. It recognizes that scientific knowledge is incomplete, but that decisions have to be made to try to determine the ways in which the environment will react to a management action. Hence hypotheses are developed and tested. It is expected that data collected from these experiments will feed back into the decision-making process to improve the next set of management decisions (McLain, R. J. & Lee, R. G., 1996; Walters, C. J. & Holling, C. S., 1990). The adaptive management approach is currently proposed as an ideal approach to follow by the Ecological Integrity Panel (2000). The panel states that the principles of the adaptive management approach are ideal for the PCA because decisions need to be made to reverse environmental degradation. Even if the knowledge is incomplete, an attempt has to be made, using information that is available, to address impact. The results of the management decision will feed into changing a course of action for the future.

Table 3.2: Comparison of Ecosystem-Based Management Approaches

Criteria	Ecosystem Management	Integrated Environmental Management	Adaptive Management
Definition	Integrates scientific knowledge of ecological relationships within a complex socio-political and values framework. It moves toward the general goal of protecting natural ecosystem integrity over the long term (Grumbine, R. E., 1994).	Is a holistic and goal-oriented approach to environmental management that addresses interconnections through a strategic approach (Margerum, R. D., 1999). Comprises four dimensions: comprehensive/inclusive, interconnective, strategic/reductive, interactive/coordinative.	Based on a more traditional form of management with a central tenet that management involves a continual learning process through trial and error. Believes that management can be adjusted to changing circumstances, events and decisions, and that a strategic approach is not necessary.
Philosophical underpinning	Based on the synoptic planning framework. Goal to synthesize ecosystem science to provide a transdisciplinary framework that links biophysical and socioeconomic research and practice.	Falls between classic comprehensive/ rational and incremental planning. Response to traditional natural resource management which has been reactive, disjointed and narrow (Born, S. M. & Sonzogni, W. C., 1995). Integrated, holistic and goal-oriented approach to environmental management that addresses interconnections through a strategic approach.	The rational planning model plus trial and error, has been incorporated into integrated environmental (ecosystem) management. Focus is ecosystematic rather than jurisdictional. Based on a population or ecosystem not individuals. Time scale is biological rather than business-oriented.
Basic principles	Is inter or transdisciplinary. Uses a systems approach to describe structure, process, and dynamics. Uses multiple theories and methods. Is adaptive using monitoring and evaluation to gather and assess information. Generates hypotheses and models.	Requires stakeholder involvement and public involvement. Requires flexibility and cooperation in decision making. Requires supportive political structure (Walther, P., 1987). It is also a good model to use in complex situations, attempts to be a proactive and anticipatory decision-making process. It balances the interests of environmental resource users and affected parties It integrates social and environmental change (Born, S. M. & Sonzogni, W. C., 1995).	Conditions of adaptive management. "The experiment cannot destroy the experimenter, that is someone has to learn from the experience. Experiment should not create irreversible changes in the environment. The experimenter must be willing to start again having learned from failures" (Mitchell 1997: 135). It is an interactive process.
How is scientific	Recognition that scientific data are very important but	Ensuring that all interest groups understand the	Recognizes that it is impossible to know

Table 3.2: Comparison of Ecosystem-Based Management Approaches

Criteria	Ecosystem Management	Integrated Environmental Management	Adaptive Management
information incorporated.	that social data may also be equally important. Educate managers and citizens on conservation science so that it is used in the decision-making process	ecological processes and gain scientific knowledge on how to make decisions with this information (Born, S. M. & Sonzogni, W. C., 1995).	everything and management proceeds as in a basic experiment. Management is adjusted as new information revealed.
Decision-making process	Tries to integrate different kinds of knowledge, not just ecological theory. Examines all aspects and issues within a problem and evaluates all knowledge input. Stresses that cooperation and opening up of the decision-making process are the key to applying an ecosystem management process. Citizen support must be built by ecological literacy and environmental advocacy so that citizens are also involved in decision-making (Grumbine 1994).	Stakeholders need clear decision rules, the most effective of which is general or complete consensus. Stakeholders should base management of decisions on a sound understanding of environmental systems and interelationships. Stakeholders need to create structures and mechanisms for coordinating decision making. It needs a clearly articulated, regularized process of information exchange and joint decision making (Margerum, R. D., 1999).	A decision is made to test a clearly stated hypothesis. Adaptive management considers the process of management a continual "learning experience, and encourages approaching management as a series of experiments from which new knowledge leads to continuous adjustments and modifications (Mitchell 1997:54)."
Main benefits	Comprehensive holistic approach for understanding whole systems. Recognizes diversity of cause and effect, uncertainty and probabilistic nature of ecosystems. Draws on theory and methods from different fields to generate models and hypotheses. Contributes to understanding limits, complexity, stresses and dynamics. Facilitates locally appropriate development.	Stakeholder and public involvement. Considers impacts on local people, and generates local support. Focuses on core ideas of problem and therefore is more practical. Concentrates on key components and linkages; more limited focus; believes a small number of variables cause a large proportion of variation; keeps expectations more realistic (Mitchell 1997: 57).	Recognizes that knowledge is incomplete and that trial and error are required to gain better understanding. The result is that that some action can be taken, to address the situation, but need to recognize that it may be modified.
Main constraints	Danger from generalizing from biophysical to socioeconomic. Theory not well developed. Lack of boundaries (temporal and spatial) may result in too much complexity. Scientific uncertainty, lack of a good database and	Needs to be integrated as early as possible. Needs clear political commitment. Requires a high amount of money and time.	An over-reliance on synoptic planning models; reliance on science based data; other types of data not included or discounted. If communication amongst interest groups is lacking, information is not shared (McLain, R. J. & Lee, R.

Table 3.2: Comparison of Ecosystem-Based Management Approaches

Criteria	Ecosystem Management	Integrated Environmental Management	Adaptive Management
	basic rules. Lacks consistency and accountability (Fitzsimmons, A. K., 1996).		G., 1996). Too much emphasis on the use of linear systems models. Politically, once a course of action is taken it is not likely to be reversed (Mitchell, B., 1997). Requires a high amount of financial and human resources.
Stakeholders	Participatory; seeks individual and institutional cooperation and integration.	Multistakeholder, public participation.	Multistakeholder.
Main decision makers	Government, researchers and local interest groups.	Government, researchers and local interest groups.	Government, researchers and local interest groups.

3.6.3 Policy/Decision-Based Frameworks

Frameworks developed with an emphasis on decision theory illustrate the linkages between the types and importance of knowledge more clearly than the other types of frameworks. This focus enables policy and decision makers to provide both clarification and justification for decisions (Doern, G. B. & Phidd, R. W., 1992). Three contrasting frameworks outline how scientific information should be included in the decision-making process. They are: 1) Underwood's model outlining the relationship between decision making and scientific research (Peterson, D. L., 1996; Underwood, A. J., 1995); 2) the analytical hierarchy framework (Peterson, D. L., 1996; Schmoldt, D. L., Peterson, D. L., & Silsbee, D. G., 1994); and, 3) the multiple criteria model (Munda, G., Nijkamp, P., & Rietveld, P., 1994; Smith, P. G. R. & Theberge, J. B., 1987) (refer to Table 3 for details).

Underwood's model is based on the premise that different types of research produce different types of data. He recognizes that different types of data are required at different phases of the decision-making process. His framework clearly outlines the inputs that different types of research have at different stages of the decision process (refer to Figure 4, Appendix 2). The main goal of his framework is to identify all of these relationships in order to improve understanding and help direct the appropriate information to the correct stage to improve the validity of decision making (Underwood, A. J., 1995).

The multiple criteria decision-making framework recognizes that decisions incorporate many types of data, perspectives and values. One way to improve decision making is to identify all of

these inputs and then determine a numerical value for each one of the alternatives. Taking this step can ensure that both qualitative and quantitative data are given appropriate weighting in a decision-making process (Munda, G., Nijkamp, P., & Rietveld, P., 1994; Smith, P. G. R. & Theberge, J. B., 1987). The decision-making process can be repeated again with another problem. The drawback to this method is that the weightings are largely subjective.

The analytical hierarchy process is identified as helping to produce decisions that are "rational, consistent, explicit and defensible" (Schmoldt *et al.* 1995: 707). The process develops a hierarchy, or a decision tree, for simplifying and assessing complex decisions that are based on multiple objectives (Peterson, D. L., 1996). It is based in decision theory and comprises both judgements and formal mathematics to quantify and express ideas (Schmoldt, D. L., Peterson, D. L., & Silsbee, D. G., 1994). A main benefit of this framework is that it is very easy to use with a minimal amount of training. It also helps to identify priorities for management, the importance of data to support decisions and, if enough data are available, to make the decision (Peterson, D. L., 1996).

Table 3.3: Comparison of Decision-Making Frameworks

Criteria	Underwood's Model	Multiple Criteria Evaluation Framework	Analytical Hierarchy Process (AHP) Framework
Definition	Research produces types of knowledge. This knowledge and data are required at different stages in the decision-making process, Recognition of the requirement of different kinds of research at each stage of the decision-making process. Facilitates an understanding of this process and improves the decisions.	Integrates measurements of several separate criteria to arrive at a choice from among a series of alternatives (Munda, G., Nijkamp, P., & Rietveld, P., 1994; Smith, P. G. R. & Theberge, J. B., 1987). Based in management science. Converts all criteria to quantitative numbers for comparison.	Allows for multiple objectives and viewpoints, uses hierarchies to structure decision making, and applies judgement measures and formal mathematics to express and quantify individual preferences. Is a systematic process for prioritizing projects (Schmoldt, D. L., Peterson, D. L., & Silsbee, D. G., 1994).
Philosophical underpinning	Incorporation of research into decision making is inadequate; adaptive environmental management	Based on Decision Theory and utility theory (preferences of decision makers for different types of data)	Based on Decision Theory, and importance of structuring a hierarchy of decision
Basic principles	Four types of research are identified: 1) Available and directed 2) Applied and environmental 3) Basic and strategic 4) Managerial Each type has different links to management and	Based on principles and assumptions that are valid and easily illustrated and understandable to decision makers and the public. Make explicit subjective values and judgements. Yields results that are repeatable. Allows use of	The use of hierarchies to structure decision making. The application of judgement measures and formal mathematics to express and quantify individual preferences. Values can be applied to various problems, both in

Table 3.3: Comparison of Decision-Making Frameworks

Criteria	Underwood's Model	Multiple Criteria Evaluation Framework	Analytical Hierarchy Process (AHP) Framework
	feedback mechanisms.	qualitative and quantitative information in a methodologically sound way. Increases insight. Enables use of data at different spatial scales. Considers alternatives both separately and in combination.	terms of importance and economics. Important to use when problem is complex, with many alternatives fighting for priority.
How scientific information is incorporated	Different types of scientific knowledge are incorporated into steps of decision-making process where required.	By ranking criteria numerically and a weighting system.	Scientific information and value system form the basis of evaluating alternatives.
Decision-making process	Existing research used to help set agenda and define problem. Management solution is proposed. Hypotheses are developed. Feedback loops are developed Research is conducted to: 1) test hypotheses, 2) develop new models if old ones fail, 3) determine how managers arrive at the chosen models and tests of hypothesis.	Based on the realization that a problem may comprise many criteria; criteria are not necessarily similar, but all should be included in the analysis. An evaluation process is developed to ensure all criteria are considered in final process. These evaluations are transformed into numerical form for analysis. They may be weighted or aggregated to provide alternatives for decision makers to choose from.	Project goals defined; all data inputs determined; relative importance of inputs and management decisions evaluated. Decision made depending on rankings is consistent and defensible (Schmoldt, D. L., Peterson, D. L., & Silsbee, D. G., 1994).
Main benefits	Purpose is to analyze research and environmental decision making so that relationships and purposes become clearer. Helps lead to more examination and analysis of the various ways in which ecological research might be improved. Helps to ensure that appropriate findings, models and/or opinions become incorporated into a complex mechanism for making decisions. Tries to understand the entire process of incorporating data and	Provides a way to follow the decision-making process. A good process depends on the way inputs such as information, human resources and models are used to produce a decision (Janssen, R., 1992). Generates information on decision-making problem from available data. Generation of solutions (alternatives) to a decision-making problem. Provides a good understanding of structure and content of a decision-making problem.	Identifies goals and objectives and types of knowledge and importance of knowledge for making each decision. Identifies all considerations in dealing with a decision-making problem. Integrates views of a variety of decision makers (consensus). Application in a National Parks setting for identifying key inventory and monitoring needs.

Table 3.3: Comparison of Decision-Making Frameworks

Criteria	Underwood's Model	Multiple Criteria Evaluation Framework	Analytical Hierarchy Process (AHP) Framework
	research into decision making.		
Main constraints	Uncertainty factor. May be difficult to determine which type of science is being conducted and data may not classify that easily. No public involvement.	Aggregating criteria simplifies complexity. Ignores the relationship between criteria. Criteria are linked not independent.	Does not include multiple year time lines.
Stakeholders	Multistakholder	Multistakeholder	Multistakeholder
Decision makers	Researchers and/or government decision makers.	Researchers and/or government decision makers.	Researchers and/or government decision makers.

3.7 Analysing Decision-Making Processes

Although all the frameworks listed above are useful for clarifying the approaches to decision-making, the data, decision-maker and process, they are not as useful for analysing decision making. The Insitutional Analysis and Development (IAD) framework provides a method for analysing the decision-making process within an organization. This model is generic and can be applied to any decision-making process, both in the private and public sectors (Ostrom, E., Gardner, R., & Walker, J, 1994). It comprises elements of the other three models.

The IAD framework incorporates elements of the decision theory frameworks and outlines a means of examining a decision-making process within a government system (Ostrom, E., Gardner, R., & Walker, J, 1994). This framework, though not based in scientific knowledge, planning or ecosystem science, provides a useful method for analysing the decision-making process in a government body such as the PCA. The IAD framework facilitates the analysis of the decision-making process by identifying the elements of a conceptual unit or action arena. An action arena is the stage on which decisions are made. Given that the current PCA is complicated by a changing decision-making context and by a myriad of plans, application of the IAD framework is one way to clarify the process. The benefit of this framework is that it can be applied both theoretically and practically.

The IAD framework identifies the elements of any action arena. These seven elements are:

1) the participants,
2) their positions,
3) their actions,
4) the potential outcomes,
5) the decision-making structure,

6) information inputs, and

7) payoffs.

Participants and positions in an action arena are often quite similar. Participants are those actors who have a role to play in decision making in a given situation. Each participant may have a unique role to play in the situation. The minimum number of participants is one. There are often many different participants acting in a situation. Positions are the different roles that the actors (or participants) play in the action arena. The roles may vary, from an employee to a corporate executive officer. The strength of each actor's position is determined relative to other positions.

The actions are the set of decisions that participants may take at different stages of the decision-making process. Depending on the position that a participant holds or the strength of that position, different actions are available to them. The potential outcome is the result of the actions of the participants. A number of actions may be presented for the participants to evaluate. Each action may result in a different outcome.

The decision-making structure is the map of the different decision nodes that result in the intermediate or final outcomes. Within the decision-making process a number of different steps are followed before an outcome is reached. The mapping of these steps and nodes is useful to follow the decision-making process and to provide a rationale for the outcome.

Actions and decision-making structures are determined based on the type of information available. All information may not be available at the beginning of the decision-making process. It is important to identify which types were used to make initial decisions and what types of information were added in order to make the final decisions.

The final element in the action arena is the payoff. The payoffs are the benefits and costs of the actions and outcomes that result from the decision-making process (Ostrom *et al.* 1994). They are evaluated to determine the payoffs. "The payoffs differ from outcomes as they are the method of assigning positive and negative weights to the outcomes and the actions leading to outcomes" (p 32 Ostrom *et al.* 1994).

These seven elements are used to define action arenas. Further to these particular elements, investigators of action arenas also have to examine the rules that govern action arenas and the context of the cultural and physical worlds in which decisions are made. They also help the researcher to focus on the most important elements of the decision-making process, while leaving room to address multiple levels of decision making. The framework is not intended to be a recipe book that should be followed to the letter, but is used to improve the conceptualization of the action arena and to identify the data inputs into the decision-making process.

3.8 Discussion

The types of frameworks illustrated briefly in the previous section identify the importance of different types of data, the decision maker and the decision making process. Each framework has its benefits and limitations. The use of a framework in a particular situation depends on: the type of problem being addressed, the type of information available, the scientific uncertainty and complexity of the situation, the degree of public involvement, and the level of decision making required. The personal preferences of a decision maker also influence the decision-making process.

3.8.1 Planning Frameworks

The general planning frameworks are important for demonstrating a continuum of inputs to the decision-making process with respect to data, decision makers and the type of process. Table 3.4, identifies the relative importance of the three elements of decision-making with respect to each planning approach. These frameworks also reflect the main positions in the literature on the usefulness of scientific data to researchers. With the synoptic model, scientific or objective data are very important. Using a civics framework, however, requires that other types of data based on traditions or intuition are valued more highly. The decision makers within the synoptic model are professionals and experts, whereas within the civics model local input is emphasized. The actual decision-making process in the synoptic model is rationalist, very structured and top-down, whereas with the process of the civics approach more interconnections are recognized by the process (it is built from the bottom up and through consensus). The incremental approach falls between the two other models. It uses both natural science and social science data and tries to include a variety of decision makers. One of its major premises with respect to the decision-making process is that small steps towards a goal are much more feasible then trying to implement large changes.

Table 3.4: Comparison of Planning Frameworks Based on Three Elements

Framework	Biophysical data	Decision maker	Process
Synoptic	High	Medium	Low
Incremental	Medium	Medium	High
Civics	Low	High	Medium

3.8.1.1 Planning Frameworks and the PCA

Within the PCA the decision-making process is closely parallel to the synoptic approach. The data that are input into the process are based on data collected applying the internationally recognized scientific methods (Parks Canada 1994). The decision-making structure is very

hierarchical and top down. The top decision maker is a CEO who is guided by six directors general. There is no mention of the public or interest groups in the organization chart.

Although the synoptic planning approach has strongly influenced the structure of the PCA, there is evidence that a paradigm shift towards a civics approach has been necessary to address the issues that have arisen. For example, the action of expropriating land for national parks for half a century has led to a very angry public. With the creation of Gros Morne National Park, the park officials did make a greater attempt to appease the local residents by allowing traditional renewable resource harvesting activities (*Canada National Park Act* 2000). Another change has been the setting up of co-management groups with aboriginal people in new national parks such as Gwaii Haanas and Aulavic National Parks (McVetty, D. & Wight, P. A., 1999; Wight, P. A. & McVetty, D., 1999).

There has been a shift towards applying a civics approach to planning new national parks. The involvement of the public in the initial planning stages of developing national parks has been necessary to ensure that the process moves ahead and that new parks are being put in place. This factor has also required using not only data derived from internationally accepted scientific methods but including data and knowledge acquired by local people. As well, the local people have become more involved in setting the management requirements so that their interests have been included. However, the hierarchical structure of the administration of this organization demonstrates that the synoptic planning approach still has a very strong influence.

3.8.2 Ecosystem-based Management Frameworks

The planning approaches described in this chapter illustrate models applied to planning issues in a wide variety of circumstances and organizations. Ecosystem based-frameworks have been developed to assist decision making for issues involving the environment. The frameworks developed from the ecosystem-based perspective reflect a change in the scientific paradigm from studying single systems and species to trying to integrate the biological systems. More recent frameworks, such as the ecosystem management framework, the integrated environmental framework, and the adaptive management framework, attempt to include different types of knowledge, recognizing that within environmental management very strong components of politics, sociology and economics come into play in every decision. A clear decision-making structure has not yet been incorporated into the ecosystem-based frameworks. New ones are being developed to improve this situation (Tonn *et al.* 2000).

Each of these models attempts to explain how to address the complexity of environmental management issues. The ecosystem management approach is very similar to the synoptic model, in which decision are made only after all available information has been gathered and studies

have been conducted on an issue. Its premise is that with large amounts of information, better decisions can be made. This process tends to be very burdensome, because it is hard to address all concerns surrounding an environmental issue. The integrated approach simplifies a situation by prioritizing the main issues and focusing on these issues. The adaptive management framework however, works on quite a different basis, in which a decision is made based on a hypothesis, is tested and evaluated. Knowing everything before a decision is made is not necessary; however, the process ensures that once more is learned from a management action, it is incorporated into subsequent decisions. In theory, the process involves many stakeholders; in practice, non-government organizations are often left out of the process, and the types of data that are relied on are often based on the scientific method. Other types of knowledge are not viewed as important (McLain, R. J. & Lee, R. G., 1996).

Each of these frameworks provides an alternative for addressing environmental issues. The emphasis that the ecosystem and integrated frameworks place on data is very high, based on the premise that more data will lead to a better decision. While the ecosystem management approach provides very little guidance in terms of the decision-making process (it is left to the managers), the integrated environmental management approach promotes a strategy of prioritizing issues and concentrating on solving the main issues. The adaptive management process places less emphasis on the data and more on the ways in which data can be incorporated into the decision-making process.

3.8.2.1 Ecosystem-based Frameworks and the PCA

The PCA has long used ecosystem-based approaches to planning (Canadian Parks Service, 1992; Slocombe, D. S., 1992; Slocombe, D. S., 1993). A recent report prepared by the Ecological Integrity Panel (PCA 2000) states that an adaptive management approach is the way of the future for the PCA decision-making process. The Ecological Integrity Panel further notes that managers need to recognize that knowledge about the natural systems in parks will always be incomplete. Managers need to make decisions, however, to address issues, either to attempt to stop the degradation or to mitigate it by using the best available information. They can then monitor the environment to assess the outcome of the decision that has been made and make further decisions based on this new information.

3.8.3 Policy and Decision Based Frameworks

The planning-based frameworks provide the broad parameters for scoping an issue. The ecosystem-based frameworks identify specific types of data and the decision makers for addressing environmental issues. Decision-theory based frameworks focus specifically on the

decision-making process. They do not specifically discuss the scoping exercise or the issue, but discuss instead what to do after an issue has been defined. These frameworks examine the specific decision-making process and how and when data should be brought into it.

The frameworks based in decision theory, such as the multi-criteria attribute theory, the analytical hierarchy theory and Underwood's conceptual framework and the IAD framework also illustrate the importance of examining environmental management from a policy perspective. Underwood (1995) states that scientists need to recognize that just doing science will not result in an improved environment. They need to be actively involved in explaining the implications of their research to environmental managers. Researchers need to detail the implications of their research so that environmental management will improve. The different perspectives ensure that frameworks adapt to the new knowledge and new methods and approaches to decision making. Each one provides important understanding of the ways in which scientific knowledge is incorporated into the decision-making process.

Underwood's framework discusses decision-making as a circular process, with different types of data required at each stage as the process is applied. The multi-criteria attribute framework focuses more on providing a valuation of the data in order to provide alternative courses of action. The decision makers convert values to numbers so that the process is more systematic and hopefully less subjective (though valuing data will be a subjective decision in itself). The analytical hierarchy process describes the decision-making process as a set of priorities. The decision-making process follows each hierarchy in deciding on an alternative course of action.

The frameworks based in decision theory provide the greatest clarification on steps in the decision-making process and the types of scientific knowledge required at each step. As well, the frameworks demonstrate that the process and decision makers are important to either provide opportunities or constraints to employing different types of data.

3.8.3.1 Policy and Decision Based Frameworks and the PCA

The specific decision-making process in the PCA is not normally very detailed. A specific ranking of the relevance of data and/or the value applied to data is rarely found. The process that is followed, a circular structure or hierarchy, is also not detailed. These processes will be explored in greater depth in subsequent chapters.

The Ecological Integrity Panel (Parks Canada Agency 2000) states that the PCA requires a system of accountability for decisions. For this reason, they recommend that the adaptive approach be applied to decision making. An approach such as Underwood's model, however,

would provide more specifics on the actual decision-making process and the relevance of information to each stage of the process. The multi-criteria model has been used in terms of issues relating to protected areas to help determine alternatives (Smith, P. G. R. & Theberge, J. B., 1987).

The IAD framework is a tool used to analyse the decision-making process within an organization. Because it is generic, the type of approach or framework used to make decisions is not significant. It provides a framework to evaluate facets of decision making for an organization. This framework is used to for the decision analysis in Chapter 5.

3.9 Conclusion

The goal of this chapter was to increase the understanding of decision-making processes in environmental management by reviewing the literature. Three facets of decision making were examined: the data, decision maker and process. Because national parks management contains components of both visitor management and environmental management, it requires the use of both biophysical and social science data and information. A review of the literature suggests that both are being used to a certain extent in decision making. The three positions examined, however, demonstrate that there is reluctance to base too much emphasis on scientific data because of data gaps and lack of understanding of ecosystem processes. It was found that this scientific uncertainty and complexity of environmental situations does encourage decision makers to be cautious. Other factors influencing the use of scientific data and information in decision making are the value systems of decision makers (personal choice), the ability to analyse decisions and communication. This review of knowledge and use of this knowledge in decision making provides a general background of concerns identified in the literature about how and what types of data should be incorporated into decision-making processes in environmental management and the role of the decision maker.

There are parallels between the positions held on the importance of scientific knowledge on decision-making processes and the planning frameworks. The analysis of the planning, ecosystem-based and decision theory frameworks sets the context for clarifying the history and issues facing the decision-making framework within the *Canada National Parks Act*. Without a review of the history and major trends in the literature, it is difficult to assess where the field is moving and how improvements can be made to incorporate data into decision making.

As stated in the review of the models, there is no consensus in the literature about what types of data should be used in decision making, who the decision makers should be, and how data should be valued. Perhaps more importantly, there is little direction on how decision makers should use and value data within the decision-making process.

Many changes have occurred within the PCA, including a shift in the planning paradigm from synoptic towards the civics framework. The types of data have also changed from a strong emphasis on scientific objectives towards including traditional knowledge and more social science data. As well, although the PCA retains a hierarchical structure in its decision making, it occasionally becomes flexible in terms of including other people, such as the public and aboriginal groups, in the decision-making process. The process of decision making is dynamic and will continue to change as new issues arise that are not successfully addressed using the current system.

4 An Evaluation of Visitor Management Frameworks

4.1 Introduction

Chapter 3 discussed the influences of planning, ecosystem-based management and decision theory on the evolution of the national parks decision-making process with respect to general environmental management. This chapter delves into the options for addressing a more specific type of management, that of visitor management in natural areas. Visitor management is the process used to minimize environmental and social impacts of visitation in natural areas and to provide good opportunities to visitors as well as interpretation. Managers recognize the limitations of natural areas to support a variety of visitor activities without some degree of impact (Hall, C. M. & McArthur, S., 1998). Visitor management is accomplished through the modification of visitor behaviour or the modification of the natural environment (Hammitt, W. E. & Cole, D. N., 1998).

Management actions directed towards visitors include: the regulation of access to natural areas, limiting visitation by numbers and group size, determining the type of visitor desired, and stipulating the types of equipment that can be used in an area. Other management actions related to facility management include charging entry fees, modifying (or hardening) the site, and promotional marketing of a site to ensure visitors know what to expect when they arrive as well as education. The park managers may focus on research and education to monitor the environment and the visitors, provide interpretation and education, and encourage alternative education providers and volunteers to help modify behaviour (Hall, C. M. & McArthur, S., 1998).

Many of these management actions are implemented in isolation. This is due to the compartmentalization of the management of a natural area. The PCA, for example, divides management into resource conservation, visitor management and general works (facility management), whereas, the US Forest Service bureaucracy is organized along functional lines with few incentives for integration (McCool, S. F. & Cole, D. N., 1997a). Communication amongst various groups in an organization does not always occur. As a result, the implications of decisions on visitor management issues for other aspects of natural areas management are not always known (Ritter, D., 1997). A framework, clearly outlining a visitor management decision-making process, ensures that each time a visitor management issue arises, a similar and complementary solution is determined. Implementation of a visitor management framework also provides a traceable, defensible and transparent decision-making process. Visitor management is complex and requires a multidisciplinary approach, which necessitates a good understanding of

the natural resources and visitors. Consequently all visitor management frameworks require some consideration of both social science data and natural science data in decision making.

4.2 Purpose

The main purposes of this chapter are threefold. First, the main formalized visitor management frameworks used in parks and described in the literature are introduced and briefly described. Second, these frameworks are compared with respect to data requirements, decision-making processes and decision makers. Third, recommendations are made on the ways in which these models may be better incorporated into the management of Canadian national parks and the constraints for so doing.

4.3 Visitor Management Frameworks

A variety of informal visitor management mechanisms have been presented to managers over the last century. These mechanisms incorporate elements from society, the environment and the economy. They have been widely applied and are useful on a case by case basis; however, considerable discretion is required to apply them at a larger scale. These strategies have not been completely successful because they are not proactive, do not provide guidance over the long term and because there are inherent contradictions in their application to visitor management in national parks (Lucas, R. C. & Stankey, G. H., 1985; Payne, R. J. & Graham, R., 1993). The main principle that guided visitor management prior to the development of visitor management models was carrying capacity (Cole and Stankey 1997). The carrying capacity principle promoted the idea that there was a direct relationship between use and impact. Many managers have realized, however, that this principle is inadequate because it was originally formulated for range animals, not people. In fact, amount of use is just one of the many parameters to be taken into consideration; other factors (e.g., environment variables and visitor behaviour) may have a greater impact on the environment (Cole, D. N. & Stankey, G. H., 1997). Over the last 20 years, formal visitor management frameworks have been developed in response to the inadequacy of the carrying capacity model, to improve on the informal management mechanisms developed to aid managers. These frameworks theoretically ensure that management actions are defensible, comprehensive and consistent (Graefe, A. R., 1990). The benefit of using a framework is that it leads to the development and formalization of agreements about what data are required and how data are to be used in decision-making processes (Meis, S. M., 1990). The six frameworks most frequently mentioned in the literature are as follows:

1) Recreation Opportunity Spectrum (ROS) (Clark, R. N. & Stankey, G. H., 1990; Driver, B. L., 1990),
2) Visitor Activity Management Process (VAMP) (Canadian Parks Service, 1988),

3) Limits of Acceptable Change (LAC) (Hendee, J. C., Stankey, G. H., & Lucas, R. C., 1990; McCool, S. F. & Stankey, G. H., 1986),

4) Visitor Impact Management (VIM) process (Graefe, A. R., 1990),

5) Visitor Experience and Resource Protection (VERP) (Manning, R. E., Lime, D. W., & Hof, M., 1996) and

6) Tourism Optimization Management Model (TOMM) (Manidis Roberts Consultants, 1997; Wight, P. A. & McVetty, D., 1999a).

4.4 Description of Visitor Management Models

The Recreation Opportunity Spectrum (ROS) (Clark, R. N. & Stankey, G. H., 1990; Driver, B. L., Brown, G. H., Stankey, G. H., & Gregoire, T. G., 1987),the Limits of Acceptable Change (LAC) framework (Hendee, J. C., Stankey, G. H., & Lucas, R. C., 1990; McCool, S. F. & Stankey, G. H., 1986), the Visitor Impact Management (VIM) process (Graefe, A. R., 1990), and the Visitor Activity Management Process (VAMP) (Canadian Parks Service, 1988) have been the focus of most analyses to date (Hall, C. M. & McArthur, S., 1998; Nilsen, P. & Tayler, G., 1997; Payne, R. J. & Graham, R., 1993). Two others have been developed more recently to deal with issues that are not adequately addressed by the initial ones: Visitor Experience and Resource Protection (VERP) (Manning, R. E., Lime, D. W., & Hof, M., 1996) and Tourism Optimization Management Model (TOMM) (Manidis Roberts Consultants, 1997; McArthur, S., 1997; McVetty, D. & Wight, P. A., 1999). Detailed flow diagrams for each of these frameworks are presented in Appendix 3. Each of these visitor management frameworks is described in turn in the next sections. As well Table 4.1, presented at the end of Section 4.4, summarizes elements of the six visitor management frameworks.

4.4.1 Recreation Opportunity Spectrum (ROS)

The ROS (Clark, R. N. & Stankey, G. H., 1990; Driver, B. L., Brown, G. H., Stankey, G. H., & Gregoire, T. G., 1987) was developed in response to the inadequacies of the carrying capacity concept. It is based on the concept that providing a wide range of opportunities for users will result in good quality nature experiences for the majority of visitors. This framework categorizes recreation locations as opportunities along a continuum from modern and developed (e.g., cities and urban parks) to primitive and undeveloped (e.g., single camping sites and wilderness areas). A recreation opportunity setting is the combination of physical, biological, social (potential or existing recreational activities) and managerial conditions (designation of area as a National Forest, National Park etc.) that give value to a place (Clark, R. N. & Stankey, G. H., 1990) (refer to Figure 1, Appendix 3). ROS is applicable at the park level of planning. ROS is a tool, that is used to help managers comply with the *National Forest Management Act* (1976) in

the United States, which requires that the Forest Service "...produce an optimum range of social and economic benefits from the national forests under its management (Payne and Graham 1993: 187)".

ROS is a planning tool that is used to help managers decide how a recreational area should be managed. The steps of this process are:

1) the development of an inventory and map of a potential recreation area including physical, social and managerial options;
2) an analysis of information collected in step 1) to identify inconsistencies, define classes, integrate with other activities, identify conflicts and recommend mitigation;
3) determine a timeline for the management of these areas;
4) design a site;
5) implement management prescriptions; and
6) monitor results (Clark, R. N. & Stankey, G. H., 1990).

The application of this framework results in a matrix and a map. This matrix includes all relevant information about a region to determine a recreation designation. It also clarifies the social, physical, biological and managerial relationships relating to the region. The map identifies the different zones in the recreational region. A designation of an area by the ROS process results in managers applying a standardized management strategy. For example, if an area is designated as a primitive natural area it is unlikely that managers would approve improved access to the area, or the development of condominiums or other major types of infrastructure.

ROS is widely referenced in the literature as providing a basis for identifying recreational opportunities. ROS has been widely applied in North America, New Zealand, Australia and Scandinavia (Payne, R. J. & Graham, R., 1993; Hall, C. M. & McArthur, S., 1998). Wollmuth (1982) applied ROS to river systems but found that the zoning that was used and the types of activities identified for each zone in the ROS framework did not apply to river systems. It has been applied with success in many Canadian national parks such as Pukaskwa, Banff, Yoho, Kootenay and Jasper) (Canadian Parks Service 1986) and in some provincial Crown lands.

Criticisms of the ROS are related to its complexity. Managers have been reluctant to apply ROS, but training sessions, demonstration films, and sending in experienced personnel have helped to overcome some of the problems (Clark, R. N. & Stankey, G. H., 1990; Driver, B. L., 1990). There is a need to improve methods identifying and measuring experience opportunities and to develop a better understanding of the link between settings and experiences (Wollmuth, D. C., 1982).

4.4.2 Visitor Activity Management Process

The Visitor Activity Management Process (VAMP) was developed in response to a need for a visitor management strategy in Canadian national parks (Canadian Parks Service, 1988; Payne, R. J. & Graham, R., 1993). A visitor management strategy would ensure that all services that the PCA provides for the visitor were integrated (Ashley, R., 1990). It ensures that a consistent overall approach is used for visitor management, and that a method of monitoring the effectiveness of service provision and method to gather and organize data are put in place (Tayler, G., 1990). The implementation of VAMP requires knowledge of both social and physical attributes in a national park. VAMP is an issue-driven framework and integrates both informal and formal knowledge with respect to visitors. It is based on understanding visitors' needs and perceptions. It builds a list of potentially appropriate activities for each national park and assesses them by cross-referencing with the natural resource management process, to determine if they are acceptable in the environment in which they have been designated (refer to Figure 2, Appendix 3).

The VAMP generally follows seven steps:

1) a terms of reference is developed;
2) existing park purpose and objectives statements are confirmed;
3) a database describing park ecosystems is organized;
4) alternative visitor opportunities and existing visitor services are identified;
5) the existing situation is analysed and alternative visitor activity concepts are produced;
6) a park management plan is developed and;
7) the park management plan is implemented (Nilsen, P. & Tayler, G., 1997).

The types of information required to implement VAMP are primarily social science data collected to understand the visitor and visitor activities. VAMP incorporates biophysical data, environmental impact data and more precise information on visitor impacts on the environment from data resulting from the application of the Natural Resource Management Process, which runs parallel to VAMP in the overall Canadian national park system planning process (Nilsen, P. & Tayler, G., 1997). The data collected in this second planning process are primarily biophysical data on site conditions (Payne, R. J. & Graham, R., 1993).

Theoretically, VAMP is fully integrated into other aspects of park management, such as resource management and operation management. It is applicable at the site or park level. The actual influence that VAMP has in terms of helping to address current visitor management issues in Canadian national parks is minimal. The framework is not officially promoted by the PCA National Office (Contact Person 2, 2000), although managers may use it to identify appropriate

activities in a park. VAMP is a planning tool, similar to ROS, but the specific focus is on the visitor.

Glacier National Park implemented VAMP by focussing on the campgrounds within its boundaries. The implementers were able to incorporate previous studies into the process (Reynolds, R. J., 1990) which facilitated the framework's application. It has not been applied in other countries because it has been developed specifically for Canadian national parks, not as a generic model.

The slowness of completing a process such as VAMP is a result of its complexity. In fact, two researchers only commented on part of the process, the appropriate activities research, for the rest of the details had not yet been etched out (Nilsen, P., 1994; Wright, P., 1994). It may take many years to fully develop and implement VAMP. Critics of VAMP state that some parts of the process are much too complicated despite the existence of a manual provided by the Canadian Parks Service (Canadian Parks Service, 1988; Nilsen, P., 1994; Wright, P., 1994). VAMP has the ability to include scientific data when the focus is on the receiving environment, but the monitoring process and feedback mechanism for incorporating data are not clear. One other strong criticism of VAMP is that it does not include the public in decision making (Payne, R. J. & Graham, R., 1993).

4.4.3 Limits of Acceptable Change

The Limits of Acceptable Change (LAC) planning system was developed as a response to the inadequacies of the carrying capacity concept. It is based on three key factors: visitor expectations, impacts of recreational behaviour and the relationships between them (McCool, S. F., 1990). The understanding of the three factors results in setting realistic standards of acceptable impacts in natural areas. These standards are set by discussion among all stakeholders involved in the application of this framework (Payne, R. J. & Graham, R., 1993) and management actions are taken in a way that ensures that standards are not exceeded.

The process flows in a circular manner from the identification of concerns, defining and describing management objectives, selecting indicators or resource and social conditions, inventorying resource and social conditions, specifying standards for resources and social condition indicators, identifying alternatives, identifying management actions for each alternative, evaluating and selecting an alternative, and implementing actions and monitoring conditions (refer to Figure 3, Appendix 3). LAC is applicable at both the park-specific and site-specific scale.

LAC is used to determine an appropriate management action to address environmental impact issues and/or the quality of a visitor experience (Stankey, G. H., McCool, S. F., & Stokes,

G. L., 1990). The data that drive the initial scoping exercise are primarily biophysically based if environmental impacts are assessed and social science based if social impacts are assessed. The framework is applied by park staff and other participants involved in the process. Because LAC focuses more precisely on standards of acceptable conditions and the monitoring of conditions to ensure they are within acceptable limits, management is "equipped with a logical and defensible case to identify and implement actions to protect or achieve the conditions" (Manidis Roberts Consultants, 1997; 6). LAC therefore is a good tool for managers to use as justification for their actions and fits into the overall management process.

LAC has been implemented in both the United States and Australia, however often the process has been incomplete (Hall, C. M. & McArthur, S., 1998). One place to which it has been successfully applied is the Bob Marshall Wilderness Area (Ashor *et al.* 1994; Warren, D. M., 1991). In their case study, the authors stated that the framework has many principles that are important for comprehensive visitor management.

Despite LAC's strong reliance on biophysical data, it has been criticized for its reliance on perceptions and values (informal data) and the requirement for interest group involvement. Public involvement may slow the process down, making it difficult to reach consensus. With the difficulty of choosing indicators and determining cause and effect, managers may have problems interpreting natural science data and incorporating it into the framework. It has been further criticized for its narrow focus: because the process was created by managers for managers, it can be difficult to involve other stakeholders; also, indicators and standards are chosen by the managers, and not the broader tourism sector (Hall, C. M. & McArthur, S., 1998).

However, a review of case studies demonstrates that interest groups have not been involved to as great an extent as originally perceived possible (Hall, C. M. & McArthur, S., 1998). Governments may not be able to let go of power and may not ensure that the voices of interest groups are heard (Payne, R. J. & Graham, R., 1993). When the public is involved, it is often not given a strong role in decision making, such as assisting in choosing indicators and standards (Hall, C. M. & McArthur, S., 1998). It has been difficult to determine appropriate indicators to demonstrate change of conditions over time as they relate to recreation use (Knopf, R. C., 1990; Watson, A. E. & Cole, D. N., 1992). In response to this concern, Watson and Cole (1992) have published a document that lists potential indicators and where they should be applied. Critics have suggested, however, that a more meaningful document would be one that demonstrates the specific merits and issues surrounding each indicator so that managers can decide which one to choose. With the difficulty of choosing indicators and determining cause and effect, managers may have problems interpreting data and incorporating them into the

framework. A final criticism is that the LAC does not have a clear step initially identifying the goals and objectives for the management area, thereby providing limited direction to managers in terms of the overall guidelines in the national park. The LAC framework has been widely tested but has not often been fully implemented (Hall, C. M. & McArthur, S., 1998).

4.4.4 Visitor Impact Management Process

The Visitor Impact Management (VIM) process was developed in response to a review of the application of the carrying capacity concept and visitor impacts (Graefe, A. R., 1990). VIM is based on the premises that:

1) there is no single predictable response of natural environments or individual behaviour to recreational use;
2) impacts do not exhibit a linear relationship with visitor use density; and
3) environments vary with respect to tolerance and some types of activity produce impacts faster than others.

These considerations apply to almost all problems with which managers are faced within the ecological, physical and social realms. Applying the VIM process recognizes that effective management involves both scientific and judgmental considerations.

The VIM process is composed of eight specific steps. The first five steps focus on problem identification. In this capacity the framework includes a pre-assessment step, which identifies all available data, an examination of management objectives, identification of key impact indicators and standards, and then incorporates a field component to evaluate the conditions of the resource in comparison to standards that are set. If there is a discrepancy between the two, the implementers continue with identifying the cause of the impacts, identifying a management strategy and implementing an agreed-upon course of action (refer to Figure 4, Appendix 3).

A particularly useful analytical tool incorporated into VIM is a matrix comprising impacts, proposed management action and the consequence or viability of implementing an option. This matrix ensures that decision points, data supporting them and the rationale for a subsequent choice of a management action are clear and trackable. VIM is a good tool to apply at a site-specific level. It is not a framework generated to help managers implement a piece of legislation such as ROS or VAMP. When applied to an issue, however, legislation and regulations that apply to that site are reviewed and incorporated at an early stage (Payne, R. J. & Graham, R., 1993).

The data incorporated into the VIM process are both social and biophysical. Typically it is applied by the U.S. National Parks Staff. One of the benefits identified is that it has a process

that allows the incorporation of both professional judgement and other types of data into decision making (Nilsen, P. & Tayler, G., 1997). VIM was developed to minimize negative impacts to the environment from visitor use. It is not generally applied to an entire park but typically is used at a smaller scale and fits into the overall park system plan.

Three case studies of natural areas that applied VIM were found in the literature (Graefe, A. R., 1990). The scope of the first case study was restricted to a shelter in the Great Smokey Mountains. The researchers found it easy to follow the steps of the process and to determine indicators. One area for which there appeared to be some hesitation was in determining a management action. The study stated that options would be weighed against each other using the biophysical data gathered, but criteria for this weighting were not given. The second application of VIM was to a front-country site, Logan Pass/Hidden Lake Trail Case Study, Glacier National Park. This site comprised three management areas. Results were similar to the first case study: biophysical data and indicators were easily obtained. The third case is a visitor perception study on the Buck Island Reef.

VIM is criticized for being very site-specific. This site-specific quality makes it difficult for managers to apply VIM to a broader situation. It has also been criticized for being reactive rather than proactive. In this sense, it waits until a situation has already developed rather than helping to head it off prior to the impacts. Finally, it is criticized for relying on primarily formal natural science data rather than including other types of data (Payne, R. J. & Graham, R., 1993). This quality limits its applicability to social aspects of visitor impacts.

4.4.5 Visitor Experience and Resource Protection

The Visitor Experience and Resource Protection (VERP) process is based on the social carrying capacity of natural areas (Manning, R. E., Lime, D. W., & Hof, M., 1996). It was developed in response to the fact that crowding usually negatively affects visitor experiences in national parks and may also impact the natural resource. The researchers' goal was to develop a process that was clear, specific and guided visitor use planning and management (Hof, M. & Lime, D. W., 1997). To this end, the researchers have stressed the importance of incorporating the VERP into the general management planning process for the US National Parks. By ensuring that VERP is part of the process, they are hoping that it will be implemented and that the results will influence the overall decision-making process in the national parks in the U.S.A.

The process comprises nine elements. First, an interdisciplinary team is assembled to address issues; second, a public consultation strategy is developed; third, a statement of the park purpose, significance, and primary interpretive themes are stated along with planning constraints; fourth, the park resources and existing visitor use are analyzed. The fifth element is to describe

the potential range of visitor experiences and resource conditions. The sixth element is to allocate the zones to specific locations within the park. The seventh element is to develop quality indicators and standards of both physical and social phenomena in national parks from data collected from interviews with visitors, park staff and the local community. These indicators and standards are subsequently monitored and appropriate management actions are taken to manage problems that may arise. Finally, management actions are taken when monitoring indicates that there is deterioration of the set standards (refer to Figure 5, Appendix 3).

This process, to date, has only been applied in its entirety to Archès National Park U.S.A. (Manning, R. E., Lime, D. W., & Hof, M., 1996). Initial steps have also been taken, however, towards its application in Mt. Ranier, Isle Royale National Parks, St. Croix National Scenic Riverway, and the Flagstaff Group in the U.S.A. (Hof, M. & Lime, D. W., 1997). It attempts to be more comprehensive in its decision-making process by widening the number of decision makers (e.g., park staff, community and public). Much of the information used, however, is qualitative and it is unclear how the process will incorporate scientific data, balancing it with qualitative data. This framework is still in the process of being fine-tuned.

Although a great deal of enthusiasm has been raised about VERP by its developers in terms of its application to visitor management in the completed case study, respondents were purposefully chosen, rather than randomly selected, to ensure that a variety of viewpoints was included. There may be a bias on the part of the researchers to focus on people whom they believe will give them the outcome that they want. VERP has some benefits in that it includes a variety of stakeholders and has become incorporated into the general management process of the US National Park Service. Another criticism of the framework is that the perceptions of visitors, park staff and local people are relied upon for determining environmental impacts. Perceptions are not the only indicator of environmental conditions; it is important to provide monitoring data gathered through field studies in order to demonstrate physical change in the environment. The authors recognize that it is fairly expensive to conduct research on indicators and standards. They suggest that another option is to hire an interdisciplinary team to assess the park and make the initial recommendations that staff can use in the planning process and for public consultation.

A recent decision was made by the U.S. Park Service to deal with issues such as indicators, standards, monitoring and management outside the process, so there may not be a strong commitment to implementing VERP. More research and case studies are required to understand fully where this framework fits into visitor management.

Critics of approaches based on carrying capacity, such as VERP, state that there are inherent problems associated with basing any management strategy on this concept because the

significance of numbers changes depending on the environment as well as perceptions of visitors and managers (Hall, C. M. & McArthur, S., 1998). The framework relies heavily on the perceptions of visitors, park staff and local people (Manning, R. E., Lime, D. W., & Hof, M., 1996). Perceptions of visitors are good for reporting incidents at a point in time (e.g., trees across a trail), but not necessarily a good indicator of environmental conditions over a season. Unlike park staff or local people who have a history in the area and may have noticed changes to the environment over time, visitors may only have visited the area once and may have different benchmarks upon which to base their decisions. The incorporation of some monitoring data on changes to the biophysical environment over a decade would strengthen this framework as a decision-making tool.

4.4.6 Tourism Optimization Management Model TOMM)

The TOMM is a new process that has only recently found its way into the peer-reviewed literature (Hall, C. M. & McArthur, S., 1998). The TOMM was developed as a means of addressing tourism on Kangaroo Island in Australia. The authors reviewed existing visitor management models and used the principles from the LAC framework but broadened the scope so that it could be used on a regional basis (Manidis Roberts Consultants, 1997). The TOMM is a planning and management tool that focuses on a range of relevant disciplines as well as the challenge of helping communities and the tourism industry to optimize the outcomes of tourism, not simply maximizing its growth or mitigating the damage it causes (McVetty, D. & Wight, P. A., 1999; Wight, P. A. & McVetty, D., 1999b). It recognizes that visitor management is a complex subject that requires an integrated strategy amongst stakeholders in order to succeed.

The TOMM comprises a three-tiered structure that incorporates and integrates a context identification, a monitoring program and a management response to visitor management in a particular area (refer to Figure 6 Appendix 3). It is an ongoing management tool that, according to proponents and if applied properly, will deliver optimal returns to stakeholders. It has been developed to operate at a regional level rather than at a park or site-specific level. It serves a variety of stakeholders with a range of interests and provides data and insights to foster a sustainable tourism industry (Manidis Roberts Consultants, 1997).

The data required to run the TOMM comprise both social science and natural science data. The social science data range from visitor numbers, expenditures, crime rates, accidents, length of stay, visitor satisfaction levels, to resident opinions and occupancy rates. The natural science data range from impacts to the vegetation, soils, water quality, population size of wildlife species and breeding rates to state of the environment reports. The data requirements for TOMM are the most diverse and comprehensive because the model examines visitor management from a

regional perspective with a wide array of participants, rather than limiting its scope to a particular site with only a few decision makers.

The implementation of the TOMM is managed by a consultant. The consultant brings together a variety of stakeholder who collaboratively make decisions. They include the park's staff, the local community affected by tourism, the public, tour operators and business leaders. This approach may be applied regionally or at a park-specific level. The consultant then disseminates all relevant information, identifies potential data gaps to stakeholders, and subsequently organizes seminars and workshops where those involved can discuss this information, identify potential tourism scenarios and decide upon a course of action. Given the complexity of the TOMM, and in order to ensure its success, the proponents of the TOMM also recommend that a part-time coordinator be hired for a three-year period to complete the process.

The TOMM has also been applied in Canada at Gwaii Hannas National Park and Aulavik National Park, two remote sites. The purpose was to develop the visitor management vision for the two parks and to identify constraints to increasing visitor numbers (McVetty, D. & Wight, P. A., 1999). The three case studies presented demonstrate that this approach may be used more frequently in visitor management for national parks in the future.

The TOMM is not without its drawbacks. First, it is expensive (e.g., $70 000 per year) to implement for three years. Also, the requirement of the model to identify all the potential tourism products/scenarios that may arise and then evaluate them requires the collaboration of all stakeholders, which may be difficult to achieve. The authors do recognize this issue by identifying up front all the potential benefits to stakeholders, to encourage them to join in the process. The TOMM has only been applied to remote regions. It may be difficult to implement in an area where the possibilities to optimize the tourism potential are much more varied. As well, the three tiered process of context identification, monitoring and management requires time to implement. The timeframe recommended to implement the TOMM process adequately is three years.

Table 4.1 : A Comparison of Six Visitor Management Frameworks

Frameworks	ROS	VAMP	LAC	VIM	VERP	TOMM
Purpose	A planning, site design and development, and administration device, that determines a level and type of activity appropriate for a given setting.	To formalize visitor planning and management in PCA. Integrates activities, measures effectiveness of management and Identifies data gaps.	To provide a means of improving recreation management of protected areas.	Focuses on reducing or controlling impacts that threaten the quality of heritage and visitor experiences	To help address carrying capacity questions associated with visitation related resource impacts and impacts to the quality of visitor experiences.	To help make better decisions about tourism and to monitor tourism activity and impacts.
Planning Approach	Rational	Rational	Transactive	Rational	Rational	Integrated, mixed scanning
Conceptual Approach	Regional Planning	Appropriate visitor activities	Environmental carrying capacity	Problem solving orientation	Carrying capacity	Optimize tourism potential
Scope	Regional use of land resources and visitor activities.	Focuses on appreciation, understanding and enjoyment of visitors in natural areas.	Narrow types and levels of recreation use, facilities and services, levels of service, levels of protection.	Recreational use and protection of natural values in a specific site.	National park crowding and understanding of carrying capacity.	Helps community and tourism industry to optimize outcomes for both visitors and site.
Focus	1) Visitor 2) Resource	1) Visitor, 2) Resource	Impacts to 1) resource, 2) visitor experience	Impacts to 1) resource, 2) visitor experience	Impacts to 1) visitor experience, 2) to resource	Optimize tourism ensure environmental quality and industry satisfaction
Application	In national forest reserves where multiple use is an issue	In Canadian national parks to determine appropriate visitor use.	In protected areas	In protected areas at specific sites	In U.S. national parks to address visitor crowding.	Includes public and private land, range of stakeholders, fosters sustainable development.
Stakeholders						
Protected Area Staff	Yes	Yes	Yes	Yes	Yes	Yes
Visitor Consultation	Perceptions sought, but not involved in decision making.	Perceptions and views sought, but not involved in decision making	Yes	No	Yes (not involved in decision making)	Yes (if part of committee)

Table 4.1 : A Comparison of Six Visitor Management Frameworks

Frameworks	ROS	VAMP	LAC	VIM	VERP	TOMM
Researchers	Yes	No	Yes	Yes	Yes	Yes
Public Consultation	No	No	Yes	No	Yes	Yes
Outside Agencies	No	No	No	No	No	Yes
Decision makers	Managers, researchers	National park staff at all levels,	Consensus in theory, protected area staff in practice	Managers, researchers	Managers, researchers	Consensus of committee
Decision-making process						
Decision-making process	Managers class an area based on known information about its naturalness and accessibility. This information is incorporated into planning process.	Linked to the resource management process within the PCA. Based on appropriateness of activity given and information about the visitor and linked to natural environment resilience.	Decision-making system determines management actions required to achieve the desired conditions. A complete circle of steps to arrive at standards and to determine management action.	An eight-step process that defines a problem, assesses alternatives and determines a management action. Creation of a matrix to clearly define options for management and results.	Decision required when environment and visitor experience indicators exceed standards.	Emphasizes best conditions, sets acceptable ranges, and indicates whether in range. If not, decision alternatives are determined and decision taken.
Indicators and standards	Yes	Yes	Yes	Yes	Yes	Yes
Feedback mechanism	Monitor	Qualified yes. Functional and operational reviews	Monitor conditions	Monitor conditions	Monitor resource and social indicators	Monitoring process clearly defined in framework
Information Requirements						
Scientific (social)	Medium	High	High	High	High	High
Scientific (natural)	High	Medium	High	Yes in context	Medium	High
Perceptions, Traditional Knowledge	Not required	Low	Essential	Not required	Essential	Some
Application	Regional, mapped	Preliminary	Plan for a	Action plans which	Determination of	Develops a set of

Table 4.1 : A Comparison of Six Visitor Management Frameworks

Frameworks	ROS	VAMP	LAC	VIM	VERP	TOMM
Results	identification of settings for recreation.	assessment of visitor activity, visitor activity profiles, visitor activity concept, plans for interpretation.	wilderness area based on social and ecological standards.	provide site-specific solutions and means to monitor.	number of visitors and behaviour and acceptable resource conditions.	tourism scenarios for a destination, evaluates, and defines a set of outcomes and indicators.
Complexity	Very complex	Very Complex	Medium	Medium	Medium	Very complex
Regional integration	Identifies range of economic and social benefits to local communities	No history of examining local community interests and visitor interests	Identifies the range of economic and social benefits to local communities	None	None	Complete focus on integrating visitor management with local community
Drawbacks	High complexity Users require training sessions, instructional films and on-site visits from experienced personal.	High complexity. Unable to implement technical solutions; does not contribute to park zoning; little opportunity for public involvement. Is now considered out of date with the increased emphasis on ecological integrity.	Internal resistance to share power with other interest groups, e.g., public. Is reactive in that it addresses current issues, but does not provide guidance on potential issues because it is normally not applied proactively.	Seeks to regulate visitors, not manage; relies heavily on expertise and professional advice	Carrying capacity values depend on place, season and time, and are highly subjective. Participants purposefully chosen, may omit a group.	Requires high financial, human resource and time commitment. Conflict potential between two of desired conditions and over acceptable ranges. Predictions difficult. Collaboration amongst stakeholders essential.
Spatial Application	Broad, identifies a range of opportunities	Broad, identifies a range of opportunities	Large scale wilderness planning on impacts	Small site localized impacts	Small site	Large area

4.5 Discussion

Six visitor management frameworks were evaluated to determine their potential benefits and limitations for use in a variety of national parks and protected areas. Initially, the approaches were examined to determine how they compare with respect to primary focus, geographical scale, decision makers, involvement of interest groups, the decision-making process and the incorporation of data into the decision-making process.

Some general observations can be made:

1) All visitor management frameworks recognize the need to have a balance between data that explain visitor use and behaviour and data that explain natural processes and potential impacts from visitor use;
2) Visitor management models such as VERP and VAMP are much more focussed on the visitor whereas LAC, VIM and ROS are much more focussed on the environment. The TOMM's approach is to optimize tourism in an area by involving a wide variety of stakeholders and identifying potential alternatives for development;
3) The decision-making processes are quite similar, though they are complicated in terms of the greater number of stakeholders, visitor activities and geographical area covered;
4) Frameworks such as LAC and VIM are much more suited to site-specific impacts of tourism. The VAMP, ROS, TOMM and VERP may be applied at the broader scale; and,
5) The LAC, TOMM and VERP attempt to broaden the number of participants in the visitor management process, to ensure that all stakeholders buy into the process. The VAMP, ROS and VIM are much more focussed on keeping the decision-making within a particular government body; for example, the VAMP in the PCA, the ROS in the US Forest Service.

4.6 Conclusion

Despite potential benefits from implementing a formal management framework and the years of work that managers and researchers have spent developing these options, the frameworks are not widely implemented (Hall, C. M. & McArthur, S., 1998). Many reasons are given to explain this inertia including the complexity of the frameworks, cost constraints, time constraints, lack of professionals to implement them and unclear benefits (Hall, C. M. & McArthur, S., 1998; McCool, S. F. & Cole, D. N., 1997b).

The transformation of visitor management from an *ad hoc* process to working with frameworks has not been smooth. A number of reasons contribute to this lack of support:

1) The process does not provide an immediate solution to a visitor management issue.

It takes time to follow all the steps outlined in each of the frameworks. It is necessary not only to identify who will implement the process but also to clearly identify the issue, the parameters of the issue, the indicators and standards and to set up a monitoring mechanism.

2) The implementation process is not a paper exercise.

It requires as complete knowledge as possible of both the natural and social elements of a particular issue. This requires a detailed knowledge of both the literature surrounding the issue and experience in the field addressing these issues.

3) Often, after the issue has been identified on-site studies are needed to determine the most appropriate management actions and to monitor the actions that were taken.

The monitoring process for some types of impacts is carried out yearly or even at five-year intervals. This results in a considerable amount of time required for feedback to occur. Managers are often not able to pursue a visitor management issue for this length of time.

4) The identification of indicators and setting of standards is not clear.

Even the 1997 Limits of Acceptable Change and Related Planning Processes Conference Proceedings (McCool, S. F. & Cole, D. N., 1997b) noted that there were too many data gaps with respect to the process of identifying indicators and setting standards. It is difficult to find indicators that are useful for monitoring change over time.

5) Determining a management action

A particular management action is often chosen based on the funds available for implementation. Despite the existence of a detailed process outlining the pros and cons of a particular management action, if the action is too expensive or controversial it will not be implemented.

6) It is difficult, without years of monitoring, to determine whether a standard has been surpassed.

The management action taken has to endure for several years until enough information is gathered through monitoring to determine that it should change or that it was in fact appropriate. During this time, the rationale for a particular standard may change if quality of the environment is deemed less important or if higher visitor impacts are deemed acceptable.

In general, implementing a visitor management framework takes time, money, skill, information, political will, good planning and cooperation. Without all of these elements, it is difficult to successfully implement a visitor management framework or to even start the process

of implementation. Managers are more than likely to address an issue in a reactive manner using some of the options identified in the earlier paragraphs of this chapter.

Visitor Management and the PCA

There were attempts to implement VAMP in many Canadian national parks. However, the model is now out of date (it does not incorporate ecological integrity issues into its implementation) and did not require updating unless there was significant change either to the environment or visitor profiles (Contact Person 5, 2001). The main constraints to implementing other visitor management frameworks in the PCA are the lack of support for the implementation of a single model, costs and expertise required. Visitor managers are required to incorporate a variety of mandates, visitor education, visitor enjoyment and marketing (Parks Canada, 1991). Currently, the National Office does not recommend a single model that should be used for visitor management. Instead, it provides individual parks with the alternatives and allows them to make the choice. As well, with limited financial and human resources, it is difficult to implement a complex visitor management framework. For example, the implementation of the TOMM is estimated to cost $70 000 per year over at least a three-year period (Manidis Roberts Consultants, 1997). Visitor management in the PCA has had much of its resources and funding reduced so there is no formal management process for visitor management promoted at the National Office. An alternative that requires much time and money without proven benefits is not considered an option. Managers are more likely to try to solve each issue reactively as it arises rather than address visitor management issues in a systematic manner. These visitor management frameworks may be good tools to assess impacts and effectively meet visitor needs, but they are less suited to proactive planning and determining tradeoffs between varying activities (Wright, P., 1994).

Visitor management is continually changing. Outdoor recreationists expect to be able to mountain bike and skydive in the same natural area. Though these activities may be appropriate in principle, they are difficult to accept in practice because they do not fit in well with traditional uses (e.g., hiking) in many "natural" areas. In Canada, the scope of national parks planning has broadened to address the Greater Ecosystem (Parks Canada Agency 2001). This shift may result in more public involvement and a change in the current practice of parks management and decision making. Further to this, many national parks are being created in remote northern areas of Canada. These parks are being co-managed with local indigenous groups. New models such as the TOMM have been applied to develop visitor management strategies (McVetty, D. & Wight, P. A., 1999; Wight, P. A. & McVetty, D., 1999b). The VAMP is not flexible enough to incorporate these diverse groups (Wight, Pers. Comm. 1999).

Where do we go from here? Formalized visitor management models are expensive to implement; however, the lack of justification and defensibility of decision making or the *status quo* may result in an even greater expense when poor decisions are made, requiring mitigation. It appears that funds are procured only when a real tangible problem exists. Proactive management is not the current operating principle. More work is required at the park or site level to assist in the implementation of the different types of management, and increased communication on successes and sharing of information will improve visitor management and minimize environmental impacts in natural areas.

Much work is still required to improve visitor management. Although good tools are available to assess impacts and to effectively facilitate the meeting of visitor needs, they are less suited to proactive planning and determining tradeoffs between varying activities (Wright, P., 1994). Case studies that demonstrate the application of these approaches should be published in the literature and/or made available to libraries. One good research opportunity would be to attempt to implement each of the models on the same study site to determine how they compare. This kind of research would provide a more realistic understanding of the constraints and strengths of each framework. As well, a comparison of the frameworks at one site would demonstrate exactly how both natural and social science data and informal data are incorporated into the decision-making process.

5 Decision Making within the Parks Canada Agency

5.1 Introduction

This thesis focuses on clarifying the decision-making process in the PCA. It examines the ways in which data and information are incorporated into the decision-making process. This goal is accomplished first by setting the theoretical context in Chapter 3 and then by examining options available for formal visitor management frameworks in Chapter 4. This chapter focuses on identifying the decision-making parameters for the PCA. The goal of this chapter is to describe and clarify the decision-making process within the PCA and to explain the linkages between the different management levels. The roles of each of the main levels of organization in visitor management are also examined.

The methods used to describe the decision-making process in the PCA comprise participant-observation and a literature review, in addition to informal interviews, discussions and e-mails with PCA staff. Three years of work on the trail system and participation at trail team meetings provided insight into specific considerations of trail management. Understanding how this process was developed required examining other levels of the PCA organization. Initially, a literature review was conducted to find information about the organization. Both published documents and unpublished internal documents were reviewed. Information on elements of decision making was found but a specific document outlining the main action arenas (decision-making context) and linkages within the PCA organizational levels was not found. The information from various sources was analysed using the Institutional Analysis and Development (IAD) framework.

The IAD framework is a useful analytical tool in this context because it provides a standard set of elements to address each action arena (Ostrom, E., Gardner, R., & Walker, J, 1994). The main elements of an action arena comprise: the roles, participants, positions, actions, potential outcomes, decision-making structures, information, payoffs, preferences, information processing capacities, selection criteria, resources, and evaluating outcomes. Essentially, by determining the elements of the action arena, it was possible to clarify the decision-making process.

Three levels of the organization were examined using the framework (i.e., the Parks Canada Agency National Office (National Office), Service Centre (SC - formerly Regional Office), and Field Unit level (geographical grouping of one or more national parks and/or historic sites). The literature review and application of the IAD framework clarified the theoretical decision-making process; however, it became apparent that the information detailed in the literature did not always

match what was happening in the field. Further information was then obtained through informal interviews (Refer to Appendix 1 for sample questions), e-mail and discussions with PCA staff at the National Office (three staff members contacted), SC (four staff members contacted), and the Field Unit level (12 staff members contacted). The information collected from discussions was summarized and/or quoted directly and placed in the comparative Tables 5.1, 5.2. 5.3 to facilitate analysis. This information provided details on the actual decision-making process. The IAD framework facilitates a comparison between the theoretical and actual action arena at each level in the organization and amongst the action arenas on the basis of similarities and differences.

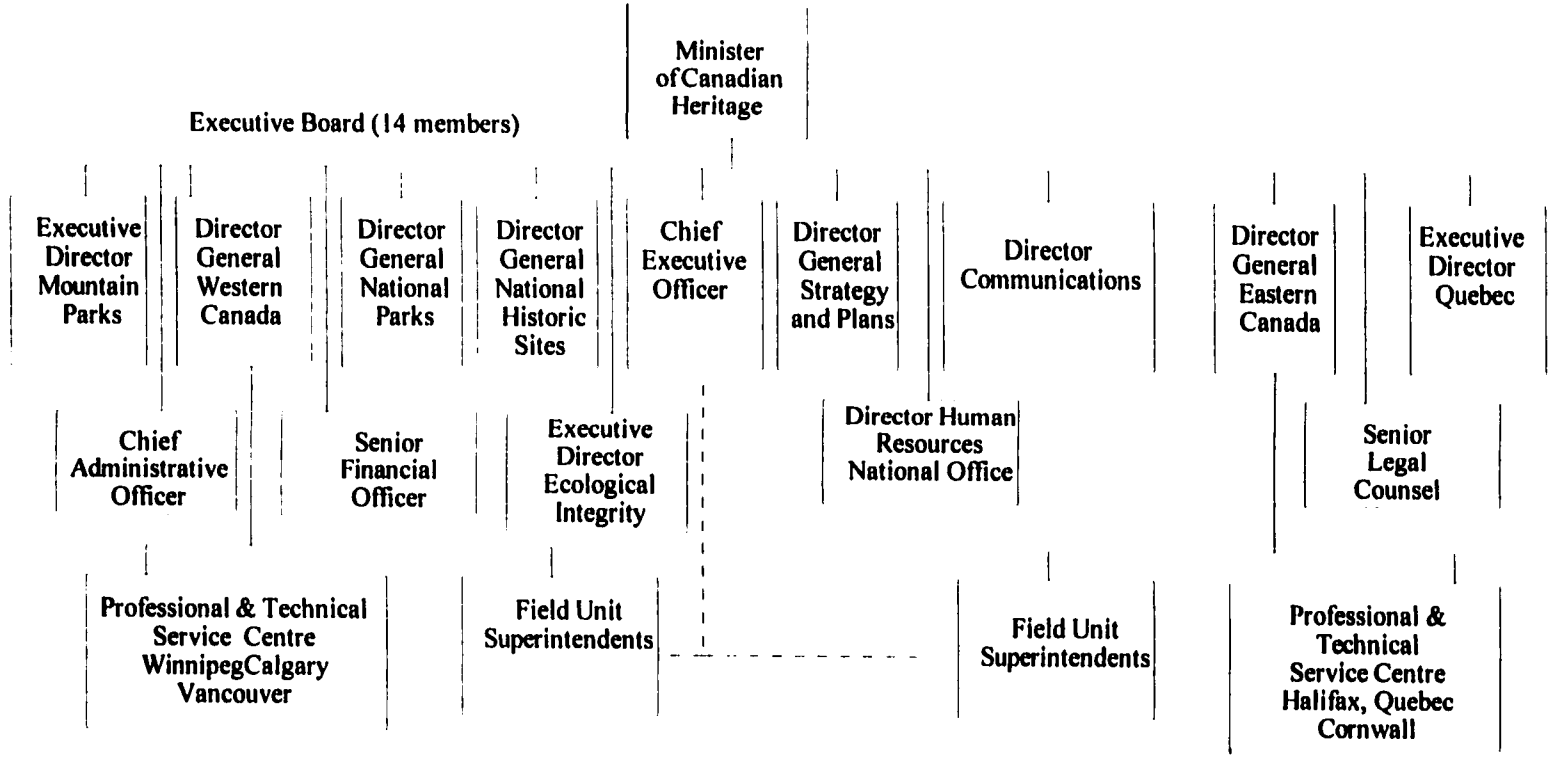
5.2 Overview of the Current Decision-Making Structure of the PCA

The PCA is an independent agency reporting to the Minister of the Department of Heritage; it comprises both national parks and historic sites. The PCA has a multi-tiered management system. The National Office, located in Ottawa, is responsible for the overall management of the PCA within Canada and represents Canada at international fora. The PCA has at its helm a Chief Executive Officer (CEO) who reports to the Minister of the Department of Canadian Heritage. An Executive Board comprising six members reports to the CEO. The PCA is divided geographically into two regions; the geographical split is from Manitoba westward and Ontario eastward. The Director Generals of the Eastern and Western regions and the Executive Directors of Quebec and the Mountain Parks are part of this Executive Board. There are 32 Field Unit Management areas across Canada that are part of the PCA. Field Units are composed of one or more national parks and/or historic sites. These Field Units are each managed by an Executive Officer and/or a Field Unit Superintendent. The PCA also comprises four Service Centres. one each in Halifax (NS), Quebec City (PQ), Cornwall (ON), and Western and Northern Canada (one service Centre in Winnipeg, (MN) but outlets in Vancouver (BC) and Calgary (AB)). The Field Unit Superintendents and the Service Centre Directors report to their respective Regional Director General (refer to Figure 5.1 for a flow diagram of the organization of the PCA).

5.3 Background of the Changing Decision -Making Context

Decision making in Canadian national parks is complicated by the dual mandate of the *Canada National Parks Act*. The *Act* specifically states in Section 4(1) : "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" (p. 3). This dual mandate was put into place to ensure that a balanced approach would be taken to managing national parks and it allows considerable discretionary power to managers. To strengthen the emphasis on protection

Figure 5.1: Parks Canada Agency -Organization Chart



Note: Dotted lines refer to accountability for Business Plan through the Executive Board which is clarified by the Chief Executive Officer.

Source: Adapted From Parks Canada Agency 2000

Section 8(2) was added to the *Act* in 2000: "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" (p.5). Formerly, the 1988 *Act* stated that ecological integrity should be the first priority when considering park zoning and visitor use in a management plan (Section 5, 1.2).

The Parks Canada Agency was previously divided into three management levels: national, regional and individual park. These levels of organization were linked in a hierarchy. Individual parks reported to the regions and regions reported to the National Office. This reporting structure changed, however, with the restructuring of the organization from a programme within Canadian Heritage to an agency affiliated with Canadian Heritage. The new reporting structure as identified in the Annual Report is for Field Units to report to the CEO theoretically but to be guided by the Eastern or Western Director General practically, and for the Service Centres to report to an Eastern or Western Director General (refer to Figure 5.1). The linkages between levels in the organization and the types of data, information and knowledge that feed into decisions are not clearly defined.

Changes within the PCA have resulted from new government initiatives and public pressure. In the 1970s, the focus was on adding new parks to the system (McNamee 1993). The 1980s, were a time of change for the Canadian National Parks. After a low key Centennial of National Parks in Canada, in 1985, the government moved to strengthen the *Canada National Parks Act* to increase the importance of maintaining the ecological integrity of national parks. It increased the accountability of the PCA by introducing the requirement for a State-of-the-Parks Report every two years (McNamee, K., 1993). In the 1990s, parks were asked to refocus on cost recovery and adopt a business culture. The PCA also adopted a business vernacular, developed business management plans and referred to visitors as clients. These changes in emphasis are expected to make the parks more accountable for spending and to improve visitor satisfaction and hence public support. This new business ethic resulted in parks determining ways to improve and increase visitation to national parks and to streamline management towards marketing and visitation. At the same time, senior government officials and academics realized that there was a need to improve the linkages between research and decision making (Willison, J. H. M., 1995). Since 1990, the Science and the Management of Protected Areas Association (SAMPAA) has addressed this issue by organizing a series of conferences that bring together both managers and academics every few years. Conference proceedings are published after every conference (Willison, J.H.M., Bondrup-Nielsen, S., Drysdale, C., Herman, T.B., Munro, N.W.P., & Pollock,

T.L. 1992; Herman, T. B., Bondrup-Nielsen, S., Willison, J. H. M., & Munro, N. W. P., 1995; Munro, N. W. P. & Willison, J. H. M., 1998).

As well, the Parks Canada Agency recognizes that it can no longer manage the parks in isolation. Accordingly, it has launched partnerships and cooperative ventures in data acquisition and management in order that it can monitor ecological integrity, carry out ecosystem management planning, environmental impact assessments and environmental management audits and engage the public in appropriate protection and planning. These partnerships allow the PCA to achieve its fundamental goals of wilderness conservation and ecologically sustainable land use (Canadian Heritage, 1998: 51). This adaptation to changing circumstances is designed to ensure that the mandate of the *Canada National Parks Act* is fulfilled in a collaborative manner.

Parks Canada became an agency in 1999 to "ensure responsible stewardship and public accountability" (Parks Canada Agency, 2000b). The changes that have resulted from this are a reduction in the bureaucracy and a change in the budget structure so that parks are able to plan over longer periods of time. A report prepared by the Ecological Integrity Panel recommends that the PCA refocus on the primary mandate of ensuring ecological integrity (Parks Canada Agency, 2000a). The report includes 127 recommendations relating to ways in which the PCA can improve the ecological integrity of all national parks. In the 2000s, there may also be a greater emphasis on improving Human Use Management (HUM) (Parks Canada Agency, Atlantic Service Centre, Proceedings of a Human Use Management Workshop 2000).

The PCA decision-making process is influenced mostly by the synoptic planning framework, and to a lesser degree, by the civics planning framework. Decision makers are expected to use scientific information, internationally accepted principles and concepts of conservation biology as the bases to make decisions consistent with the mandate of the *Canada National Parks Act* (Parks Canada, 2001). Theoretical and informational uncertainties limit the ability of decision makers to make decisions. National parks management is complicated by the current situation in which:

1) the focus of management in national parks has changed every decade;
2) the environment is not static; managers have to adapt to changes in the state of the environment and new impacts;
3) the complexity of park management has increased with the recognition and identification of potential threats to national park integrity. Over 2400 external threats and 2000 internal threats have been identified in US national parks, for example (Lemons, J. and Junker, K., 1996);

4) a broader perspective for management is required such as the Greater Ecosystem Concept, which recognizes that parks are not islands but in fact part of a larger fabric of the landscape (Bridgland, J., 1994)
5) new management arrangements are being made to co-manage national parks with native groups and to improve public consultation (Berg, L., Fenge, T., & Dearden, P. 1993; McVetty, D. & Wight, P. A., 1999); and,
6) budget cuts in the PCA, have resulted in an overall reduction of 25% of staff, for example, the staff assigned to visitor management at the National Office are minimal, with only three people (formerly in the late 1980s there were 10 staff assigned to visitor management (Contact Person 2, 2001)).

The PCA is legislated by the *Canada National Parks Act* and *Guiding Principles and Operational Policies.* Individual Field Units (i.e., a specific park or a group of heritage sites and parks geographically situated relatively close to each other) are responsible for implementing the *Act*. Identifying the theoretical and actual information used in decision making helps to set the context for understanding this process. Determining decision points, decision makers and information requirements consistently documents the decision process at different levels of the organization.

5.4 Action Arenas within the PCA

The PCA as a whole is a single large action arena where decisions are made by a group or groups of decision makers to manage the entire Canadian national park system. There are many inter-linked action arenas nested within this large arena. The most distinct action arenas correspond to three clear geographical levels of organization, recognized within the PCA. They are: the NO, the Service Centres (SC) (formerly regional offices), and the Field Units (park and/or historic site or combinations of both). Each level of management has a different role to play in the overall management of the PCA and has a distinct set of decisions allocated to them.

In the next sections, the three action arenas are examined by applying the IAD framework. The role that each action arena plays with respect to visitor management is also discussed.

5.4.1 Parks Canada Agency National Office, Ottawa, ON

The elements of the National Office action arena were determined from the published literature and internal documents and by discussing elements of the action arena with parks staff. Information from documents was placed into Table 5.1 under the heading: Theoretical Action Arena. Information obtained from park staff which differed was placed under the heading: Actual Action Arena.

5.4.1.1 Discussion

One of the main reasons for applying the IAD framework to the PCA is to determine the theoretical parameters of the action arena and verify them in relation to the current actual situation. By breaking the action arena into actors, positions, actions, payoffs, decision-making structures etc. it is easier to understand the components and the ways in which they interact. Table 5.1 identifies the elements of the National Office action arena, both from an interpretation of the published literature and internal documents. Communications with park staff identified areas where the current situation is different from the theoretical situation identified.

The National Office acts geographically at the national level. Its main role is to "...help build national consistency and coherence in the systems of national parks, marine conservation areas (MCAs) and other protected heritage areas" (Parks Canada, 1998: 2). In this role, the National Office provides support to the SCs and Field Units. They are responsible for the framework within which the SCs and Field Units function. To achieve this goal they develop the legislation or rules (e.g., *Canada National Parks Act*), policies (e.g., *Guiding Principles and Operational Policies*), processes (e.g., *National Parks Management Planning Process Manual*) and guidelines (e.g., *Getting Started – A Guide to Service Planning*) to assist the management of each SC and Field Unit. Further to this, the National Office interfaces with other departments where there is overlapping jurisdiction (e.g., Department of Fisheries and Oceans and Department of Environment) and represents Canada at international fora.

The organization of the National Office comprises three directorates Strategies and Plans, National Historic Sites and National Parks. Within the National Parks Directorate there are five main branches: Operational Services Branch, Legislation and Policy Branch, Park Establishment Branch, Protected Areas Cooperation Branch and the Ecological Integrity Branch (formerly the Natural Resources Branch). These directorates and branches work together to support the mandate of the PCA. For National Parks the Operational Services Branch is accountable for the provision of services and advice on activities such as finance, human resources, administration and informatics. It accomplishes this by coordinating the preparation of the Multi-Year Business Plan by providing information on fiscal monitoring of the financial system. It also provides information to managers on their responsibilities in terms of material management rules and processes, and provides advice and guidance on matters relating to human resources. It ensures the documentation centre services are available and provides system access and support within the directorate and for remote sites where national parks activities are carried out. It maintains informatics services to PCA staff and administration services related to general office management, record management and security services.

Table 5.1: Parks Canada Agency National Office: Theoretical Versus Actual Action Arenas

Elements	Theoretical Action Arena	Actual Action Arena
Role	The main role of the National Office is "to help build national consistency and coherence in the systems of national parks, marine conservation areas (MCAs) and other protected heritage areas" (Parks Canada 1998: 1). This role is accomplished by: 1) the development of legislation, regulations, national policy and practical management tools, including: i) guidelines and standards, ii) performance indicators, iii) functional training and iv) support for SCs and Field Units; 2) the provision of specialised advice e.g. Aboriginal Affairs and strategic advice to the Executive Board monitoring results of policy application (e.g., in management plans and business plans); 3) aggregating and analysing the results of national surveys to prepare the *State-of-the-Parks (S-O-P) Reports* and; 4) the identification of emerging issues of concern.	The National Office does fullfill many of roles stated in the theoretical action arena, however it has others not specifically identified for example: "*... at the national office we do create a lot of paper work in the name of national coordination, be they directives, briefings, Act revisions, training manuals. We do also actually coordinate the delivery of training, fire management and other programmes, and interface with other departments on behalf of Parks Canada (e.g. to administer the new Species at Risk Act), advise and train delegations from developing countries, negotiate and establish new parks, etc., so in a broad but still concrete sense we do influence or even control the parks and regions* (Contact Person 1, 2000)". However, they have changed their focus: "*The Parks Canada organization has adopted a decentralised model - the National Office now has an advisory and support role – like a SC, except that we have a national perspective and we represent the concerns and perspectives of the field at the national level*" (Contact Person 2, 2000). There is a perception the National Office role is not very strong: "*There can be many things at the Parks level that allow the Service Centre-Field Unit thing to work. As for Headquarters there seems to be the same situation - they should be giving us (SC and individual parks) direction and expertise in certain areas and again this is met with sporadic success...*" (Contact Person 4 2000).
Participants	CEO, Executive Board, National Parks Directorate, Five Branches of the National Parks Directorate, (Legislation and Policy Branch, Park Establishment Branch, Protected Areas Cooperation Branch, Ecological Integrity Branch, and Operations) (refer to Figure 5.1).	Same as theoretical.
Positions	CEO is the head of the PCA; the six member Executive Board gathers information from staff and provides guidance to the CEO; the National Parks Directorate has an Executive Director and four Chiefs who work to form legislation and policy, establish new parks, set up cooperative arrangements with other groups and ensure ecological integrity. As well, three people work on visitor management issues.	Same as theoretical.

Table 5.1: Parks Canada Agency National Office: Theoretical Versus Actual Action Arenas

Elements	Theoretical Action Arena	Actual Action Arena
Actions	The primary action is to provide a framework within which PCA staff work. The framework encourages staff members at all levels of the PCA to use it by disseminating information through documents, policy and legislation to the SCs and to the individual Field Units. This information guides the way in which the SCs and individual Field Units are managed. It is not, however, involved directly with decision making at the SCs or Field Units. The framework within which the PCA conducts itself is also brought to international fora to demonstrate the position that Canada holds towards national park protection.	Involved with workshops to help disseminate information. National Office is not perceived as taking a strong role in the dissemination of information and ensuring national consistency in SCs or Field Units.
Potential Outcomes	National consistency in the implementation of legislation and policy in all national parks is the desired outcome of developing a national conceptual framework. Indirect guidance influences the way in which visitor management occurs, but not specifics of application in the field. The National Office provides all SCs and Field Units with the same types of information and the same general conceptual framework within which to make decisions (e.g., the *Canada National Parks Act* (CNPA), *Guiding Principles and Operational Policies (GPOP)*, guidance documents for planning etc.). The SCs and Field Units work within this framework to ensure national consistency. The implementation of this framework may vary depending on the regional or site specific conditions (however, because the framework is broad the SCs and Field Units are expected to be able to work within it). The regional SCs and Field Units may not be able to adhere to the framework provided by the National Office, which may lead to inconsistent implementation of policies or regulations. As a result parks are managed differently from each other. The outcome at the international level is that if Canada has a strong stance on protecting the environment through its national park system perhaps other countries will follow this example.	There is not national consistency in the application of legislation and policy because managers need to take into account site specific considerations. It does provide consistent information to the SC and Field Unit. The National Office does not have a strong personnel presence in regions or individual parks SCs and Field Units may work independently, though generally within the conceptual framework provided by the National Office. The ASC and the Association of Universities is responsible for organizing SAMPAA conferences and thereby responsible for informing international groups of the PCA activities with respect to many aspects of management and research. The National Office Head of the Human Use and Public Safety Unit is involved at many workshops discussing visitor management issues.

Table 5.1: Parks Canada Agency National Office: Theoretical Versus Actual Action Arenas

Elements	Theoretical Action Arena	Actual Action Arena
Decision making Structure	The decision-making processes of the National Office are typically confined to issues at the national or international conceptual level. The National Parks Directorate is responsible for the preparation of the documentation that supports the framework under which parks are managed. The involvement that the National Office has with the SCs or the Field Units is mainly related to dissemination of information and approval of business and management plans. This process may result in feedback into legislation such as the *CNPA* and policies such as *GPOP* from regional SCs and Field Units (refer to Figure 5.2). The timeline under which the National Office decision-making process functions is typically long term. The National Office considers the implications of their actions to the park system over 5, 10, 20 or 50-year timeframes.	Provides materials to SC and Field Units, input into workshops when requested, maintains minimal contact with Field Units. Not involved in decision making at the SC or Field Unit level. Not perceived as having a strong presence of National Office personnel or authority in either the SCs or Field Units.

Table 5.1: Parks Canada Agency National Office: Theoretical Versus Actual Action Arenas

Elements	Theoretical Action Arena	Actual Action Arena
Information	Information that feeds into the decision-making process comprises: published refereed literature, internal government documents, input from SCs and Field Units for *S-O-P Reports*. Results of workshops and proceedings from conferences Within Parks Canada, general direction and authority are guided by the *CNPA* and *GPOP*, and specific day-to-day operations are guided by regulations passed as Orders in Council (Rollins 1993). The National Office is responsible for funneling input from the academic literature, conferences, local knowledge, the general public, and government publications into the guidance and planning documents. The participation of senior managers at conferences such as SAMPAA ensures that employees are kept up to date on the state of research in parks both in Canada and around the world.	National Office does tap into published literature. Central location enables them to collate more information and develop more comprehensive information for the SCs and Field Units. International role of National Office not as strong as expected, the Atlantic SC, in collaboration with universities and other government agencies, guides the planning and organization of international conferences such as SAMPAA. Information is not always disseminated to the Field Units; they are unaware of some of the National Office initiatives. Although the National Office has access to all information about the individual national parks, and has access to academic environments, the National Office uses summarized information about each National Park. For example, information for the *S-O-P Reports* is gathered through the completion of a questionnaire and summarizing information into a short report and table. In practice, few senior managers use conferences such as SAMPAA to keep up-to-date.
Payoffs	Consistent implementation of legislation and policies at SC and Field Unit level. Provision of good guidance manuals to assist in conservation, administration and visitor management issues. A nationally coordinated PCA with consistent implementation of legislation, policy, and guidance manuals. Framework allows individual SCs and Field Units some flexibility in terms of how they implement legislation and programs depending on the site specific considerations of the national park. The National Office is located geographically distant from most national parks. Staff may not have first hand experience of the functioning of a national park (unless they have transferred from a SC or a Field Unit to National Office) or the implementation process of the *CNPA* or the *GPOP*. They know however, how the implementation is supposed to work and therefore can see different ways of over coming situations. They ensure national consistency from a National perspective rather than specific SC or Field Unit situations.	Considerable discretionary power is given to SCs and Field Units in terms of the implementation of legislation and policies, which results in applications which take into consideration site specific conditions, rather than trying to be consistent at a national level. The disadvantage of this system is that the National Office may not always be aware of what is happening at the SC or Field Unit level. The reporting structure every two-year to five-years makes it difficult to determine over shorter time-periods whether things are working well within the park. The advantage is that many National Office staff members have transferred from Field Units to the National Office and have first hand knowledge of the functioning of the Field Units. With specific reference to Human Use Management, the Field Units may have a very liberal interpretation of some of the policies and may develop infrastructure that is different than the intent of policies. There are very few people working directly on visitor management in the National Office, so it is impossible for them to have a strong role either in an advisory or other capacity on activities of the individual Field Units.
Actors	CEO, Executive Board, Executive Director of National Parks Directorate, and approximately 65 staff members.	All work together to ensure that appropriate activities and safety are ensured in Field Units and National Parks. Although the mandate

Table 5.1: Parks Canada Agency National Office: Theoretical Versus Actual Action Arenas

Elements	Theoretical Action Arena	Actual Action Arena
	Three are involved directly with visitor management	remains unchanged the National Office (like SCs and Field Units) has to do the same work with a reduced budget and human resources.
1) Preferences	Visitor management is largely a site specific type of activity. National Office provides the general framework under which management occurs in the forms of legislation, policies and guidance manuals. The Field Units are responsible for implementation.	Same as theoretical. Also participate in workshops on human use management to ensure that appropriate visitor activities are undertaken safely.
2) Information-Processing Capabilities	Work towards ensuring goals of the Parks Canada Agency given resources both human and financial.	Potential to be at the centre for a repository of information, staffing has been reduced over the last decade. Has been able to pull together theoretical visitor management models to produce information for the Field Units and SCs (Nilsen and Tayler 1997).
3) Selection Criteria	Ecological integrity, visitor satisfaction, public safety Budget, politics	Ecological integrity, political will, budget, public safety, visitor satisfaction
4) Resources	Financial: National Office receives its budget from parliament; it then distributes it to the Eastern or Western Regions; the Region allocates budgets to SCs and Field Units. At the national office, the budget is allocated to ensure that information required by the SCs or Field Units is provided, and that sufficient resources are allocated to the development of a legal and policy structure. Human : Three person years	Same as theoretical.
Evaluating Outcomes	Feedback systems have been built into the framework. These comprise, the *S-O-P Reports* (prepared every two years), *Park Management Planning Process*, management and business plans, budgets, environmental assessments, and feedback from visitor surveys etc. The *S-O-P Reports* highlight areas of concern in the Field Units, identify change, either in the form of and improvement or a continuing decline in environmental quality. The management plans and business plans identify both the short and long term goals within each national park. These plans are coordinated by the SCs and approved by the National Office. The financial resources provided to SCs and Field Units typically hinge upon the approval of a budget. A percentage of the budget is allocated to resource conservation, visitor services and infrastructure support. Anomalies should be found within this variety of checks and balances. The *Park Management Planning Process* also includes feedback mechanisms such as the EI Statement, a Field Unit Business Plan (annual) and an Annual Implementation Report, and Monitoring of the Plan implementation (Figure 2 Parks Canada 2001).	There is not a close relationship between National Office and the SCs and Field Units; it is difficult to know immediately if legislation and guidelines are being met. The two-year reporting structure allows some correction if necessary. Participation at workshops also enables National Office to state its position on safety and appropriateness of activities. Although the stated goal of the Parks Canada Agency is to ensure ecological integrity, in the implementation process, public safety is often given a higher priority (Banff-Bow Valley Study 1996).

The Legislation and Policy Branch is accountable for legislative and policy initiatives for national parks and marine conservation areas. It manages the legislative and regulatory program for the PCA and monitors its effectiveness in national parks and marine conservation areas. It provides advice and direction on issues involving Aboriginal peoples, and coordinates the review of national park and marine conservation area management plans for the approval of the Minister and tabling in Parliament.

The Park Establishment Branch is accountable for the establishment of new national parks and national marine conservation areas. It prepares system plans for protected areas, identifies representative areas in unrepresented natural regions, selects areas of interest for potential national parks and marine conservation areas, conducts feasibility studies and negotiates agreements with provinces, territories and Aboriginal organizations. It also seeks Cabinet and Treasury Board approvals, ensures the involvement of the Field Units throughout the process of park establishment and assists in the post-agreement transition to operational status. Finally, it assesses significant proposed boundary changes for existing national parks and national marine conservation areas.

The Protected Areas Cooperation Branch is responsible for the development and management of National Volunteer and Cooperating Association Programs and is responsible for the liaison and joint projects with the Canadian Parks Partnership, the national umbrella organization for cooperating associations. It provides strategic advice and support for federal-provincial and/or territorial negotiations for protected areas. It also provides leadership on the protected heritage areas components of other federal departments.

The Ecological Integrity Branch is accountable for the provision of national policies and standards, guidance on their interpretation and application, and the transfer of appropriate technology, including learning tools and curricula regarding:

1) the management of ecosystems for the goal of maintaining ecological integrity,
2) public safety,
3) fire management,
4) appropriate activities for visitors,
5) environmental assessment, and
6) law enforcement.

The Ecological Integrity Branch is committed to improving communication amongst researchers and parks managers. The branch also promotes the implementation of the policy to ensure ecological integrity and appropriate use in Canadian national parks. This branch includes

science advisors and human use management specialists. When referring to the National Office from this point forward, the focus is primarily from the Ecological Integrity Branch as visitor management is included under this umbrella. The Head of the Visitor Management Unit has two people working for him, a person responsible for public safety and a human use management specialist.

The National Office staff coordinate the development of guidance documents, regulations and policy. They disseminate information and encourage the use of information at the National, SC and Field Unit level of the PCA and represent Canada in discussions at the international level.

The National Office provides a framework within which the Service Centres and the Field Units work. The framework facilitates national consistency in the implementation process. The reality of the situation is that site-specific considerations result in an inconsistent application of the *Canada National Parks Act*. With the current decentralized model of management, the National Office has almost no involvement with the management of individual Field Units. It does not provide a strong leadership role in the actual implementation of the park mandate on-site. The main interactions among staff are at workshops and conferences. It also considers itself a consultancy to SCs and Field Units. It provides advice and guidance when required or when asked. Staff in the National Office do not work closely (i.e., on-site) with the Service Centres and Field Units. The Field Units have considerable discretion as to how they will implement the *Canada National Parks Act*. The feedback mechanisms, in the form of park management plans and input into the State of Park Reports, occurs every five years or two years, respectively, which allows only a small window of opportunity for the National Office to modify its framework to adapt to site specific considerations or to provide more guidance to ensure national consistency.

The information that is used to make decisions at the National Office should theoretically comprise all published literature, based in both natural and social sciences, and workshop and conference proceedings. The types of data used at the National Office are the results presented in the individual *Park Management Plans* and *Service Plans*. The information is typically a summary; raw data from fieldwork are not normally used except for specialized projects. This is in many respects a necessity because there are 39 national parks. It would be difficult to keep up to date with all research and studies in addition to knowing all about each park. The National Office works in generalities to ensure that the guidance it provides fits all parks broadly. Deciding on legislation, manuals and guidelines requires knowledge of the outer parameters of a given situation. These guidelines allow the most number of parks possible to address issues. A Field Unit that is unable to implement an initiative within the parameters outlined by National Office

provides an indication that greater communication is required amongst the three levels of the organization. Increased understanding may result in either broadening of the scope of the legislation or the addition of a special clause for a particular Field Unit.

With respect to visitor management, the National Office is very weak. Only three staff work directly on visitor management issues. The Visitor Management Section deals broadly with visitor management, and has little contact with Field Units, except through Service Centres and at workshops. The strategy of the National Office Visitor Management Section is to act as a type of consultancy instead of involving themselves in the decision-making processes in the SCs and Field Units. Their current role is advisory rather than decision making. They provide information, such as visitor management models, to assist in decision making at the Service Centre and Field Unit level. They have no input into decision making in regions or on-site.

The National Office does not have a specific policy in terms of how Field Units should address visitor management. Instead, it provides a summary of visitor management frameworks to Field Units. This summary identifies the frameworks and provides criteria for their application. The Visitor Activity Management Process (VAMP), which was developed by the National Office in 1988, is included in the summary. Given the difficulty of implementation, however, the Field Units are not required to use it. The Field Units make the decision about which framework to apply (not all frameworks are useful for every situation). Without support in the form of training and strong recommendations, and with reduced budgets, it is unlikely that Field Units will implement the frameworks or that the National Office will have a stronger role to play in visitor management issues.

5.4.2 The Service Centre Action Arena

The Service Centre action arena is much more difficult to construct than the NO. There are few documents specifically outlining the responsibilities of the Service Centre. The primary source of information for determining the participants in the theoretical action arena was the [3]Atlantic Service Centre (ASC) Directory identifying the mission statement, descriptions of each section, and the personnel and their respective responsibilities. More information was obtained through participant-observation and discussions with PCA staff. The elements of the action arena are presented in Table 5.2.

[3] Although the Atlantic Service Centre forms the primary source of information for the action arena discussion, it does represent problems facing all Service Centres in the PCA (Parks Canada Agency, 2000).

Table 5.2: Service Centre: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
Role	The mission statement is: "A network of professional, technical and corporate expertise working together with our clients to protect and present Parks Canada's natural and cultural resources by providing leadership, advice and quality service delivery in a timely and cost-efficient manner" (Parks Canada 2000) The role is to provide leadership, advice and quality service to Field Units in the form of a consultancy	Role of SC is to act as a consultancy to the Field Units. The involvement depends on the willingness of the Field Unit to pay for the SC facilities. So, if the Field Unit is willing to pay for services, SC has high involvement in the Field Units; if the Field Unit is unwilling to pay the SC has a low involvement. The Field Unit Superintendents have the option of accepting or disregarding opinions of SCs. " *we are supposed to have specialised expertise for the "field units" or parks in the Atlantic area. The reality is that:* *1) the parks like to be autonomous and do their own work and except for... environmental assessments and protection type efforts the other services we have to offer such as wildlife biologist and plant ecology and in the cases of some parks GIS and image processing the field units feel they do not need or want our help.* *2) we actually have no budget for projects that we initiate unless we propose a project ourselves, it is accepted by a field unit(s) and is successful in receiving funding from a Science Advisory Board and the field unit(s) in question.* *... the Board is also made up of select local academia and top level park reps like the CP Wardens, probably the Superintendents if they want to get involved and park ecologists. But basically the Park reps voiced their opinion around 1996 that the Science Board was not necessary or required* (Contact Person 4 2000).
Participants	A group of 82 individuals work towards achieving the mission statement of the ASC. Currently, the Atlantic SC is made up of seven sections within one directorate: business services, cultural resource management, ecosystem management, heritage presentation, information management, marketing and client services, and park/site planning and establishment (refer to Figure 5.2).	The SC houses both Historic Sites and National Parks, approximately 20 staff members are dedicate solely to Historic Sites. There is no section dedicated to visitor management and visitor infrastructure. Instead, various people from each section are called upon for expertise when a Human Use Workshop is organized or if an issue relating to visitor management arises. The specific responsibility of each person depends on which section they are associated with. One manager from ecosystem management organized a workshop due to concerns about visitor management in an environmentally sensitive new national park. The planners are interested in developing plans that make the best use of the national parks without compromising ecological integrity, yet at the same time bringing visitors as close as possible to unique and special attributes for which the park was dedicated as a special place. Client services and marketing are very interested in keeping visitors longer

Table 5.2: Service Centre: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
		in the parks and ensuring visitor satisfaction.
Positions	**Ecosystem Management:** Staff provides services in public safety, environmental assessment, law enforcement. **Heritage Presentation:** Staff assists field units in the development of interpretation plans, outreach strategies, and professional development plans, in addition to coordinating activities that include more than one field unit. **Marketing and Client Services:** Staff provides services in market/client research, revenue development, public information, facilitation of external and internal regional initiatives, regional representation for national initiatives and with provinces.	SC's provide role of expertise when required or invited, but have an arm's length relationship with Field Units. May be involved in coordinating role amongst Field Units, e.g., the Human Use Workshop held in May 2000. Many of the services provided by SC's are not used by Field Units because they have to allocate funds towards these services. Instead, Field Units prefer to allocate funds to people on site when ever possible.
Actions	Formerly, the SCs role was to bring the PCA closer to large centres and the community (Dearden and Rollins 1993). Currently they have a stated role of providing services in the form of leadership, expertise and coordination to Parks Canada clients. Do not have decision making power in the Field Units. The actions that the SCs may take is to coordinate the dissemination of information either through documentation or by organizing a workshop. They provide advice to the Field Units on what the regional position is in terms of a particular issue. If a Field Unit issue threatens to become a National Office issue, they intervene. They provide recommendations to the National Office on how they might improve legislation and policy.	Role is not as clear as stated. It was recently recommended that SCs be provided with a clear definition of roles, responsibilities and authorities in specific fields (EI Panel 2000:2-12). Actions comprise a variety of activities, coordinating the Workshop on Human Use, involvement in environmental assessments, provision of GIS expertise to Field Units, coordinating warden staffing and training for the region, however, they are not involved in interpretive staffing or training. "The regions have lost their coordination roles and capacities, leaving a huge gap in regional program coordination. Many strategic issues, which could be managed on a regional level are being dealt with at the park level in an uncoordinated manner. Many parks are without regional level support" (PCA, 2000: 4-10)
Potential Outcomes	If roles are carried out as stated above, coordination of activities of Field Units can ensure dissemination of information and minimal overlap of activities. They can coordinate the management plan updates and revisions for each Field Unit. They can also provide expertise and coordinate visitor interpretation and management between Field Units. With changes, may have a decreasing role in Field Unit activities. The SCs try to ensure regional consistency in the implementation of policy and the development of management tools such as park plans and conservation strategies. The SCs provide advice to the Field Units in terms of how to address various issues. It is the Field Unit's prerogative to accept or reject this advice. Field Units are under National Office legal obligation to accept this point of view. They have little input into the daily running	The SC involvement in projects with Field Units is on an invitational basis only, Superintendents are able to accept or disregard recommendations. SC's do not have a strong role to play in many Field Unit activities. Some exceptions to this are the Warden Service and the SC coordination of management plan revisions. Field Units are now self-sufficient in terms of many of their activities such as GIS expertise, conducting environmental assessments, conducting their own research programs and interpretation.

Table 5.2: Service Centre: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
	of a park. Coordination of workshops to which all Field Unit's are invited may demonstrate the perspective of the SCs towards various issues, information may be incorporated into the decision-making process at the Field Unit level.	
Decision-making Structure	Bring PCA staff together to share opinions and ideas about issues that are of concern to all Field Units. Coordination role for preparing park management plans.	Provide expertise to facilitate the decision-making processes for Field Units, provide technical advice for environmental assessments, coordinate the dissemination of new or updated legislation from National Office to Field Units. Provide opportunities for dissemination of information on visitor management at workshops, develop park management plans and business plans for Field Units, provide expertise when requested and paid for by Field Unit. The SCs role has been diminished. They no longer have funds to coordinate many workshops or to input into the running of a particular Field Unit. Some staff members organize SAMPAA conferences. These conferences at least, in theory, improve communication amongst managers and researchers and help Field Units learn about the types of information and activities in research in other parks. Field Unit staff currently contact other government departments for expertise, formerly, they would have contacted the SC.

Table 5.2: Service Centre: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
Information	Use of *Canada National Parks Act*, other legislation and policies produced by National Office, Ecosystem Science Reports, published in house, workshop proceeding, discussions with Field Unit staff. Work with provinces to share information and have compatible marketing strategies. The SCs provide expertise not available at a Field Unit site for preparing planning documents. For example, a planner from that SC may act as a project manager to lead and guide the planning process, coordinate input, prepare planning documents, and organize and facilitate public consultation (Parks Canada 2000) for an individual site. The final document is approved by the specific Field Unit. The SC can also provide an alternative perspective (if requested by the Field Unit). They rarely do anything at the Field Unit level unless specifically required by law (e.g., coordinating input into the *S-O-P Report*).	Same as theoretical, but also benefit from having closer association with Field Units; have more opportunity to see studies done at Field Unit level and to participate in data analysis. Also have linkages with provincial governments in order to mesh activities. Although the National Office is suppose to be the leader with respect to international initiatives it is the SC that is actively involved in the organization and coordination of SAMPAA.
Payoffs	Recognized role of expertise in the region the SC represents. Coordination of visitor management activities and reduces redundancy. If SCs were used as fully as possible, as outlined in Directory, they would have a very strong involvement in PCA. Expertise is available at the SC if specifically required by parks. It coordinates the dissemination of funds for research in Field Units, although it no longer provides a Science Review Board to allocate funds. Parks are given money and conduct research as they deem necessary.	Reality is that Field Units are not required to involve SC in all activities and therefore do not. They often will allocate funds to pay for staff on site rather than bringing expertise from the SC. This results in a diminished role for SCs in terms of Field Unit activities.
Actors	Various people at the SC in each of the Ecosystem Management, Heritage Presentation, and Marketing and Client Services are involved in aspects of decision making.	The SC is not equally involved in all activities at the Field Unit level. They are involved with the Warden Service. No one is directly responsible for visitor management at the SC. A Human Use Workshop, was organized to address visitor management concerns in a new national park. Visitors have the potential to cause impacts to ecological integrity. The geomatics expert is shared by several Field Units, e.g., working on a GIS for landscape suitability for trails, some safety and ecological integrity concerns. The Environmental assessment expert is drawn upon occasionally to address trails issues.
1) Preferences	More likely to become involved in an issue if it involves more than one Field Unit; requires expertise Field Units do not possess, or in issues that surpass the Field Unit jurisdiction.	The SCs involved in Field Unit activities on an invited basis. They do not become actively involved in Field Units in all issues or have expertise in all areas.
2) Information-	Have a high potential to pull together information from all Field Units for an Atlantic perspective. Have expertise to publish a	In reality, Field Units are fairly reluctant to involve the SC and prefer to work on-site. One area of shared information is the Ecosystem

Table 5.2: Service Centre: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
Processing Capabilities	refereed Ecosystem Science Series.	Science Series organized and published by the SC.
3) Selection Criteria	Ecological integrity, public safety, visitor satisfaction politics, budget	Public safety, budget, political will, ecological integrity visitor satisfaction
4) Resources	Financial: Human: Expertise in environmental management, planning, visitor marketing and client services, Expertise in the coordination of various activities and the dissemination of information from National Office , Implementation of projects, Coordination of workshops Provision of the Human resources to the Field Unit is dependent on the Field Units budget to pay for these services.	Financial: funding has been reduced, new system expects Field Units to pay for services, rather than to provide services for free. Human: Expertise in environmental management, planning, visitor marketing and client services, Expertise in the coordination of various activities and the dissemination of information from National Office; implementation of projects, coordination of workshops; provision of SC's expertise to the Field Unit is dependent on the Field Units budget to pay for these services. Some of the positions are currently vacant, so expertise is not available. Field Units prefer to have on-site expertise such as GIS experts, or may not have budgets to pay for SC expertise, therefore they are not used to their full potential by Field Units.
Evaluating Outcomes	The outcome of actions by the SC can be determined by examining the areas in which the SC is actively involved and comparing them to the ones that they have the potential to be involved with. Involvement of SC in issues relating to the Field Units will probably not increase as long as Field Units have the resources to conduct on site research and activities.	If ecological integrity is maintained in Field Units and SOP reports are good, SC will maintain a hands-off approach. If SC identifies an area of duplication between Field Units they may become involved in a coordination role. They will continue to facilitate the development of visitor management plans and other plans they may require expert guidance not available in the specific Field Unit.

5.4.2.1 Discussion

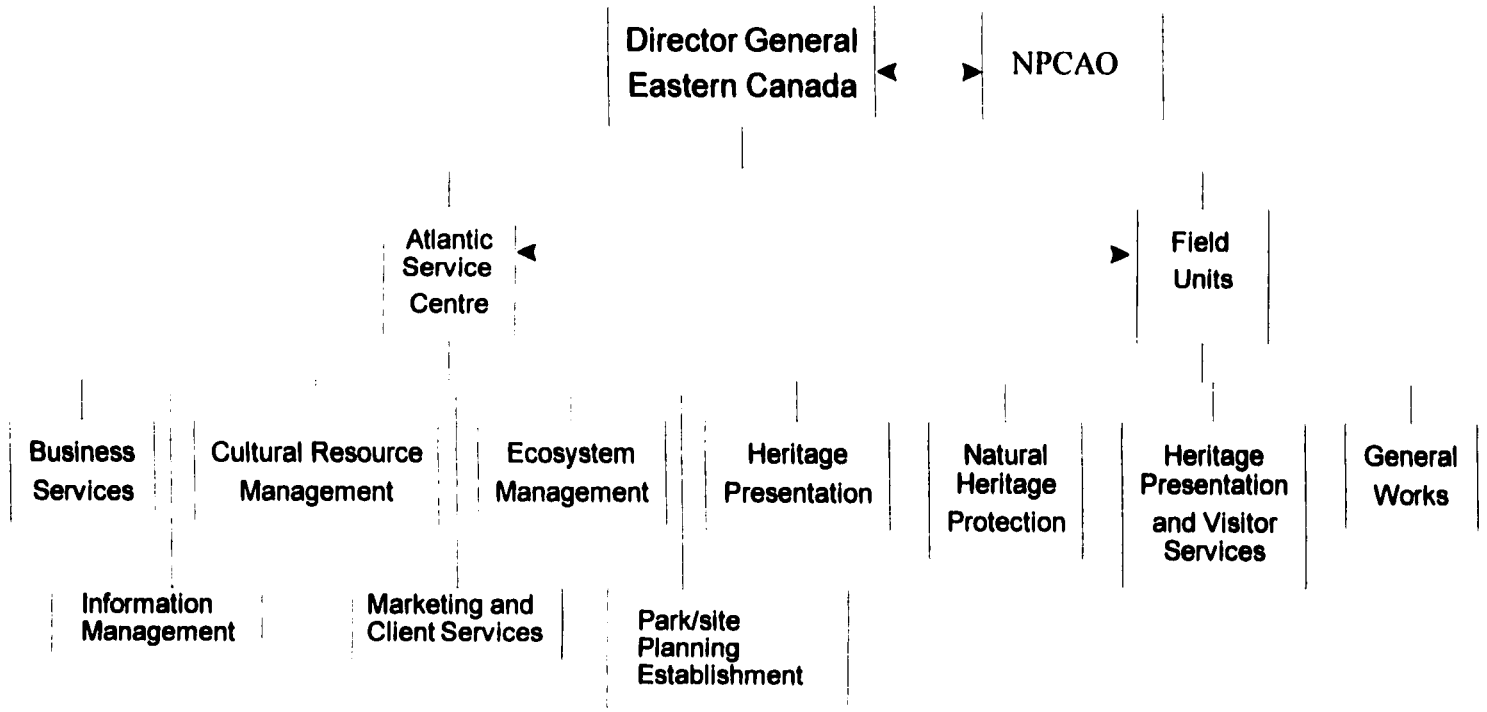
The PCA has four SCs. With the recent downsizing of the PCA, some regions are still grappling with their specific relationship to the overall PCA (Contact Person 5, 2000). Originally, the role of the regional offices was to "bring parks closer to the public by maintaining a visible presence in each region of the country rather than locating the entire bureaucracy and decision making apparatus in Ottawa" (Rollins 1993:92). As well, they coordinated the development of biophysical inventories for each national park. Currently the SCs action arena is difficult to determine because the theoretical action arena and the actual action arena are quite different. The SCs involvement in decision making at the Field Unit level has been reduced since the reorganization. The Atlantic Service Centre's mission statement is: "A network of professional, technical and corporate expertise working together with our clients to protect and present Parks Canada's natural and cultural resources by providing leadership, advice and quality service delivery in a timely and cost-efficient manner" (Parks Canada, Atlantic Service Centre, 2000). The SCs are also involved in park planning, and providing operation and developmental support to the parks.

The Service Centres provide professional and technical expertise on various activities from environmental assessments to consultation on planning for the Field Units when asked. Seven service areas make up the Service Centre; they are: Business Services, Cultural Resource Management, Ecosystem Management, Heritage Presentation, Human Resources, Information Management, Marketing and Client Services, and Park/Site Planning and Establishment (refer to Figure 5. 2). Table 5.2 outlines the theoretical and actual action arenas as determined from the literature and from communications with staff.

The theoretical and actual action arenas at the SC are the most different of the three action arenas. It has potential for organizing and coordinating but in reality is not involved in these activities to a great degree because the Field Units:

1) are relatively autonomous under the new organization;
2) prefer to hire their own staff rather than use ASC;
3) have an option not a requirement to involve SCs advice;
4) decide on their own budgets and prefer to spend on-site; and,
5) have sole control of activities such as visitor management; the SC is not actively involved or required, though an exception was the collaboration that took place during the Human Use Workshop.

Figure 5.2: Service Centre Linkages to the Field Units and NPCAO



Source: By Author

The one area in which the Service Centre is actively involved is being the primary liaison with the provinces. It provides a unique Atlantic Region Parks Canada Marketing Strategy in collaboration with the provinces, which is yet another distinction between the SC and NO.

The SC acts as a type of consultancy and the Field Unit pays the travel and accommodation expenses of the experts when they visit on-site (Contact Person 3, 2000). An example of the way this expertise works with a specific project on trails is as follows. The Cape Breton Highlands National Park Ecologist initiated a research program on hiking trails. This project required a detailed assessment of hiking trails and an expert in geomatics. The ecologist procured funding for a doctoral candidate (the author) to conduct the detailed assessment and enlisted the help of the geomatics information specialist at the ASC. These three people combined their expertise to develop a GIS model for the hiking trail system and a landscape suitability index (Bridgland, J., Lemky, K., & Allen, D., 2000). The Natural Heritage Protection section uses the SC to coordinate job competitions and allocate wardens to different parks. The Heritage Presentation and Visitor Services section in each park in Atlantic Canada on the other hand is required to conduct these activities on their own (Contact Person 5, 2000).

The SCs are involved in the coordination of park management plans. The ASC is also responsible for developing an Ecosystem Science Series which publishes scientific work that is conducted in each national park. These publications will ensure that research conducted in the Atlantic Canada will not be lost and can be used by other parks either to set up their own research programs or for informational requirements. This series also ensures that the ASC is aware of the types of information being collected and the way the information assists parks management. Formerly, the Ecosystem Science Advisory Board was responsible for allocation of funds and determining projects; now, each Field Unit decides how much money is required and the research proposal is reviewed by the Ecosystem Science Advisory Board.

The Service Centre's role with respect to visitor management is typically in marketing the Atlantic national parks. There is no one person specifically dedicated to visitor management issues in the ASC. In 2000, however, a Human Use Management workshop involving all three levels of the PCA was organized by the ASC. The primary goal was to determine an approach to visitor management in a new addition to Prince Edward Island National Park. Given that there were no visitor management experts in the ASC they invited all potential contributors to the workshop to brainstorm and address the issue.

5.4.3 Field Unit Management Areas Action Arena

(Specific Parks and Heritage Areas)

There are 32 Field Unit Management areas in the PCA. Each Field Unit comprises at least one national park or historic site. The Field Units are responsible for the implementation of the *Canada National Parks Act* with the use of the *Guiding Principles and Operational Policies* in each national park and national historic site. This requires the staff to have in depth knowledge of both the site and the *Act* so that they make the best possible decisions to protect the environment and ensure that ecological integrity is maintained. Table 5.3 depicts the organization of the Field Unit and the elements of the action arena.

5.4.3.1 Discussion

Typically, a Field Unit comprises three sections of management: Heritage Presentation and Visitor Services, Natural Heritage Protection, and General Works. There is also a separate group responsible for administration (i.e., Human Resources and Corporate Services). Very few positions are specifically discussed in the *Canada National Parks Act*, with the exceptions being the Park Superintendent and the Park Wardens. At the Field Unit level, an Executive Officer coordinates decisions and reports to the Regional Director. Within individual parks the Park Superintendent is the "decision control centre" and "... *within the bounds of the Act and Regulations, the Superintendent has full legal authority vested in him/her on behalf of the Minister, so in many operational things they have a great deal of latitude, e.g. when and how to do inventories, when and how to manage sport fisheries, etc.*" (Contact Person 1, 2000). The Superintendent makes all decisions that affect the overall management of the park and works towards partnerships with external organizations, such as the provincial government or community development groups, that may affect the park or the greater ecosystem. The Superintendent works over a long-term time-frame of five years to several decades to ensure that the park is managed within the legislative and policy framework created by NO.

The three managers of the different sections report directly to the Park Superintendent. These managers are also part of the management team of the individual park, which theoretically ensures that each section is aware of what the other sections are doing. The Manager of Heritage Presentation and Visitor Services ensures that appropriate visitor activities occur in the park, and that an interpretation of the park's unique features is available to visitors, in addition to ensuring visitor satisfaction. The Manager of Natural Heritage Protection is responsible for ecosystem conservation, ecological integrity and public safety. The General Works Manager is responsible for the development and maintenance of the park infrastructure, which supports visitors.

Table 5.3: Field Unit: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
Role	Responsible for administering the *CNPA* and *GPOP* at the site level (i.e., at a national historic site or a national park). Design and construct facilities, oversee visitor services (interpretation, education), public safety and law enforcement; and maintain ecological integrity. Responsible for providing input into plans e.g., *Park Management Plan, Business Plan, Budget, Visitor Services Plan, Marketing Plan, Heritage Communication Plans, Ecosystem Conservation Plan, Operations Plan*	Same as theoretical.
Participants *(may vary with each Field Unit)*	Superintendent Heritage Presentation and Visitor Services – Manager, Assistant Manager, Information Officers Natural Heritage Protection – Manager, various Coordinators, park ecologist, wardens, commissionares General Works – Manager, Coordinators, Supervisors, Operators and Labourers	Same as theoretical.
Positions	Superintendent - overall decision control for park, reports to Field Unit Executive Officer Heritage Presentation and Visitor Services – responsible for implementing Visitor Management program, determining data needs models, planning and making onsite decisions. Natural Heritage Protection – ensure public safety within facilities; ensure compliance with laws through law enforcement; maintaining ecological integrity by ensuring that visitor activities are zoned into certain areas, and that visitor facilities are appropriate and do not impact on the environment.	Heritage Presentation and Visitor Services are primarily responsible for visitor interpretation, education and activities. The have a reduced budget, although they have visitor management plans, they do not apply a visitor management framework.
Actions	Implementation of activities within guidelines provided by the National Office. Garner advice from SC and/or through workshops, publications, benefits and constraints of visitor management models. Use SC for coordination of activities. Primary decision making powers for onsite activities. The Field Unit or individual park staff is responsible for the decision making within each national park. They decide where and when to build new infrastructure, conduct maintenance, identify areas of the park that will be "sacrificed" for visitor use and which unique areas which will be kept off limits. Also decide the degree of development of each type of infrastructure e.g., a one-lane road or two-lane	Heritage Presentation and Visitor Services staff (frontline) provide interpretation and education to visitors. Natural Resource Protection Staff, i.e., wardens, are involved in decision making to ensure that infrastructure developments are safe and do not infringe on ecological integrity. General works staff build and maintain infrastructure. Decisions may be tempered depending on budget allocations from the PCA, however, a Field Unit may tap into provincial or other federal sources of funding to develop infrastructure. The field staff implement decisions made by the management team or the Superintendent. Information about decision making is disseminated from this team downward. Field staff make specific

Table 5.3: Field Unit: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
	highway, a small footpath or a major boardwalk.	decisions on how they decide to implement the decisions of the management team (e.g., they can determine amount of time needed, most effective way of completing work, types of materials etc.). Questions relating to how the job should be done are given to their supervisors. The supervisors write a memo to their managers, who subsequently send a report to the Superintendent detailing what they believe should be an appropriate action. The Superintendent makes the final decision.
Potential Outcomes	Control of project implementation, conformance with *CNPA*, Policies prepared by National Office with input from SCs. The action arena at the Field Unit level attempts to ensure the ecological integrity of the national park at the local level, in addition to public safety, and visitor satisfaction. As well, the activities of field staff result in a certain level of infrastructure development and its subsequent maintenance of this infrastructure.	Teams are set up involving all stakeholders, to ensure that the three sections are communicating, that consensus is reached on an issue and that a consistent message is sent to implementers. The Field Units make their decisions within the framework developed by the National Office. They occasionally ask for expert advice from the National Office or SC but are not bound by this advice or the recommendations offered. As a result Field Units are relatively autonomous.
Decision-making Structure	An Executive Officer (EO) is responsible for the overall management of the Field Unit. The park Superintendents report to the EO. Three Managers report to the Superintendent. Supervisors and field staff report to Managers. The Superintendent makes most of the decisions relating to overall park issues and the acceptance or rejection of development proposals.	Assess a situation through discussion with three parties; make a choice on visitor management and visitor infrastructure; if more expertise is required the ASC or an outside expert is contacted.
Information	*CNPA*, and *GPOP* provide the basis of the guidance in which the Field Units work. The completion and application of the park management plan, provides more detail on specific acceptable management actions. This plan requires information inputs from internal studies and research publications as well as internal external expertise about various issues that the site is facing.	Different types of information feed into the various plans and implementation strategies. For example, trail planning requires generalised information about the trail and summaries of the overall condition; implementing strategies requires detailed onsite measurements of impacts and trail condition as provided in a trail inventory.
Payoffs	Visitor management occurs smoothly.	Visitor satisfaction; increased public safety Reduction of impacts to ecological integrity Work within budget, Politics, (no red flags or problems)
Actors	Heritage Presentation and Visitor Services Natural Resource Protection General Works	Management of visitors generally by Heritage Presentation and Visitor Services.
1) Preferences	Field Units prefer to retain responsibility of visitor management because staff members are aware of site specific constraints, have a long history of managing visitors in the Field Unit and are able to	Same as theoretical

Table 5.3: Field Unit: Theoretical Versus Actual Action Arena

Elements	Theoretical Action Arena	Actual Action Arena
	change or modify procedures quickly to address situations.	
2) Information-Processing Capabilities	Have raw data from in house studies. Processing capabilities fairly high. Types of decisions are often made based on best professional judgement (learned from extensive experience in the field). Decisions based on all types of information, provided by National Office and scientific documents.	Same as theoretical
3) Selection Criteria	Ecological integrity, visitor satisfaction, public safety, budget, politics	Public safety, budget, ecological integrity, political will Visitor satisfaction
4) Resources	Financial: National Office receives its budget from parliament; it then distributes it to the Eastern or Western Region. The Region allocates budgets to SCs and Field Units. Human: Determined by the number of staff required for smooth operation of Field Unit, related to budget.	Financial: Budget controlled by Field Unit, increases need to be found through external sources (not the PCA). Human: have expertise to build infrastructure (trail crews) and visitor management (information officers) processes in the field. Occasionally use resources such as GIS expertise from SC.
Evaluating Outcomes	If ecological integrity is maintained and no serious issues arise in the *S-O-P Reports* every two years, the implication is that National Office is doing an adequate job of providing materials to the Field Units. As well, if implementation of policy is relatively consistent across the board then again Field Units are doing a good job of working within the framework provided.	Immediate feedback from visitors indicates whether visitor management is appropriate, either from a visitor management perspective, the safety of the public or law enforcement.

These three people manage the day-to-day activities of all other park staff. They recommend actions to the Superintendent and the Superintendent decides what will be done. These managers are also concerned with a shorter time-frame of management than the Superintendent, such as the week-to-week or seasonal operation of the park.

The Field Unit management areas are responsible for developing and implementing the plans that assist in the management of the national park and guide decision making. The main plans that guide decision making are the *Park Management Plan*, the *Business Plan*, the *Visitor Services Plan*, the *Marketing Plan*, the *Heritage Communication Plan*, and the *Ecosystem Conservation Plan*. Each plan is prepared by one of the three management sectors in the park. The *Park Management Plan* is coordinated by the Service Centre but has input from the Management Team. The *Business Plan* is developed by the Field Unit Management Team. This team comprises the Park and/or Field Unit Superintendents, Managers of the three sections, as well as input from the Park Ecologist and staff members. The *Park Management Plan* is developed using the *Park Management Planning Process* document, *Parks Canada Guiding Policies and Operational Principles*, and the *Canada National Parks Act*. Scientific knowledge is incorporated into the plan by evaluating research conducted in the park. Both of these plans guide the overall management of the national park and require input from all three sectors of the park management area.

The Heritage Presentation and Visitor Services Manager coordinates the development of the *Visitor Services Plan*, the *Marketing Plan* and the *Heritage Communication Plan*. The plan uses the *Visitor Activity Management Planning Process* as one of the bases for its development. It also incorporates the *Canada National Parks Act* and the *Guiding Principles and Operational Policies*. In addition, input is received from field staff. Data and information from field studies are incorporated into this process when available.

The *Ecosystem Conservation Plan* is developed by Natural Heritage Protection, and usually by the Park Ecologist, who reports to the Manager of Natural Heritage Protection. The plan is developed based on the *Natural Resources Management Process* document. It prioritizes the problems, issues and concerns that the park is faced with and avenues of action to address these threats. The plan deals primarily with ecosystem based issues and therefore is based primarily on biophysical data. It identifies where more data are required, where management plans are needed, incorporates the results of research conducted both within and outside the park boundaries and reviews relevant peer-reviewed articles to help prioritize issues of concern.

Park ecologists in Atlantic Canada are relatively autonomous and determine where scientific information is lacking and what types of research are required to improve the

understanding of a given problem or to aid in the decision-making process. They direct research programs within the parks in which they are working and secure funding and staff when the opportunity arises. They work at an advisory level, but again it is optional for managers to follow their advice.

Typically, Field Unit staff will work within the context of the conceptual framework (i.e., legislation, policy, guidelines) provided by the NO. The Panel on the Ecological Integrity, however, states that there are different levels of ecological integrity in Field Units across the country, and that the interpretation of the legislation and the policies varies in different parts of Canada (Parks Canada Agency, 2000a). The reason for this difference is that the types of decisions made from the interpretation of this framework by the Field Units have the greatest potential effect on-site in the national parks themselves. These decisions all influence or potentially impact on the environment and hence on the ecological integrity of the environment in national parks. Site-specific considerations may result in the implementation of different types of visitor infrastructure in one national park in comparison to another. There is considerable discretion to take a broad interpretation of the *Act* to ensure decisions fit within the conceptual framework provided by the NO.

The individual Field Unit and/or national park is relatively autonomous with respect to its own management. It is required to report to the National Office every two years on the *State-of-the-Park*. It decides what types of research are conducted in the park and what types of information should be used in decision making. It has the option to accept or reject the advice of the SC and the NO. This autonomy is written into the *Canada National Parks Act*, (Section 16(2)). According to Section 16(2), the Superintendent may make a decision to "(a)... vary any requirement of the regulations for the purposes of public safety or conservation of natural resources in the park". This autonomy is built in, in order to address site-specific considerations. Decision making may diverge from the intent of the *Canada National Parks Act*. The diversity of each national park may require a broad interpretation of the legislation.

The Field Units generally have a variety of data available to them. Information requirements are very detailed when addressing a specific issue; for example, trail management. However, information requirements are more general when completing a park plan. The Field Unit has to work at ensuring that decision making involves discussion amongst the different groups.

Depending on the site-specific situation, and the values and perceptions of an individual Park Superintendent, visitor interests can take precedence over ecological integrity interests[4] (Banff-Bow Valley Study, 1996). Regardless of the interpretation of this *Act*, data based in both the social and physical sciences will need to be incorporated into the decision-making process. In the coming years, the decisions made should have a greater emphasis on the impacts to the natural environment or ecological integrity (as negative environmental impacts increase) to ensure a high quality environment and visitor satisfaction.

The separation of the national parks management in the Field Units into three distinct units: Heritage Presentation and Visitor Services, Natural Heritage Protection and General Works, requires that all sections communicate effectively. Given the different mandates of each section, this does not always occur. As well, the *Park Planning Process* does not identify the stakeholders and decision makers for each part of the decision-making process.

The most visitor management takes place at the Field Units. Visitor management in the Field Unit takes place through a variety of means: service planning, zoning, interpretation, design of visitor infrastructure, and signage. The Service Plan outlines the main goals of visitor management. The park is divided into different zones. These zones stipulate a degree and type of visitor use allowed. From Zone I to III, visitor use is limited. Zones IV and V have a very high amount of infrastructure. Another mechanism is the interpretation programs, which inform visitors about appropriate activities and significant areas. The design of visitor infrastructure, such as trails, also influences the way that visitors use the environment and the areas that they enter. Finally, signs identify the appropriate areas for different visitor activities.

In some respects, the decision-making process is very clear. Field Units decide on an individual basis which information they will accept or reject, and which stakeholders they may want involved in a decision-making process. They follow guidelines offered by the NO; however, they use their own discretionary power to determine how to interpret those guidelines and apply them in the field.

5.5 Summary and Discussion of PCA Action Arena

The IAD Framework was an ideal analytical tool for determining the elements of each action arena. It clarified the role of each organizational level of the PCA and provides a means of comparing elements of the action arena in order to identify similarities and differences. The role

[4] In contrast to this, a recent government document "Conserving Ecological Integrity with Canada's National Parks" (PCA 2000) explicitly states that "There is no dual mandate in National Parks, but rather one single mandate. Parks are places for the protection of ecological integrity and for visitors to experience and enjoy nature in a manner that leaves ecological integrity unimpaired" (Parks Canada Agency 2000: 2 (5)).

of each action arena is quite distinct. The National Office sets the rules, i.e., the legislation, policy and planning guidelines to ensure a consistent approach to parks management. The Service Centres' goal is to provide expertise if required to the Field Units to assist them in the implementation of the *Canada National Parks Act*. The Field Units implement the legislation, policy and guidelines at the specific national park.

Relatively the same number of people work in the NO, Service Centres and for each of the Field Units. The types of positions, and the structure of each level of the organization, are quite different. The National Office is divided into five different branches that represent the national mandate: Operational Services Branch, Legislation and Policy Branch, Park Establishment Branch, Protected Areas Cooperation Branch and the Ecological Integrity Branch. The Service Centre is more broadly based and has the following sections: Business Services, Cultural Resource Management, Ecosystem Management, Heritage Presentation, Human Resources, Information Management, Marketing and Client Services, and Park/Site Planning and Establishment. The Field Units are specifically focussed on Heritage Presentation and Visitor Services, Natural Heritage Protection and General Works. As one moves to a broader geographical scope, each action arena becomes more complicated. The Field Units, however, are ultimately responsible for the interpretation and implementation of the national park mandate and the quality of the national parks.

The participants in each action arena work together at their specific level but do not work closely with other levels in the organization. For example, with respect to visitor management, the National Office has little direct contact with Field Units or with Service Centres. They do not have a role in the decision-making process in the other two action arenas, except to provide information. As a result, each action arena is relatively autonomous. All do have to work within the rules set at the NO, however.

The actions of the participants in each action arena are more removed from interaction with the environment as one moves to the broader geographical scale. The rules are set at the NO, however, and are expected to be followed on-site in each national park. So although the Field Units are responsible for the actions taken at the site level, directives from NO, particularly if there are legal repercussions, have major implications at the site level. The requirement for environmental assessments on any new park development initiatives is one example.

The potential outcomes resulting from the structure of each action arena are most serious at the National Office and the Field Unit levels. The provision of a good conceptual framework by the National Office provides a system that results in the consistent application of legislation and policies. The implementation of this framework at the Field Unit level ensures that on-site

visitors receive benefits and enjoy their visit to national parks and that ecological integrity is maintained. The result of the Service Centre is that it provides advice to Field Units if required to help achieve the mandate of the *Canada National Parks Act* in addition to coordinating some of the Field Unit activities.

The information used by each action arena is different. The National Office requires summary information from each Field Unit to ensure that it can prepare its *State-of-Park-Report* and to ensure that legislation and policies are acceptable and applicable to the other action arenas. The Service Centre tries to provide a common pool of information for each region and to ensure consistency in management. The Field Unit requires many different types of information to address site-specific situations. It may require raw data resulting from field studies to address a trail maintenance issue or summary information resulting from analysis of data to address a trail planning issue.

With respect to visitor management, the decision-making process is largely up to the individual park or Field Unit. Currently, only three staff positions at the National Office are dedicated to visitor issues. These staff members have little contact with parks except when they are invited to workshops and when they provide information about visitor management. Regular meetings on visitor management issues are not held with all three action arenas. Workshops and conferences are one opportunity for managers to meet. The National Office guidance in terms of visitor management is minimal in that it provides visitor management information to Field Units in the form of documents or comparative analysis, but they leave it up to the individual Field Units to determine which one to apply. Similarly, the Service Centres have a very small role to play in visitor management. Their primary mandate is to provide a marketing program for the parks in the region within which they work. The Field Unit ensures that there are adequate facilities in the park to provide for visitor services. They are responsible for ensuring that visitor activities do not adversely impact the environment, that visitors enjoy their visit to the national park and become educated about the unique qualities of the park.

Several mechanisms are in place to ensure that the PCA is fulfilling its mandate. First, there is a requirement that the PCA provide a *State-of-the-Parks-Report* to parliament every two years. This report outlines the accomplishments of the PCA, and some of the potential impacts that are occurring, and the mitigation measures that are in place to address these issues. Each Field Unit completes a questionnaire provided by the National Office regarding the *State-of-the-Park Reports*. The Field Units have many checks and balances. The *Park Management Plan*, for example, has to be completed every five years and be approved by the NO; service management plans and conservation management plans also have to be completed regularly, to demonstrate

accountability and the state of ecological integrity. Although these feedback requirements exist, a great deal more can still be done to ensure accountability such as developing a monitoring program as well as a national data base.

Finally, there are linkages amongst action arenas but the IAD framework was less useful as a tool for identifying them. There are at least a dozen potential decision makers within the national park system, but each action arena is relatively autonomous which means that the decisions made in one action arena do not necessarily affect decision making in another action arena (Environment Canada 1988). This lack of communication may result in inconsistent decision making in each national park. Although, in theory, each action arena is nested in the larger action arena, in practice they are relatively autonomous from each other. For example, the Field Units report directly to the Director General for either the Eastern or Western region, but there is no requirement to report to the SCs. The result of this reporting structure is that, unless the individual Field Unit Superintendent makes a decision to create a dialogue with other Field Units, it is quite likely that information is not transferred laterally to other Field Units in the same region.

5.6 Conclusion

The action arenas identified in this chapter clarify that the PCA is a large organization with a complicated decision-making structure. Each level of the organization works within a conceptual framework. Each action arena, however, has separate responsibilities that are often not linked to each other. The rules, therefore, are followed, but managers have considerable discretion in determining a course of action.

The identification of the elements of the action arenas demonstrates problems with the decision-making process within the PCA. First, the rules or conceptual framework are set by one action arena, the NO. As a result, the National Office may hold the balance of power within the PCA, having general control over the SCs and Field Units, because all three action arenas are expected to work more or less consistently within this framework. The Field Units and SCs do use the conceptual framework, however, there is general agreement that the National Office provides little leadership to follow up on how consistently the conceptual framework is applied. Instead, the National Office specifies a decentralized form of decision making to take place, allowing the managers discretion and flexibility in adapting to site-specific issues.

Second, the SCs theoretically provide a very important service to the Field Units; however, the reality of the situation is that the role of the SCs is not very clearly defined within the reorganization of the PCA. The inclusion of the SC in Field Unit management is often an option rather than a requirement. The Executive Officer or Superintendent now reports to the

Eastern Regional Director instead of the director of the Service Centre. Furthermore, although the Field Units have access to the expertise at the SCs, the Field Units often prefer to hire their own staff, retaining a greater level of autonomy.

Third, the types of decisions that are made in each action arena vary greatly. The National Office is responsible for developing the overall conceptual framework within which the SCs and Field Units work. This responsibility requires them to have a general knowledge of all activities that occur in these two action arenas. General knowledge allows them to recognize the potential extremes that the other action arenas are working under with respect to visitor management (e.g., Auluvik 120 visitors, Banff five million visitors), the range in environmental impacts, and the degree of ecological integrity in each action arena. This knowledge enables them to develop the framework within which the majority of Service Centres and Field Units can function; however, a caveat is still included in the legislation, stating that the Superintendent may use his/her own discretion to adapt to site-specific conditions or the environment.

Fourth, the Service Centre plays a coordination role within a particular region, particularly with respect to developing Park Management Plans. This role has been diminished, however, with the reorganization of PCA (Field Units no longer report to the Service Centre). Their new role as a consultancy requires that Field Units pay for their services if required; something the Field Units are often reluctant to do. The Field Units are responsible for the implementation of the *Canada National Parks Act* at each specific national park or historic site. They ensure that the visitor infrastructure and conservation measures are applied in the field, upholding the mandate of the national parks in Canada, to ensure that visitors benefit and enjoy national parks without compromising ecological integrity.

Fifth, the types of information that feed into the decision-making processes in each action arena are similar, however, each has a different emphasis. Data and information collected on the natural processes and environmental impacts to the natural environment are regarded very highly by all decision-makers. The National Office prefers to be aware of all the types of data and information available, but are more likely to use the summary data provided by Field Units to make decisions rather than raw data. The SC theoretically coordinates data and information the Field Units focus on the use of all data and best professional judgement for decision making.

Playing a coordination role, the Atlantic Service Centre publishes study results in an Ecosystem Science Series. This is one method to ensure that information is disseminated amongst the Field Units in the Atlantic region. As well, as they compile information from their region for the *State-of-the-Parks Reports* and assess which types of information should be entered into the final document. Finally, in their coordination role in the planning process, they ensure that all

necessary information from Field Units is taken into account when determining final plans. The Field Units use all types of information but are more likely to use specific raw data when making decisions. Another type of information which plays a very strong role in decision making is the personal experience that each decision maker holds with respect to the field. In some cases, practical experiences will override other types of information, as the decision maker is aware intuitively from other experiences what will or will not work in a given situation. Theoretically, ecological integrity is the overriding principle for decision making by the National Office and is promoted by them. The reality of the situation in the Field Units is that the overriding consideration for managers is not ecological integrity, but public safety and resources. Managers responsible for on-site facilities and conservation will not make decisions that may result in physical harm to visitors or compromise visitor safety. They are willing to compromise on environmental considerations if required (for example a safer bridge or a wider boardwalk) however this is tempered by budgetary considerations.

The IAD framework was a useful tool to apply to the different action arenas which make up the PCA. This framework allowed a consistent comparison of the action arenas based on similar elements. The analysis revealed differences in the theoretical and actual action arenas. Whereas, in the case of the National Office and the Field Units, the theoretical and actual action arenas were quite similar, in the SCs there has been a considerable change in their roles and responsibilities within the PCA.

Visitor Management takes place mostly at the Field Unit level. The National Office does set the general guidelines for decision making, through the development of frameworks and providing analysis of the use of these frameworks, but, it is the Field Unit that is specifically involved with addressing visitor management issues. The ASC is minimally involved in visitor management issues, except for the occasional workshop and the marketing of Atlantic national parks.

Panoramic View of Cape Breton Highlands National Park

6 Case Study of the Decision-Making Process for Cape Breton Highlands National Park (CBHNP)

6.1 Introduction

Although hiking trails in protected areas may appear to be relatively innocuous, resulting in the development of such slogans as 'take nothing but photos leave nothing but footprints' (Kodak), in reality hundreds or thousands of footprints may leave a very large impact on the environment. The potential environmental impacts of hiking trails have been documented in the literature since the 1930s (Bates, G. H., 1935). Since that time, research on hiking trails has grown almost exponentially (Cole, D., 1995a). Trail impacts are identified as one of the most serious recreation impacts in protected areas in the U.S. by park managers (Marion, J. L., 1994), and in Australia (Buckley, R. & Pannell, J., 1990). A 1992 survey on Canadian national parks states that visitor/tourism facilities (24 parks) contribute to significant ecological impacts . Capacity limits have been set for Lake O'Hara in Yoho National Park and the West Coast Trail in Pacific Rim National Park to reduce human use impacts on trails (Heritage Canada, Parks Canada 1998: 44). In Canada, 7500 km of trails exist in 30 national parks. There are serious concerns about the potential impacts of hiking trails on the natural environment in Canadian national parks (Cole, D., 1995b; Kuss, F. R., 1986; Liddle, M. J., 1975; Leung, Y.-F. & Marion, J. L., 1996).

In CBHNP, located in Nova Scotia, Canada (Refer to Figure 6.1), managers decided to implement a trail management system in 1995. To formalize this management they created a trail team and funded a three-year study of the hiking trail system. The trail team was responsible for ensuring that a cohesive effort was made to manage trails in order to ensure all three sectors of park management needs were met (i.e., Natural Heritage Protection, Visitor Service and General Works). They recognized that there was a need for more data and information on hiking trails to determine the state of the trails and the environment in which they were located. They funded this author for a three-year period to prepare an inventory of the hiking trails, to evaluate the hiking trail system and to develop a *GIS Model of Landscape Suitability for Hiking Trails* at CBHNP.

Upon completion of these studies and continued participation at trail team meetings, the author realized that there was no mechanism in place to ensure that this information was used in the trail management decision-making process. The decision-making process surrounding hiking trail management in the park was quite complex with different types of information requiring emphasis at different decision points. The types of information and the point at which it would be required in the decision-making process were not clear.

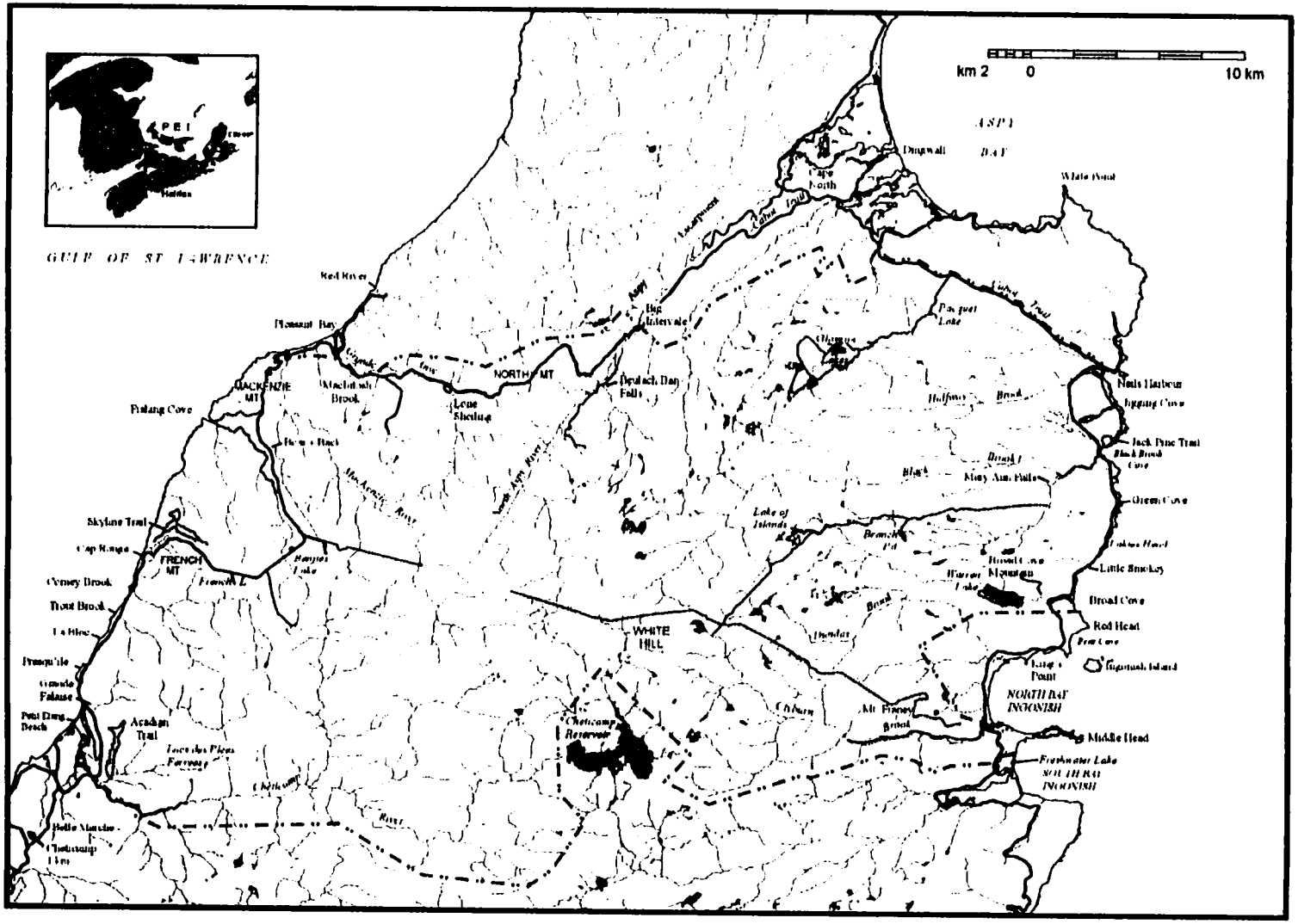


Figure 6.1: Map of Cape Breton Highlands National Park and Trails Source: D. Allen and T. Daly 2001

The original premise for conducting research on hiking trails was that: 'once sufficient quantitative data and information were available (e.g., the degree, extent and type of trail impacts and the type and extent of trail structures used for mitigation), trail management would improve'. Fieldwork on trails, participant-observation at trail team meetings and interviews with park staff, over a period of several years by the author, reveals that this premise was naive. The reality of decision making, as revealed through Chapters 4 and 5, is that the process in general is much more complex. Even in a single national park, for example, it is difficult to determine the extent to which each participant influences the decision-making process within the park and the degree to which participants and activities outside the park influence the process. A balance needs to be maintained amongst often different interests, for example visitor services, ecological integrity, public safety, human resources and money.

The purpose of this chapter is to examine decision-making processes related to hiking trail management in one national park (CBHNP). By examining this process, a number of goals are achieved. First, the actual decision-making process used in the national park for trail management is determined. Second, the people who are responsible for decision making and the types of decisions they make are determined. Third, the types of data used by each decision maker and at different parts of the decision-making process are clarified. Finally, an overall assessment of the usefulness of the products prepared by this author for trail management will be determined.

The methods used to gather information about the decision-making process are diverse. Initially, fieldwork conducted in the park by the author provided insight into trail issues. At the same time, the author was a participant-observer at trail meetings. This involvement allowed the author to determine the concerns of each of the participants in trail management. Subsequent discussions with park staff revealed more insight into the history of trail management in the park and the types of information required to make decisions. The author also participated in on-site visits to trails that required greater management consideration. Finally, more detail was gathered about the decision-making process through e-mail inquiries and unstructured interviews to determine the extent to which the trail studies completed by the author were used in the decision-making process.

To illustrate the decision-making process surrounding hiking trail management, three facets of trail management are examined in detail: trail maintenance, trail recapitalization and trail planning. Each of these areas of decision making requires different inputs of information. The roles of participants, levels of responsibility, potential decisions or action, information inputs and outcomes are unique to each area.

6.2 Background

Hiking trails are corridors used by visitors. They bring visitors into the park on foot and away from motorized traffic. Hiking trails are perhaps one of the best ways for visitors to truly experience nature on land. They are fundamental for providing visitors with a park experience that they would not otherwise get from either driving or from visiting by boat. Visitors may see unique plants and animals and become educated about the importance of the national park. In so doing, "Trails provide a means of learning more about values and pursuing recreational activities such as walking, backpacking, cycling, bird-watching and cross-country skiing" (Canadian Heritage, 1998 :98). Trails provide visitors with an opportunity to learn, understand, appreciate and enjoy park values and themes (Canadian Heritage & Environment Canada, 1996a). With this knowledge, visitors may become a strong voice to impress upon the federal government the importance of national parks (Hall, C. M. & McArthur, S., 1998). National parks need visitor support to retain budgets and stature within the federal system of government.

Environmental impacts specific to hiking trails may occur in the environment in which a trail is located or specifically on the trail itself (Leung, Y.-F. & Marion, J. L., 1996). The types of impacts identified in the literature range from broad regional impacts to site-specific impacts on vegetation, soils and wildlife. Broad regional impacts are caused by the construction of a new trail, which results in a permanent change to the environment and brings more visitors into an area. Previous to trail development, a forest may have had full canopy cover, thus protecting the surface of the ground from drying out from the sun or eroding due to exposure to the elements (Parks Canada 1996). The closed canopy results in more cover for songbirds and less opportunity for predators (Hickman, S., 1990). Inserting a trail may result in an edge being created. This may increase the exposure of some bird species to predators (Gutzwiller, K. J., Wiedenmann, R. T., Clements, K. L., & Anderson, S. H., 1994; Knight, R. L. & Gutzwiller, K. J., 1995). The development of a hiking trail may also result in permanent change to the drainage patterns in an area (Leung, Y.-F. & Marion, J. L., 1996).

The use of the trail by visitors potentially results in impacts on flora, soil, drainage, and fauna (Marion, J. L., 1994). With extensive use, the plants may change in size (become smaller) and the composition of the plants may be modified, so that the area becomes populated by plants that are more resilient (e.g., exotic species) (Adkison, G. P. & Jackson, M. T., 1996; Blom, C. W. P. M., 1976; Bowles, J. M. & Maun, M. A., 1982; Bright, J. A., 1986; Kuss, F. R., 1986). A final stage is the eventual destruction of plants, in which they are no longer able to survive on the trail. Under these circumstances, the trail surface loses its vegetation until it consists only of exposed soil, roots or rocks.

Compaction of the soil is caused by continuous trampling of plants and the ground. This compaction reduces the air spaces in the soil, making it difficult for micro-organisms to survive and reducing the ability of water to percolate into the ground (Leung, Y.-F. & Marion, J. L., 1996). A soil may lose its cohesive properties and become subject to erosion (Fish, E. B., Brothers, G. L., & Lewis, R. B., 1981). When bare ground surface is exposed to rain storms, significant gullying may occur (especially on steep slopes) which makes the ground surface become rough (Kuss, F. R. & Morgan III, J. M., 1986). Another possibility is that water may pool on the trail due to poor drainage, and this can result in increased muddiness. Hikers then walk around these muddy areas to keep their feet dry and to secure a more stable foothold. The result is trail widening, trail braiding, increased churning of soils or new side trails to avoid the wet areas (Leung, Y.-F. & Marion, J. L., 1996).

Hikers using trails disturb wildlife (Cole, D. N. & Landres, P. B., 1995). The mere presence of a trail may cause wildlife to alter their behaviour. Wildlife may be disturbed to such an extent that they are displaced away from the trail or redistribute themselves to other areas. In terms of birds, the heart rate of the animal may rise and excessive energy be dissipated due to the flight, which consequently leaves less time for feeding. Alternatively, animals may become so accustomed to humans that they become a nuisance to visitors (this is especially difficult when visitors feed animals) (Anderson, S. H., 1995; Knight, R. L. & Cole, D. N., 1995a; Knight, R. L. & Cole, D. N., 1995b).

In summary, the impacts of hiking trails result from the initial planning and construction of the trail to subsequent use of the trail by visitors. These impacts vary widely in type, (e.g., on vegetation, soils and wildlife), and in degree (e.g., mild reversible impacts to severe irreversible impacts). The impacts are related to environmental characteristics, the trail design, the type and numbers of visitors it receives, management, and maintenance. Prevention and/or mitigation of impacts is possible through planning, good trail design and careful placement, a rigorous maintenance schedule, trail surface hardening, good signs, visitor education and trail relocation or closure (Parks Canada, 1998).

6.3 Hiking Trail Management in CBHNP

The trail system in CBHNP is a front-country system. Visitors drive to each trailhead and hike a trail in a few hours. There are 26 trails in the park, extending 109 kilometres in length. Most trails are less than ten kilometres, few of the trails are linked and currently only one of the three backcountry trails is open for overnight camping. The trails comprise former Acadian cart trails (15%(16 km)), former fire roads (38%(41 km)) and planned trails (47%(51 km)). Results of the *Trail Inventory* reveal that of these trails, approximately 50% are in good condition with

minimal impacts, 25% are moderately impacted and 25% are in very poor condition (Lemky. K. 1997b). The condition ratings were arbitrarily chosen, trail sections with less than 5% of the trail surface degraded or with maintenance structures, were rated as and in good condition. Trail sections exhibiting between five and 25% degraded conditions or maintenance structures were rated as moderately impacted. Finally, trail sections with more than 25% of their surface exhibiting degradation or with maintenance structures, were rated as in very poor condition.

Many types of environmental impacts occur on the trails in CBHNP. For example, water pooling on a trail creates muddy areas and water moving on a trail causes erosion. Trails located close to rivers have become eroded at one side as visitors try to get a closer look at the river, and often become completely eroded into the river. In extreme cases heavy rainfall has completely washed away sections of trails as well as maintenance structures. Other problems are related to colluvial material which falls on a trail due to steep unstable slopes. Finally, in some areas the vegetation and soils have been severely impacted due to trampling; the vegetation has been killed, soils have been trampled to the inorganic layer, and trail widening has occurred (up to 4 metres in width).

Impacts to the hiking trail system have resulted from a lack of planning and management, poor trail maintenance, the existence of inappropriate or degrading structures, high visitor use, harsh climatic conditions (over 1600 mm of rain and snow per year, and hurricanes) and rugged terrain. Several trails were closed, in the last decade, due to obvious environmental impacts and budget constraints. These trails were often located in the wet, boggy areas of the park's interior, or were located too close to small streams and rivers, affecting the ecological integrity of areas surrounding the trails. The poor trail design in some of these locations resulted in high maintenance costs.

Various Parks Canada documents as well as the four aforementioned documents prepared under contract by this author (described on page 109) assist in decision making related to hiking trail management. The experiences of the trail managers, visitor comments, activities occurring outside the national park and the availability of funding are other factors that contribute to the way in which trails are managed. The Parks Canada documents used in trail management are general documents prepared at the National Office as well as specific on-site studies for CBHNP. These documents are as follows: a *Trail Manual* (Parks Canada, 1986); *Best Practices for Hiking Trails* (Canadian Heritage & Environment Canada, 1996a); an *Asset Inventory for Parks Canada Trails* (Canadian Heritage & Environment Canada, 1996b); and studies, research reports and academic publications on both biophysical and cultural issues specific to CBHNP (Boss, J., 1986; Parks Canada, 1977; P.G.Whiting and Associates, 1992a; P.G.Whiting and Associates, 1992b).

The *Trail Manual*, prepared by park staff in the National Office, assists managers in the planning, design and construction of hiking trails (Parks Canada, 1977). The *Trail Manual* outlines all major factors that should be taken into consideration for the trail management process (e.g., user and aesthetic requirements, environmental protection and carrying capacity, planning and design process, and construction and maintenance guidelines).

The document *Best Practices for Parks Canada Trails* was developed to assist managers in applying the concepts and ideas outlined in the *Trails Manual* to site-specific conditions. A 'Spectrum of Appropriate Trail Activities, Services and Facilities' (Canadian Heritage & Environment Canada, 1996a) was developed for the five major zones identified by Parks Canada. This spectrum clearly depicts, through photos, appropriate visitor facilities. The type of facility depends on the zoning of a particular area. For example, Zone I is a Special Preservation Zone: the development of any visitor facilities is unacceptable in this area. Zone II is a Wilderness Zone. This classification zone allows hiking trails that are narrow, built with local materials and that blend in naturally with the environment. Zone III is a Natural Environment zone. In this zone opportunities for visitors are provided in front country areas that accommodate a range of activities. Zone IV is an area designated for Outdoor Recreation. This zone accommodates the broadest range of activities, offering an easy, convenient opportunity to experience nature. For example, wide boardwalks, wheel chair accessible trails and hardened surfaces may be found in this zone. In contrast, Zone V, the Park Services Zone, is normally associated with a community, in order to satisfy the attributes sought by both the tourism market and residents of the community. It allows well-marked trails that are wide and hardened with gravel or asphalt.

The *Asset Inventory for Parks Canada Trails* is a useful document because it outlines the state of trails in national parks in Canada. It identifies maintenance costs per kilometre of hiking trail for each national park. It also identifies the highest costs for trail infrastructure; for example, bridge building is deemed to be one of the most expensive costs to the hiking trail system. Designing a trail with a minimal number of bridges undoubtedly reduces the cost of the trail (Canadian Heritage & Environment Canada, 1996b).

Research reports such as the *Trail Inventory and Recommendations*, completed in 1977 by Parks Canada, and a *Visitor Use Impact Survey of Hiking Trails*, conducted by Boss (1986) are useful for providing an historical look at the trail system, to identify impacted areas in the CBHNP. Neither the specific locations nor the extent of impacts are clearly identified in these reports. These data limitations contribute to the lack of improvement in trail management. As well, the park does not have guidelines for impact evaluation and trail monitoring. There was no inventory of trail attributes, environmental impacts or maintenance structures. To remedy this

situation, the PCA provided funding to this doctoral candidate, for building an information database that was expected to be of assistance to people involved in the management, planning and maintenance processes. This three-year study period resulted in four documents: *Review of Methods for Monitoring and Assessing Trail Conditions in Wilderness Areas: Recommendations for Cape Breton Highlands National Park* (Lemky, K., 1997a), a *Trail Inventory* (Lemky, K., 1997b), a *Catalogue of Hiking Trails* (Lemky, K., 1997c), and a *GIS Model of the Landscape Suitability for Hiking Trail Development* (Bridgland, J., Lemky, K., & Allen, D., 2000). The *Review of Methods for Monitoring and Assessing Trail Conditions* was prepared after the literature was examined to evaluate the existing monitoring and assessment techniques for hiking trails in wilderness areas to provide an overview of the methods available for monitoring hiking trails.

Following the literature review and a one-week field course, an on-site evaluation and assessment of all existing and former hiking trails in the CBHNP was conducted. This resulted in a *Trail Inventory*. The *Trail Inventory* comprises two spreadsheets, one for environmental impacts and the other for maintenance structures for each hiking trail in the park. The spreadsheet of environmental impacts on trails contains information on the type of environmental impact, its location in relation to the trailhead, its extent, and finally the degree of impact (e.g., mild, moderate, or severe). Every hundred metres the trail width, tread width and tread depth were measured, providing a quick method of monitoring changes occurring along the trail. The second spread sheet identifies the maintenance structures for the trail. It contains information on the type of maintenance structure, its location relative to the trailhead, the size, and its effectiveness (e.g., ineffective, moderately effective, or highly effective). The *Trail Inventory* provides a baseline study of conditions of all hiking trails in 1996; subsequent assessments using the same protocol will provide the national park with monitoring data which may be reviewed regularly to determine the degree of change occurring on the trails. Management can then address these changes with appropriate mitigation measures.

The *Catalogue of Hiking Trails in CBHNP* comprises an evaluation of each hiking trail in the park. It provides general information about each trail: its length, general characteristics, condition, description of soils and drainage. It also provides details on use levels and the costs of maintenance as well as a summary of impacts and maintenance features for each trail.

The data from the *Trail Inventory* were further summarized to provide a rating of high, medium or low impacts and/or environmental features for each trail. The trails were also placed into electronic format using a Global Positioning System. The trails were then classified electronically for their different ratings. This information was cross-tabulated with the existing

GIS thematic maps (e.g., drainage, vegetation, rooting depth, slope, tree cover) for the park. The ultimate result was *Use of Field-Verified GIS Classification to Determine Landscape Suitability for Hiking Trail Development* for the entire park (Bridgland, J., Lemky, K., & Allen, D., 2000). This GIS model is a map of the park which depicts three distinct areas: one where trails should not be located, another that shows good locations for hiking trails and a third category which is indeterminate, depicting where trails should be placed with caution.

All participants involved with trail management have decades of experience with hiking trails, both in their personal hiking experiences but also in terms of recognizing trail designs that minimize environmental impacts and in envisioning ways of enhancing visitor benefits. Visitor comments and occurrence reports (hiker injuries or lost persons) are important to ensure that managers are aware of visitor satisfaction levels and potential safety issues on trails. The political will to prioritize hiking trail issues, financial support and human resources all influence the types of decisions that are made. Partnership funding from the Nova Scotia provincial government was used to recapitalize the Skyline trail in CBHNP (Les Amis du Plein Air, 2000). Another national initiative, the recent report by the Ecological Integrity Panel: *Unimpaired for Future Generations?* (Parks Canada Agency, 2000a), influenced the decision-making process concerning the hiking trail system in CBHNP. Under this report all staff were required to undertake ecological integrity training which would help them to understand implications of their actions to the environment within which they work.

Finally, despite the importance of trail management and the effort made to improve the trail system in CBHNP, currently there is no trail management plan due to the lack of funding and time. A trail management plan would normally provide the philosophy for making hiking trails in the park and provide guidance for the management of the trail system.

The next sections detail three case studies that illustrate issues facing hiking trail management in CBHNP. As well, the importance and use of the aforementioned products and other types of information for decision making on hiking trail management within CBHNP are evaluated and discussed.

6.4 Facets of Trail Management

In CBHNP, decisions relating to hiking trail management fall into the following three broad categories: trail maintenance, recapitalization of hiking trails, and planning of hiking trails. The routine maintenance of hiking trails is essential to ensure that the trail condition is kept to the highest quality possible. This maintenance ensures that trail structures are in working order, that the trail is free of obstructions, that visitors can enjoy their trips on the trails and that environmental impacts to the trail and the surrounding area are minimized.

Trail recapitalization refers to the reconstruction of a hiking trail. A trail may be recapitalized for three main reasons: to reverse the incremental degradation and wearing out of trail structures (structures even made of treated wood only have a life span of several decades); to prepare a trail for its redesignation to a higher standard (multiple use or interpretive, or a climatic event which has removed much of the trail or public pressure); and addressing high impacts on the ecological integrity of a park ecosystem. Recapitalization results in a complete overhaul of a trail rather than piecemeal maintenance.

Planning of hiking trails is required to ensure that the trail system minimally impacts the ecological integrity of the park and provides maximum benefits to visitors. These are the mandates of the *Canada National Parks Act*. The planning process ensures that significant impacts are mitigated and that trails are not located in areas that may cause adverse environmental impacts. Planning provides a marketing vision for the way in which the trail system interprets park attributes. The planning process coordinates with other agencies in studying the potential of linking the national park trail system with other trails outside the national park. Well-designed trails and good visitor information help to ensure that national parks visitors' needs are met and that they leave an area with increased knowledge as well as a commitment to support these protected areas.

Each of these facets of trail management has a unique decision-making process. The types of decisions, the participants in the decision-making process and the types of information required for making a decision vary with each facet. The decision-making processes however, take place under the same legislation, the *Canada National Parks Act* and the same *Guiding Principles and Operational Policies* prepared by the PCA. Trails must be planned and designed so that they do not adversely affect the ecological integrity of the park. Activities that threaten the ecological integrity of park ecosystems will not be permitted (Parks Canada 1994; 2001). Managers involved in the protection of ecosystems are expected to base management decisions on internationally accepted scientific principles and concepts of conservation ecology (Canadian Heritage, 1994).

6.4.1 Participants

Trail management in CBHNP involves a variety of participants in the decision-making process. Those participants include the park Superintendent, the Assistant Superintendent, the Managers of Heritage Presentation and Visitor Services, Natural Heritage Protection, and General Works, Heritage Presentation and Trails Coordinator, Assistant Manager Visitor Activities, the Trail Crew, and the Park Ecologist. These decision-makers play different roles and assume different responsibilities depending on the issue. Substantive decisions on hiking trail

issues are made by the park Superintendent. He is considered the 'Responsibility Centre Manager'. His decisions are made with a long-term perspective (i.e., a 20-year time-frame). The Superintendent also develops partnerships with outside agencies working on joint programs to secure funding for trail endeavours and for finalizing funding and facility infrastructure proposals for the park. He also identifies and allocates the money and human resources for trail planning. The park Superintendent makes the final decisions determining the overall state of the trails, the trail system design, and long-term goals. The Superintendent approves any plans or programs put forward by the trail team or from outside groups.

The Assistant Superintendent was involved, temporarily for a one-year period, with CBHNP. He was actively involved with the trail team and promoted change in trail management.

The Manager of Natural Heritage Protection is responsible for safety and conservation issues with respect to hiking trail management. He identifies potential public safety issues on trails and ensures that this information is brought into discussions on trail location and trail design in the planning process. The Park Wardens are charged with enforcing the *Canada National Parks Act* and regulations (Government of Canada, 2000 Sections 20,21,22, 23). In this capacity, Park Wardens ensure that visitors are informed of appropriate behaviour and activities in the national park. As well, Park Wardens preserve the ecological integrity of the national park through environmental assessments of trail development. They also ensure, through their involvement in the planning process, that trails are kept out of the high preservation zones (I and II). Two staff members, one from the east side (Heritage Presentation and Trails Coordinator) and one from the west side (District Fire Coordinator) of the park, report to the Manager of Natural Heritage Presentation about trail issues and make suggestions as required (e.g., increase in resources). For example, if an increase in resources is required, the Manager's response is to send a memo to the Superintendent outlining the situation and recommending a course of action. The Superintendent then makes a decision on the course of action that will be taken.

The Manager of Heritage Presentation and Visitor Services is responsible for ensuring that visitors to CBHNP enjoy their park experience and benefit from it. Appropriate marketing of CBHNP ensures that visitors' have correct expectations when they reach the park. Visitors learn about the park through the variety of education programs and tools available (e.g., interpretive signs, interpretive programs and guidebooks). All front line-staff (i.e., those in frequent contact with visitors) report visitor issues and feedback to the Assistant Managers of staff who subsequently report information to the Manager of Heritage Presentation and Visitor Services. With respect to the planning process for hiking trails, the Manager of Heritage Presentation and

Visitor Services ensures that there is a balance between visitor satisfaction through the diversity of trails that are provided or the educational component of the trails and long-term protection.

The General Works Manager is responsible for providing staff for recapitalization projects taking place in the park. The General Works Manager is no longer involved with the Trail Crew because they are supervised by the Natural Heritage Protection. The manager designates General Works staff, however, to work on the recapitalization projects. He also has expertise gained from years of work in the park, which is important for assessing the feasibility of trail recapitalization proposals.

The Heritage Presentation and Trails Coordinator in CBHNP is the supervisor for the Trail Crew on the east side of the park. He is also responsible for developing the trail plan for the park and incorporates feedback from other staff members. The trail plan is expected to provide guidance in terms of understanding the purpose and future goals for the hiking trail system. It identifies the major trail themes and the roles that various management sectors in the national park have on trail management. The trail plan will further evaluate the feasibility of proposed trails, and identify potential problems of the trail system with respect to environmental impacts, maintenance issues and visitor concerns. The final acceptance of the plan relies on the decision of the management team.

The District Fire Coordinator (a Park Warden) is not a member of the trail team, but is responsible for the supervision of the Trail Crew on the west side of the park. He ensures that work plans are completed and monitors the success of the implementation of these proposals. Concerns that arise are reported directly to the Manager of Natural Heritage Protection.

The Assistant Manager of Visitor Activities is a member of the trail team and ensures that visitor needs are met by the park facilities. Her involvement has varied with the changing needs of trail management.

The Trail Crew comprises four members, two from the east side of the park and two from the west side of the park. They implement the recommendations of the trail team. The Trail Crew is responsible for routine maintenance of the hiking trails. This maintenance ensures that trails are safe for visitors and reduces environmental impacts. Members of the Trail Crew remove encroaching vegetation and fallen logs, clean out culverts and water bars, replace faulty or deteriorating maintenance structures (e.g., boardwalks, bridges, add gravel to washout areas) and generally monitor the trails to ensure that conditions are acceptable for visitor use.

The Park Ecologist is not part of the trail team in CBHNP. His input into trail planning is for the most part advisory. He plays a vital role in ensuring that scientific information is available for decision makers so that they can make informed decisions with respect to hiking trails. He

ensures that the most up-to-date tools possible are used in the decision-making process. For example, he secured funding from the Ecosystem Science Fund for a trail inventory that formed the basis for the GIS hiking trail development . He also ensures that trails are kept out of sensitive areas of the park (e.g., Zone I and II).

6.5 Trail Maintenance

Trail maintenance in a national park is a requirement. Regular maintenance is needed in order to minimize environmental impacts, preserve maintenance structures and ensure public safety. Environmental impacts occur and materials degrade despite the attempts to control them through careful planning and choice of construction materials. If severe weather occurs, a section of a trail may be washed out. Culverts, water bars and drainage ditches become clogged with debris (e.g., leaves, sand and gravel), particularly during the wetter months of the year. If this debris is not cleared the water will act on the trail surface, eroding it and/or making muddy areas that visitors avoid by widening the trail.

Materials such as wood, rock, gravel and metal are subject to the elements. Wood rots if repeatedly wetted, rock and metal both weather, and gravel is subject to erosion. Vegetation can encroach on a trail, keeping the area moist and thereby contributing to the rotting of wood and slippery surfaces. Maintaining trail structures reduces environmental impacts and keeps the trail surface smooth, thereby promoting safe visitor use. As well, the Trail Crew ensures that the trail is kept open by removing encroaching vegetation and fallen logs, and in some cases mowing trails surfaced with grass to ensure that the trail is easily visible to all visitors. With a well maintained trail visitors can concentrate on enjoying nature rather than watching out for fallen logs, slippery surfaces and rocks.

6.5.1 Background

The CBHNP hiking trail system has many trail maintenance problems. The *Trail Inventory* noted that culverts were ineffective because they were blocked or had been washed out with the rain. Drainage ditches were filled to such an extent that they were no longer visible, and the Trail Crew was unaware that they were even present. Bridges and boardwalks were deteriorating due to the high precipitation. Vegetation was encroaching to such a high degree, in some areas, that the trail was no longer visible, thus compromising visitor safety. In some areas, sections of the trail had been completely washed out and/or rock loosened from above had fallen onto the trail. Finally, trail braiding and deep incising (50 cm) had occurred on some trails.

The harsh climate, for example high winds and frequent hurricanes, contributes to these impacts. High visitor numbers on some trails impact the surrounding area. Many of the impacts identified are due to inadequate maintenance. Initial problems with trail maintenance began

because this activity was supervised by the General Works which is responsible for the upkeep of major visitor facilities in the park such as roads and visitor shelters. The priority for General Works is the Cabot Trail, a two-lane highway that provides the main access to the park and surrounding villages and transports up to 350 000 visitors annually. Trails are used by approximately 245 000 people per year (Contact Person 5, 2001) and are considered a secondary priority to the Cabot Trail. The Trail Crew was often called off the trails to work in other areas and/or a supervisor was unavailable to manage work. As well, Heritage Presentation and Visitor Services and the Natural Heritage Protection would frequently ask the Trail Crew to address an issue on the trail, which meant that it was difficult for the Trail Crew to prioritize their work. These circumstances resulted in piece-meal trail maintenance in the park. The trail system requires the four members of the Trail Crew to work full-time for four months of the year to maintain a trail system with minimal impacts. The Trail Crew was also uncertain as to all the maintenance tasks that were acceptable; they did not want to cause adverse environmental impacts through over exuberant maintenance. Deterioration of the trail system occurred slowly over several decades. Without a monitoring system in place, it was difficult to pinpoint where problems were occurring and the degree to which they were occurring until they became severe.

The solution was to formalize the trail management process by creating a trail team in 1995 and by providing a small budget to the Trail Crew. The trail team is expected to provide clear unambiguous direction to the Trail Crew. Trail management would be supervised by the Manager of Natural Heritage Protection, ensuring that:

1) the Trail Crew would be dedicated to trails;

2) all work would be done within the mandate of the *Canada National Parks Act*;

3) the *Trail Manual* would be used;

4) good supervision would occur; and

5) the accountability of the Trail Crew would increase.

Although the human resources for the trail team were fixed, providing a budget provided more flexibility in addressing trail maintenance issues. Further to this, trail maintenance schedules were created, trail logs maintained in order to identify the work completed and the acceptability of the work.

6.5.2 Participants and Roles

In order of priority from field work upwards, the people involved in trail maintenance issues are the Trail Crew, the Trail Crew Supervisors, the park management team, and the Superintendent. The Trail Crew is responsible for maintenance. Its members determine how they will implement their work and the rate at which they do it. The Trail Crews are supervised by one

of two people in the park, the District Fire Coordinator on the west side of CBHNP and the Heritage Presentation and Trails Coordinator on the east side of CBHNP. These supervisors, along with the Trail Crew, develop work plans and implement priorities identified in the *CBHNP Business Plan*. Both Trail Crew supervisors report to the Manager of Heritage Presentation. This Manager oversees the work conducted on the hiking trails. When an issue arises that is atypical, the Manager writes a memo to the Superintendent who makes the ultimate decision on a course of action. The creation of the trail team ensures that that visitor issues and heritage protection concerns are incorporated into trail maintenance.

6.5.3 Information Inputs

The major information and guidance inputs for trail maintenance are the *Trail Manual*, the *Trail Inventory*, and the staff's best professional judgement. The *Trail Manual* (Parks Canada, 1986) is the primary guide for trail construction and improving maintenance structures. It outlines basic planning and design guidelines, environmental protection concerns, and construction and maintenance guidelines for trail managers and the Trail Crew.

The 1996 *Trail Inventory* (Lemky, K., 1997b) is used by the Trail Crew and supervisors to locate the sections of the trail requiring work. Prior to the completion of this inventory it was difficult to identify the specific locations of problem areas or maintenance structures, and how long it would take to reach a certain part of the trail. This lack of information made it difficult to plan work. As well, the inventory is important for determining the type and extent of the structure being worked on. For example, maintenance structures such as culverts are often completely blocked during the low visitor season. Until recently, they were also difficult to find. Knowing their specific location on the trail makes these structures easier to locate. It is easier to replace a structure that has been removed by heavy rains if its type and effectiveness have been noted. Occasionally, the managers will consult other Field Units with similar problems or experts at the Service Centre in Halifax to determine the best solution for a trail problem, especially when a major change is required.

The Trail Crew, trail team members and all supervisors have extensive experience with trail maintenance issues through work within CBHNP and other national parks in Canada. Often, the types of information required to address a trail problem come from personal experience with a variety of issues. This type of information cannot be found in the *Trail Manual* or through a trail inventory.

6.5.4 Decision-Making Process

The decision-making process for trail maintenance is now made up of a number of distinct sets of decisions. Schedules are approved annually by managers who set trail priorities.The first

set of decisions is related to clearing the trails so that they are accessible to hikers in late spring. Initially, each trail is visited by a park staff member and particularly serious maintenance issues are noted. The Trail Crew then meets with the supervisor to outline a work plan to prepare trails for the tourist season. The trails then need to have all barriers, such as fallen trees and rocks, removed and maintenance structures are cleared of debris. The types of decisions made during routine maintenance range from determining the size and length of a drainage ditch, to adding a water bar, to which encroaching vegetation to remove. While conducting the spring clean up, the Trail Crew also makes note of structures which need replacement or which should be given special attention after the trails are opened for visitors. The degree of maintenance is related to the type of trail. Front-country trail standards are much higher than those for a back-country trail. The decisions made in this case are based on guidelines provided by the *Trail Manual*, *Best Practices for Parks Canada Trails* as well as the Trail Crew's best professional judgement.

The second set of decisions relates to prioritizing the addition or replacement of maintenance structures. Again, the members of the Trail Crew meet with their supervisors in order to prioritize work. At this time there is a need for consultation with the Manager of Natural Heritage Protection, the trail team or the park Superintendent to address issues that are not routine. A decision to replace a structure will depend in part on the information provided by the *Trail Inventory*. If a trail has chronic problems, as noted in the inventory, then a decision will be made to change the type of structure in order to improve its effectiveness, add a new structure, or enlarge the structure.

Often, it can take up to two or three days each week to supervise the Trail Crew, especially in the spring. In sensitive areas, considerable discussion is needed to determine the best options and, occasionally, outside experts are consulted for the best solution to the issue. Recommendations are made to the Manager of Natural Heritage Protection and passed to the Superintendent. This is especially important if the environment is sensitive and impacts are severe. Though this may appear to be cumbersome without a clear directive, trail plan, or trail management philosophy, the onus is on the Superintendent to ensure that that his decision making is consistent over the long-term. As well, the Superintendent can move incrementally towards the goals of good trail management (e.g., minimizing environmental impacts and promoting benefits to visitors). In some cases, advice is procured from the ASC or other Field Units to determine the best maintenance option. There is also an engineering and architect group in the National Office of the PCA who have developed the *Trail Manual* and *Best Practices for Parks Canada Trails*. Specifics on the building code for trail construction are provided on request to the Field Unit by the ASC.

6.5.5 Potential Outcomes

Maintenance is a required activity to keep trails in good condition, but with changing staff and the previous practice of minimal supervision, the lack of attention to maintenance issues has proved to be very expensive for CBHNP. For example, the current situation in the park is that if a well-used trail reaches a level of degradation that is unsafe and funds can be found to work on the trail, it is recapitalized (i.e., rebuilt). The need for recapitalization is in part due to the lack of routine maintenance and resulting deterioration of drainage structures, which leads to environmental impacts. In the case of the Skyline Trail (discussed next), structures such as culverts were blocked and or destroyed, leading to severe water damage on the trail; this damage, combined with increased visitor use, resulted in serious environmental impacts. For example, in some parts of the Skyline muddy areas were 10-20 metres in length which resulted in up to three side trails to avoid the wet spots, in other areas trail incision was 0.5 metres and over three metres of vegetation was cleared off the trail exposing roots and bare ground.

Not all impacts are due to lack of maintenance and high visitor use; severe weather (e.g., hurricanes, high winds and high precipitation) has also washed away structures (e.g., bridges). With the new formalized method of trail maintenance, it is possible that trail maintenance will be more successful at mitigating impacts before they become severe. The *Trail Inventory* provides a baseline according to which managers can check the progress of maintenance.

6.6 Trail Recapitalization

Trail recapitalization is the infusion of an existing trail with new resources to upgrade it to its full capacity. The reasons for recapitalization vary from a reclassification to a new class (e.g., a new designation from a hiking trail to a multiple use trail), the wearing out of maintenance structures, and an increase in use or environmental impacts. All of these reasons require new or more extensive infrastructure. As national parks evolve and visitor use changes, the demands on national parks for accessible trails or multiple use trails result in the need for recapitalization. Standards for accessibility and safety were incorporated into the *Trails Manual* about a decade after it was initially published (Parks Canada, 1986), thereby increasing the accessibility of hiking trails to other users. In some cases, trails have not been a priority for management due to funding issues and a lack of funds for all infrastructure, which has led to the deterioration of many trails. When safety issues arise, the park has to invest a considerable amount of money in improving the trail. The Skyline Trail in CBHNP has recently been recapitalized.

6.6.1 Background

The Skyline Trail is currently one of the most highly used front-country trails in CBHNP. This 7.2 km trail allows visitors to experience the boreal forest, moose browsed areas, and

accesses spectacular views of the Cabot Trail winding through the mountains and finally an open headland from which the ocean and often pods of whales can be viewed. The impacts on the Skyline Trail due to poor drainage have been known for decades and are outlined generally in the 1977 *Trail Inventory* (Parks Canada, 1977). In the 1986 assessment, impacts such as root exposure and the deepening of tread incision to unacceptable levels were documented (Boss, J., 1986). Other major problems with trail widening, braiding and serious vegetation impacts to the headland vegetation were not documented quantitatively (e.g., specific locations, extent and degree of impacts), however, until 1996. The staff recognized that the trail was deteriorating and impacts were increasing, and visitor complaints about trail degradation were received (Refer to Figure 6.2 for photos illustrating impacts).

Promotion of the Skyline Trail locally as one of the best trails in the park for wildlife viewing and beautiful scenic views, by frontline staff, further popularized the trail. One of the results was overcrowding. This crowding occurred both on the trail and in the parking lot. The increased number of visitors on the trail resulted in trail widening and braiding as visitors passed each other. As well, side trails proliferated (over 30 were documented in the 1996 *Trail Inventory*). The parking area was filled to over capacity for several months of the year; cars were routinely parked for up to .5 km along the side of the secondary road leading up to the parking area.

About three km of the trail had the most impacts and was rebuilt at a cost of $ 0.5 million. To reduce impacts, the trail was shortened by 300 m. Boardwalks were placed on extensive portions of the trail and new viewing platforms were built at the end of the trail. The rest of the trail surface was widened and hardened with gravel and proper drainage was put into place to minimize water impacts.

6.6.2 Participants and Roles

The trail team in 1996 comprised an Assistant Superintendent, the Heritage Presentation and Trails Coordinator, the Assistant Manager of Visitor Activities from the Western side of the park, and two members of the Trail Crew. As well, the park Superintendent also had a role to play in the decision to recapitalize the trail. During the business planning process, the Skyline trail was identified as a priority by the management team.

The Assistant Superintendent was the person who organized and facilitated trail team meetings. Guided by his experience as a Park Warden for many decades, he was very concerned about impacts to the ecological integrity of the environment where the trail was located. The location of the Skyline Trail is on a narrow exposed headland, with the increasing width of the trail, the headland was at risk of losing a great proportion of its vegetation.

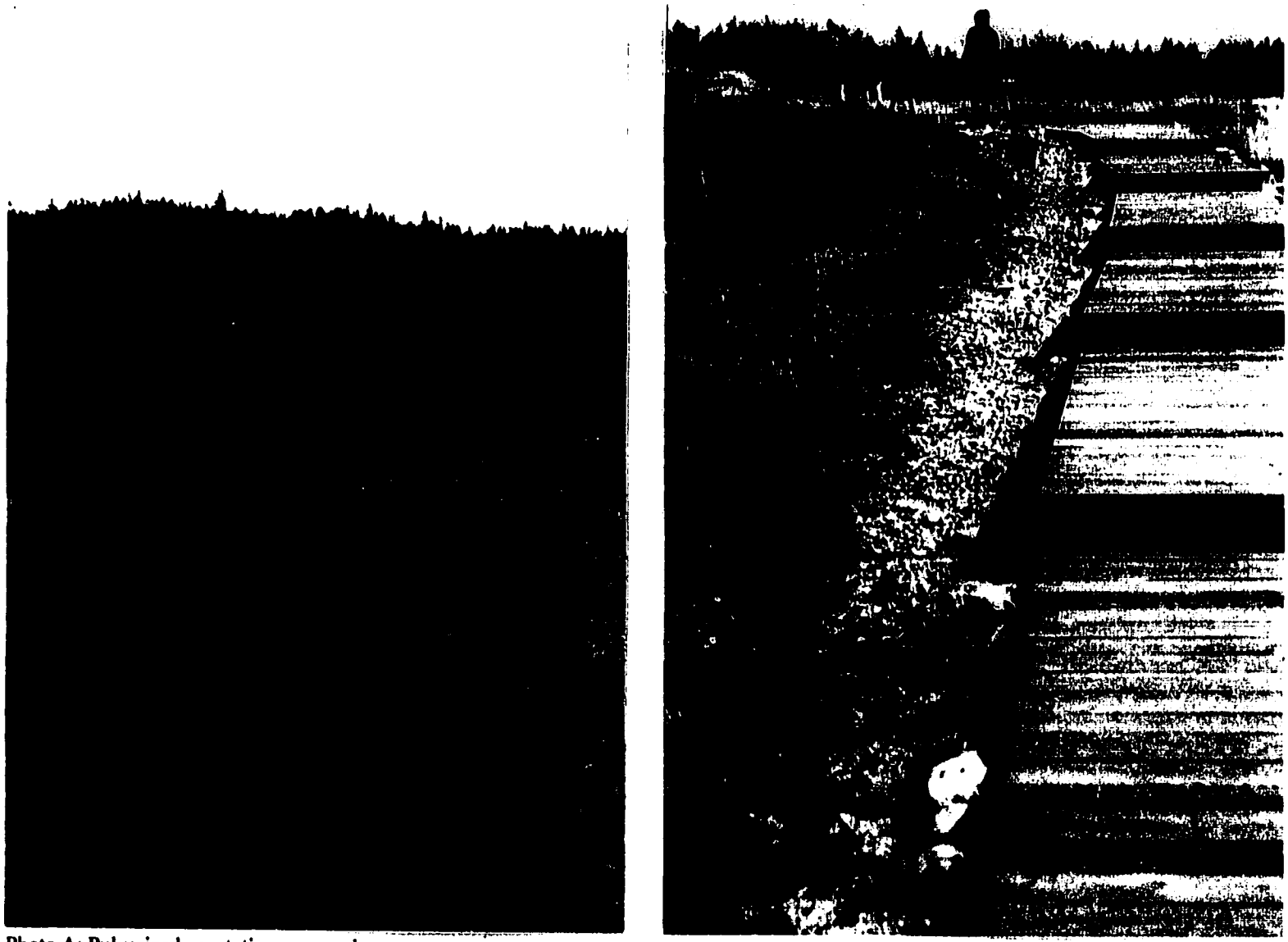


Photo A: Pulverized vegetation, exposed roots, exposed soil, trail widening

Photo B: Boardwalk and small 'Vegetation Recovery' sign, keeps hikers on trail

Figure 6.2: Photos Illustrating Environmental Impacts and Mitigation to the Skyline Trail

The Assistant Manager of Visitor Activities, Heritage Presentation and Trails Coordinator were adamant that the trail be preserved and recapitalized because of the high number of visitors that used the trail. The opportunity for visitors to enjoy the park, view a wide variety of habitats and experience spectacular scenery was very high at this site. The current condition of the trail, with poor drainage in some areas, tree roots exposed in others, and depositional materials or large rocks exposed in other areas meant that it was difficult for visitors to maximize their experience because they were spending most of their time watching their feet to avoid having an accident. As well, because the trail lacked interpretation and structures along its length, visitors were impacting sensitive areas of low-lying vegetation (e.g., setting out blankets and having picnics on rare plant species) without realizing the impacts of their actions.

The Natural Heritage Protection representative noted that in many parts of the trail inadequate infrastructure encouraged visitors to leave the designated trail, resulting in severe localized impacts such as trail braiding and widening, increased exposure of roots and side trails. During the 1996 *Trail Inventory*, over 30 side trails were documented. The width of the trail, normally one metre, was widened in some areas to over three metres. As well, much of the infrastructure was old and deteriorating, which reduced its safety for visitors. The area impacted most severely was also an area with many rare species of plants. The impetus to stop visitor use from impacting the trail environment in these ways was very high.

The Trail Crew noted that recapitalization of the trail would require extra staff, as the reconstruction was extensive. As well, they noted that over time many of the maintenance structures had been filled in, which meant that they were no longer functioning to keep water off the trail. The result was increased degradation of the existing trail.

The person who made the ultimate decision as to whether the Skyline Trail should be recapitalized was the park Superintendent. Upon reviewing the recommendations of the trail team and after assessing the situation, the park Superintendent agreed with the trail team. Recapitalization, however, required extra funds which were not in the park budget. The Superintendent secured funds through a variety of sources, provincial, federal and the community, to recapitalize the Skyline Trail. The park also worked in conjunction with *Les Amis du Plein Air*, a non-profit association working in co-operation with CBHNP, to secure funding from a provincial source (The Nova Scotia Trails Destination Project Steering Committee). The guidelines for appropriate visitor structures are quite strict within the national park (i.e., note the zoning designations for the park). It is important that all funding partners are aware of these guidelines. The *Canada National Parks Act* stipulates that facility development cannot compromise the ecological integrity of a national park. It was important to develop memoranda of

agreement with outside funding groups to ensure that the mandate of the national park would be followed, that strict environmental considerations would be adhered to and to identify which parties would be responsible for funding.

The Heritage Presentation and Trails Coordinator is also the Project Manager for the Skyline Trail recapitalization. He helped find money for the recapitalization of the trail. He also decided who would work on the hiking trails and what type of design would be put in place. The trail construction crew used for special projects, are staff from General Works. Crew members would use their expertise gained from road building, on trails. Heritage Presentation and Visitor Services is involved with the interpretation of the trail via signs, including interpretive content, education and information.

6.6.3 Information Inputs

Many types of information fed into the Skyline Trail recapitalization decision-making process including visitor use, environmental impacts, funding constraints, environmental constraints, and the *Trail Inventory*. The personal experience of staff members was the most influential, however. The *Trail Inventory* clearly documented all of the impacts and the maintenance infrastructure. It was the on-site visit to the trail and subsequent discussion that led to the championing of the recapitalization project, however. Other types of information that fed into the process were the resource constraints placed on the park and potential impacts to the environment. The reduced financial resources and the sensitivity of much of the park environment to construction meant that no new trails were being built in the park. In fact, some trails in diverse locations are being closed because of poor condition and adverse environmental impacts.

6.6.4 Decision-Making Process

The process of decision making for recapitalization was initiated along with the recognition that serious environmental degradation problems were present on the Skyline Trail. The *Trail Inventory*, an on-site trail team visit, staff and visitor perceptions of impact, as well as increased visitor numbers were all used as evidence that management action was necessary to address this issue.

The second stage of the process was to discuss alternative management actions to address this situation. The trail team discussed alternatives such as trail closure, shortening the trail to avoid the most impacted area, increased interpretation, improved maintenance and recapitalization. The facts of the situation were that the impacts from visitor use and environmental degradation were serious, causing the ecological integrity of the area to be impaired; however, visitor enjoyment, education and other benefits of using this trail were very high. The fact that, for the last several years, the parking area was over flowing its capacity for

the high tourist season attests to the trail's popularity. The enjoyment of the trail by visitors was apparent through discussions with front-line staff who stated that many visitors perceived their visit to the Skyline Trail as a highlight of their trip to CBHNP. The Skyline Trail's potential for enhancing visitor enjoyment and education meant that trail closure was not seriously considered.

The alternative, shortening the trail, was discussed. The biophysical characteristics of the last 800 m of the trail which also corresponded to the most highly impacted area, were evaluated. Characteristics such as the slope of the land and trail, potential weathering, erosion of the site, and devegetated areas were all taken into consideration in this decision (this information was found from the 1996 *Trail Inventory* and an on-site visit). Based on this information, it was decided that the trail should be shortened by 300 m. This would ensure that further damage due to visitor use would be minimized; as well, the cost of recapitalization would be lower. Further shortening of the trail was not deemed appropriate because visitors might have their experience diminished if they could not fully experience the spectacular views the trail had to offer.

The trail team also decided that visitor education in the area needed improvement. The educational component of trails is, for many visitors, one of the most important draws of a trail. The interpretive trails in CBHNP are integral to educating visitors. Interpretive signs provide insight into unique vegetation, ecosystems, and wildlife in a protected area. If the trails are to be used to promote the park as well as provide unique learning experiences to visitors, more action is required to provide interpretive tools on-site. Visitors needed information about the sensitivity of the site and the importance of staying on the hiking trail. It was decided that those with expertise in the Heritage Presentation and Visitor Services Sector would explore the alternatives to interpretation and visitor education.

Improved maintenance on the trail was deemed essential, however, because the trail had so many drainage problems, eroded areas, and severely devegetated areas, as well as many side trails. The first order of business was to determine a course of action for recapitalization. Although ideally it would have been good to keep the trail narrow and unobtrusive in the environment, the reality of the situation was that the trail was already over a metre in width for the majority of its length, and in some cases almost four metres. Extensive erosion on the trail resulted in trenches of over .5 m in depth and there was extensive root exposure. Major recapitalization was required to mitigate all impacted areas (e.g., fill trenches, fix drainage problems, and to construct board walks on wet areas and sensitive devegetated areas). The trail was uniformly widened to 1.2 m in width. In areas where scenic views were particularly spectacular, viewing platforms were constructed.

The proposal for recapitalization was submitted to the park Superintendent. He agreed with it in principal but could not act until finances were procured. The Heritage Presentation and Trails Coordinator actively sought funding for the recapitalization project from the province and *Les Amis du Plein Air* and CBHNP matched this funding from their own budgets. This funding enabled the recapitalization project to go ahead.

One step in addressing the overcrowding of the parking area was to relocate it closer to the Cabot Trail. The Skyline trailhead was one kilometre from the Cabot Trail, off of a gravel road. The site near the Cabot Trail was a larger parking area which helped to address the over capacity issue, the inconvenience being that visitors would now have to walk an extra kilometre to reach the trailhead. Judging by the continued popularity of the trail since this change was made, it has not been a deterrent to the number of visitors on the Skyline Trail.

6.6.5 Potential Outcomes

The Skyline Trail was recapitalized. Information gathered from previous trail studies, the *Trail Inventory*, the best professional judgement of the staff, as well as visitor perceptions and comments all led to the proposal to recapitalize the trail. Given the decision-making structure in the park, however, the project was considered feasible only when it was approved by the park Superintendent. Regardless of the benefits of recapitalization to the visitor and the ecological integrity of the park ecosystem, until funding sources were found, the degradation of the trail would continue. The documentation of environmental impacts through a trail inventory, and social science data in the form of staff observations, resulted in a recognition and evaluation of a problem and consideration of management alternatives. Trail management action to mitigate resulted only when the political will and finances were in place.

The outcome of the Skyline Trail recapitalization is that the trail is more accessible to visitors. The enjoyment to visitors has increased because the trail is safer (e.g., no roots to trip on) and more comfortable to walk (e.g., more space to pass oncoming hikers and no puddles to avoid). Hardening the surface with gravel and/or boardwalk has reduced erosion, impacts to vegetation, and helps to keep visitors on the trail.

Although the increase in the size of the maintenance structures may have initially been thought to increase environmental impacts, in fact it has reduced the impacts to both the trail and the surrounding environment in many places. The mitigation of water impacts, a wider trail, a comfortable walking surface and clear demarcation of sensitive vegetation zones has reduced the number of side trails to five from 30. Visitors are no longer straying from the path and impacting the environment by creating new paths, or trampling the surrounding vegetation.

6.7 Trail Planning

Trail planning results in a clear vision of how a trail system should be managed, how it will address changes in visitors and to the environment and provides a general philosophy under which all decisions can be made. Well-designed trails and good visitor information help to ensure that visitors to national parks leave an area with increased knowledge and a commitment to support these protected areas. It also ensures that visitor expectations are met. It ensures a process that evaluates the trail system to ensure that it meets the mandate of the *Canada National Parks Act* and that visitors are receiving maximum benefit either through education or enjoyment. It therefore requires consideration of user needs, natural and cultural resource protection concerns, services and facilities, public safety and the legislative and policy framework of a protected area (Parks Canada 1996). User needs and requirements are determined by conducting surveys of visitors or potential visitors in terms of current or desired activities. The effectiveness of the educational component (e.g., interpretive signs and programs, park themes) can be determined through the same method or through observation of visitor behaviour.

Natural and cultural resource protection concerns are identified through inventories of the biophysical and cultural attributes of an area. A specific study of potential impacts that a trail would pose to these attributes may be necessary to properly locate and design a trail. Services and facilities development is contingent on the protective designation that an area is under and the needs stipulated in visitor surveys. As well, all planning proposals must be acceptable under the current legislative and policy framework. Furthermore, planning helps to ensure that on-site visits to trails minimize environmental impacts and enhance visitor benefits.

6.7.1 Background

Currently there is no trail plan for CBHNP, although steps have been made to rectify this situation. Approximately half of the trails in CBHNP were never planned or designed. Initially, the trail system was based on existing infrastructure, such as former Acadian cart tracks and paths between settlements. In the 1970s, fire roads crossing the park were built, and some of these were used as hiking trails for a decade or so. The roads were built in straight lines across the park, without regard for the environment, they were built through bogs, dense brush, rivers etc., and subsequently did not endure. In the 1980s and 1990s six trails were closed due to environmental impacts occurring on the trails and high costs of maintenance. Individual trails have been planned and built in the park since its inception in the 1930s, to bring visitors to scenic sites. Though these trails were planned, they still have had extensive impacts, a result of poor design, inadequate maintenance and/or high visitor use.

6.7.2 Participants and Roles

The theoretical participants involved in trail planning within CBHNP are the park Superintendent, the Managers of the three management sectors of CBHNP, Heritage Presentation and Visitor Services, Natural Heritage Protection, and General Works. These four people comprise the CBHNP management team. They provide feedback to the Superintendent for all issues relating to park management, not just for trail management. Further to this, the Heritage Presentation and Trails Coordinator reports to both the Manager of Natural Heritage Protection for issues surrounding trail management, and to the Manager of Heritage Presentation for issues involving interpretation and theoretically collates input on the trail plan from both people (refer to Figure 6.3).

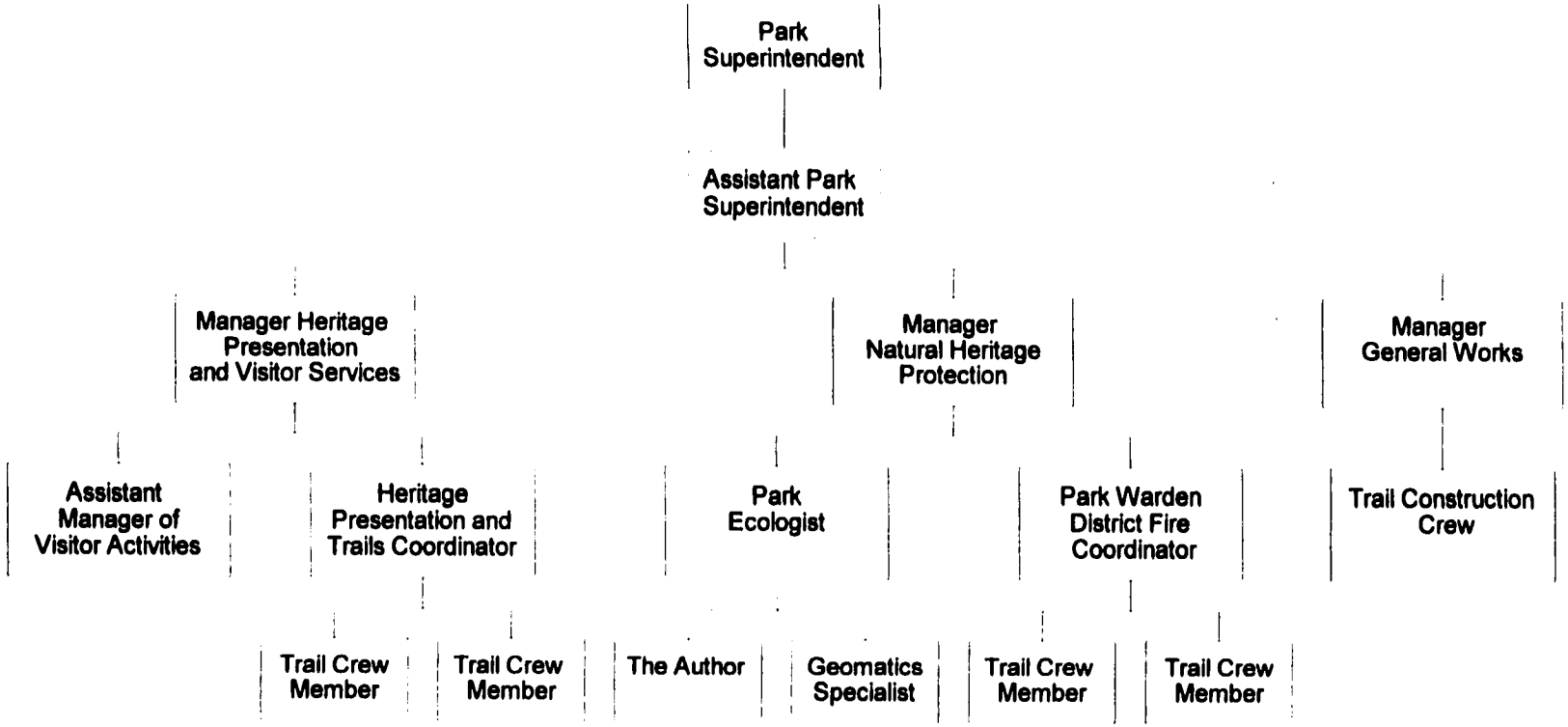
Although roles and process are theoretically defined they have not been implemented to date. These participants in the trail planning process each have a unique role to play in ensuring that trails are well managed. Their different perspectives ensure that comprehensive decisions are made and that progress is occurring with trail management.

6.7.3 Information Inputs

The information used by the participants in the planning process is diverse. The most recent information inputs into the process are the *Trail Inventory* and GIS for Hiking Trail Development completed by this author in collaboration with park staff. This information facilitates the preparation of work plans. The data in the inventory were collated and summarized to classify sections of high (25-50%), moderate (5-25%), and low (5% of trail) impact on trails in CBHNP. This information was useful to the trail team because it identified trails that had high maintenance problems and/or impacted areas, thereby facilitating the management process. The trail team was immediately aware of which trails should receive the most attention.

The classification of the trails into three categories allowed the creation of GIS for Hiking Trail Development. Using the existing information in the park GIS, the trail classifications were correlated with biophysical information to create a map of areas that were highly suitable or not suitable for the development of future hiking trails. Areas of caution (that did not correlate either with suitable or unsuitable) were determined. This GIS model is ideal for developing a trail management plan for CBHNP. Although it is generalized, it can be used to identify areas where there is potential for new trails, and where trails should probably not be placed. Ultimately, the specific location of any new trails will have to be evaluated on-site.

Figure 6.3: Participant Organization Chart for Trail Management in CBHNP



... Indicates Temporary Involvement in Trail Management Issues

Source: Adapted From internal CBHNP organization charts

6.7.4 Decision-Making Process

Although there is a trail planning decision-making process set up for CBHNP, it has not as yet been implemented. The trail team had been involved with individual trail planning, however not with a trail system plan. Currently, it is the mandate of the Heritage Presentation and Trails Coordinator to develop a trail plan with specifications outlined by the Park Management Team. There has been little progress to this end because a trail plan is not considered a high priority in relation to other issues the park is concerned with.

6.7.5 Potential Outcomes

Trail system planning and design is only in its early stages in CBHNP. The benefits to improving the planning of hiking trails are to minimize negative environmental impacts and to enhance positive visitor benefits. A trade-off is that trying to find consensus amongst the different managers is much more time consuming (at least initially) and decisions may take much longer to implement.

The use of the various types of information is important as input into the decision-making process. The history of hiking trails in CBHNP can be found in former studies conducted in the 1970s and 1980s. The general planning guidelines identified in the *Trail Manual* and *Best Practices for Parks Canada Trails* provide a conceptual framework for trail management. For specifics on the state of trails in CBHNP, the *Trail Inventory* and the GIS model of landscape suitability for hiking trails, move the entire trail planning process forward for the park. There is one major piece of information missing for trail planning and that is a monitoring system. Even if trails are managed using available information, without a system in place to monitor the environment and the results of management actions, it will be difficult to know the effectiveness of trail management.

Communication amongst the three management sectors with respect to trail management has improved tremendously with the creation of a trail team. Each person in the three different sectors has a different priority (e.g., public safety, conservation, facility management and visitor service). Consequently, the emphasis is placed on different types of information depending on the sector priorities. The final trail plan will be made based on the value placed on different types of data and information by each participant in the decision-making process. The decision to create a trail team was important for changing the management of hiking trails from an *ad hoc* to an organized system. Through reorganization, managers have increased accountability and can re-evaluate the trail system situation each year, recognize what work has been done and plan for improvements.

6.8 Discussion

6.8.1 Data and Information Inputs

The three separate but related trail issues that the trail management is faced with in CBHNP illustrate the decision-making processes, decision makers and data inputs that feed into trail management issues. General guidelines and a conceptual framework are provided by the National Office in the form of the *Trail Manual*, *Canada National Parks Act* and the *Guiding Principles and Operational Policies*. These generic documents apply to all Canadian national parks trail systems. The site-specific studies such as the 1996 *Trail Inventory*, *Trail Catalogue* and *GIS Model of Landscape Suitability for Hiking Trails* provide more detail on the trail system in CBHNP. The data, information and guidance available for decision making in all three studies are adequate. What is missing is a quantitative monitoring program for the trail system in the park. This is simply a matter of repeating the elements of the trail assessment using the same assessment protocol as completed in 1996 (the Rapid Assessment Survey could be done very quickly each spring). A subsequent analysis of the data will provide information on the environmental changes that have occurred, and provide a feedback mechanism on the success of management's actions in addressing impacts.

The data and information required for each case study are unique. For example, in terms of trail maintenance, the most important data and information are the *Trail Manual* and *Trail Inventory*. The *Trail Manual* assists in trail construction and the *Trail Inventory* is ideal for locating structures on each trail. Other factors, such as the budget for trail maintenance, are fixed. The flexibility in the types of infrastructure, however, is relatively narrow. Routine maintenance is considered a required part of trail management in CBHNP. Given this consideration, factors such as political will are not an issue. Without regular trail maintenance, many issues will arise, including environmental impacts, degradation of maintenance structures, and a compromise in public safety.

The planning of work schedules with the Trail Crew requires the use of the *Trail Inventory*. The Trail Crew's specific decision to maintain a structure is determined through experience. Every trail has a general standard set by the initial construction of the trail (e.g., multiple use, backcountry, or frontcountry), and it is up to the crew to maintain this standard. The Trail Crew examines each structure on the trail in the spring (e.g., bridges, culverts, waterbars etc.) to determine its effectiveness. If it is found ineffective, maintenance is prescribed.

The data and information emphasized for the Skyline Trail recapitalization project is very different than that emphasized for trail maintenance. Whereas funds and human resources for trail maintenance are included in the operating budget, trail recapitalization projects are not

considered. The decision to recapitalize the trail took place in several stages. First, there was a recommendation to recapitalize the trail; second, funding was procured and, finally, the project was implemented. In the first stage, the *Trail Inventory* was useful because it identified all of the maintenance structures as well as the locations of environmental impacts. The information on impacts and maintenance structures was available, however, it was an on-site visit that convinced the trail team that recapitalization was necessary. The decision at the trail team level was based on personal judgement. Getting approval to complete this project required political will. The park Superintendent examined the merits of the recommendation and decided that the project was feasible. Because the recapitalization of the trail is very costly, funding to complete the project was not available within the current park budget. It was necessary for the Park Superintendent to procure funding from an outside source prior to starting the project.

This detail is significant. Data identified environmental impacts, on-site visits verified the impacts, recapitalization was recommended by the trail team and the park Superintendent was on side with the project, but the project could not be implemented until funding was procured. If funding could not be procured, the environmental impacts and deterioration of the maintenance structures would have continued indefinitely, until visitor safety would have been compromised or the trail closed.

In terms of trail planning, the information requirements were different from either of the other two case studies, with the process being much broader. Where the other case studies dealt with a specific aspect of trail management, trail planning required an overall perspective and understanding of the trail system requirements. The *Trail Inventory* provided specific information on each attribute of the trail; the *Trail Catalogue* provided an overview of each trail and set it in the broader context of the trail system. *The GIS Model of Landscape Suitability for Hiking Trails* provided an overview of the entire trail system and identified specific landscape attributes in each area. This GIS model is ideal for locating trails. The GIS model is also useful for explaining why a given trail might have such a high maintenance requirement; steep slopes, for example, might result in high maintenance and environmental impacts. Again, even if biophysical and maintenance structure data, inventory data and best professional judgement allude to the need for planning, without the political will a formal trail planning process will not be put in place.

6.8.2 Decision Makers

All participants in the trail management process are involved in each of the case studies, though the degree and type of involvement changes for each, with the exception of the park Superintendent. The park Superintendent has ultimate decision-making power over trail management. He approves funding and resource requirements for all three case studies. He has

control of changes in funding and human resources. He also approves recapitalization projects and is responsible for allocating resources to trail planning.

The Manager of Natural Heritage Protection is actively involved as the manager of trail maintenance supervisors, and may allocate a couple of days a week to this task. He is accountable of the recapitalization project for the Skyline Trail but his involvement is limited to regular discussions with the Project Supervisor to assess the project to ensure it falls within the guidelines provided by the *Canada National Parks Act*. He also ensures that public safety is not compromised and that ecological integrity is maintained in respect to all trail activities. His involvement in trail planning is as a member of the Park Management Team.

The Manager of Heritage Presentation initially suggested the organization of the trail team to improve the way in which trails were managed. Her involvement with trail management fluctuates with the changing needs of the park and depending on issues that arise. Once the trail team had sorted out many of the trail issues, she became less involved in maintenance. Her involvement is primarily in ensuring a balance between visitor experience and environmental concerns. This includes ensuring that a variety of trails are available to a range of visitors. As part of the park management team, she has a strong voice in terms of how the trail management plan should proceed.

The Manager of General Works is a member of the park management team, but has minimal involvement with trails. Although formerly trails were managed under General Works, currently the General Works only provides staff for the recapitalization project. The Manager of General Works also lends his voice in ensuring that engineering and construction of the trail is safe and feasible. He is no longer involved in any aspect of trail management except to provide technical support, e.g., if a machine operator is required to address a major trail impact.

The Trail Crew has two supervisors. The supervisor on the western side of the park is not only involved in supervising the Trail Crew but also has other responsibilities as a Park Warden. The supervisor on the eastern side of the park is much more involved with trail management. Besides supervising the Trail Crew, he was project manager for the Skyline Trail recapitalization project, is Heritage Presentation and Trails Coordinator and is the trail planner for the park.

The Trail Crew is responsible for trail maintenance. Members of the Trail Crew had a small role to play in the trail team, in terms of determining a direction for trail management, but they are minimally involved in the recapitalization project or with trail planning.

The participants in the trail management process are actively involved in different parts of trail management. The two people that have decision-making power in all three case studies

are the Park Superintendent and the Heritage Presentation and Trails Coordinator. All other participants are more actively involved in one of the three case studies.

6.8.3 Decision-Making Process

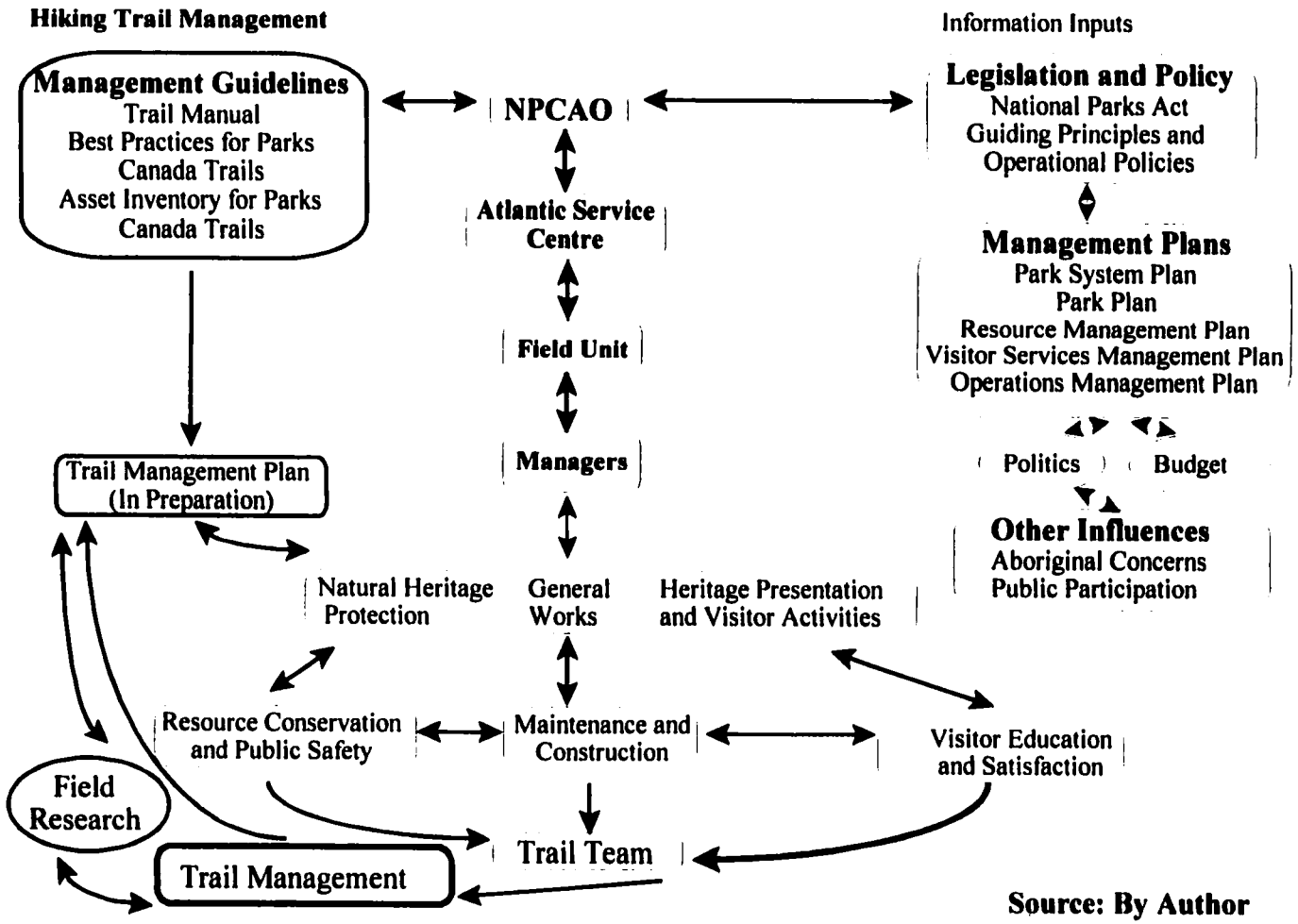
Trail management has progressed significantly in CBHNP since the creation of the trail team. The overall trail system is slowly improving. In the decision-making process, the trail team does not have the authority to make changes, but instead they diagnose a problem, outline alternatives for addressing the problem and present the analysis to the Manager of Natural Heritage Protection who decides on a management action.

For trail maintenance, the Trail Crew carry out the maintenance work and determine a course of action with assistance from the Trail Supervisors. The Trail Supervisors then report problems to the Manager of Natural Heritage Protection and the Park Superintendent. With the Skyline Trail Recapitalization Project, the Trail Team met and determined a course of action, which was then approved by the Park Superintendent. A Project Manager was then assigned to complete the project with the assistance of the construction crew. In the trail planning process, the ultimate responsibility for encouraging the planning process is the park Superintendent. The Park Management Team discusses a course of action, then identifies a trail planner to complete the process.

This short summary of the reporting structure in the trail management decision-making process demonstrates that a different process is needed for each of the case studies. A formal process, in which each participant has the same role, is not feasible; neither is the requirement that all data and information be given the same weight in each case study.

Trail planning, ideally, should provide a cohesive process that dictates trail management. The trail planning process is the least developed of the three case studies, however, and a low priority until major changes are required. Neither a trail plan nor an overall philosophy for the trail system exist, formally although general interpretive themes have been identified. Many trail management issues arise because there is no system in place to periodically assess the trail system. Decisions are made but rationales not presented, so it is difficult to get the whole system working cohesively, and large amounts of money are required to fix problems reactively. Figure 6.4 depicts the relationship between trail management, the three levels of organization of the PCA and information inputs.

Figure 6.4: Influences on Decision Making for Trail Management in CBHNP



Source: By Author

6.9 Conclusion

At the start of this research, management had recognized that there were serious problems with the trail system. The reasons identified included the lack of a clear trail management process, lack of communication amongst different sections in the park with respect to trail management, the initial poor location of many of the trails and the harsh climate, and lack of resources. A literature review brought to light some major information gaps. The analysis of the decision-making process for trail management in CBHNP reveals that the management process for hiking trails is dynamic. Analysing the three case studies clarified the types of information required for making decisions, the decision makers and the decision-making process itself. Many informative results came out of the analysis and are detailed below.

Initially, it was unclear how information and data, especially biophysical and evaluative information prepared by this author, would assist in the decision-making process. When observing the decision makers use of this new information, however, the author realized that it only influenced the decision-making process to a certain degree. Other factors, such as funding and political will, may take precedence over biophysical information. Without the political will to change the *status quo*, a trail management team would not have been organized. Without funding, few of the trail team's recommendations would have been implemented.

Trail management and the incorporation of data and information on hiking trails into decision-making, had occurred on an *ad hoc* basis in CBHNP. Decisions made in terms of managing hiking trails range from overall trail system planning to the determination of the appropriate materials for building a maintenance structure. Consequently, consultation is required amongst all sectors of park management and occasionally the Service Centre, other Field Units or experts. The creation of the trail team provided a mechanism to allow Heritage Presentation and Visitor Services, the Natural Heritage Protection and General Works to collaborate and overcome some of the trail issues. The trail team functioned well from 1995 to 1998. From 1999 to 2001, there were few meetings because many issues had been addressed and several major recapitalization projects took up resources and time. The initial trail team also lost several members through either a temporary or permanent absence from the park. Although the Superintendent is the overall manager of the decisions made in the park, the Heritage Presentation and Trails Coordinator was given many tasks relating to trail management. His championing of the trail issues, through identifying funding sources and as Project Manager for the Skyline recapitalization project, propelled the recent improvements on hiking trails in the park.

Accountability measures for trail management have improved through the creation of work logs for the Trail Crew, but the lack of a trail management plan results in less cohesive trail management. A trail plan could identify current trail system issues and solutions, management objectives, potential future issues as the environment and visitor needs change, guidelines used for trail management, available information for trail management and the roles and responsibilities of the various sectors of park management. Without clear guidelines in a plan, trail management will be guided at the discretion of a manager. Three scenarios may develop: 1) If visitors are a priority, the trails system will be expanded, and bigger visitor infrastructure will be put in place. 2) If ecological integrity is a priority, the human foot print in the park will be minimized by decreasing the size of the maintenance infrastructure and by closing trails that pose the greatest threat to the environment. 3) Alternatively, the trail system may be ignored and allowed to slowly degrade. Without the knowledge of existing databases, inventories, catalogues and the GIS, there is a possibility that, rather than building on existing information, new managers will repeat studies unnecessarily. As trail management requires input from all three management sectors, however, their continued involvement in trail issues, and identification of their specific role, will ensure a comprehensive approach to trails issues.

Not using a formal management framework also leads to reduced accountability. Guidelines for visitor management state that level of use is one of the key elements relating to visitor management (Parks Canada Agency, 2001); this point is similar to a carrying capacity principle. Trail management is not that simple (Marion, J. L., Cole, D. N., & Reynolds, D., 1985). Factors such as the resilience of the environment in relation to impacts, the type of visitor and the behaviour of the visitor can have a much greater effect on the environment than visitor numbers. Given the limited funding, the lack of human resources and the history of using the carrying capicity principle in the PCA (Banff-Bow Valley Study, 1996) perhaps it offers an alternative to not having a principle at all. Developing a formal framework to ensure that the national park is accountable for its decision making does not seem to be an option.' The assessment of many problems informally follows a LAC or VIM framework, however, in which problems are identified, potential solutions are examined, and a course of action is taken that fits within the park policy. The use of an updated visitor management framework would also increase accountability.

This analysis of trail management in CBHNP provides insight into the decision-making process in CBHNP. It identifies the participants in the process and data inputs. Analysing the decision-making process was not simple. It required being actively involved within the management process through participation at trail team meetings. Conducting on-site research on

the biophysical environment, evaluating the trail system, and working with PCA staff to develop a *GIS Model of Landscape Suitability for Hiking Trails* provided greater insight in terms of the way in which information could contribute to the decision-making process in CBHNP. Even after discussing the decision-making process with PCA staff members, it was clear that although there was a general conceptual framework within which staff members worked (provided by the National Office through the *Canada National Parks Act*), a clear decision structure did not exist. As well, even over the short time period within which the researcher worked there were major changes in the management process. The general trend was to improve the trail system in the park, to minimize environmental impacts and enhance visitor benefits.

This analysis provides insight into the management of one type of visitor facility in one park over a five-year period. It clarifies the options of trail management from a consensus based trail team, working under a 'Responsibility Control Centre'. It details how some of the obstacles to trail management can be overcome.

The PCA funds studies in national parks to increase data and information and ultimately to improve understanding of a situation in order to make better decisions. Park management should identify specifically where a study assists trail management. A case in point is the development of the GIS model from the *Trail Inventory*. The Trail Crew used the *Trail Inventory*, but the GIS model will contribute to trail system planning. Planning maintenance schedules required site-specific information on each trail; for example, information on a particular maintenance structure. Trail planning requires summary information with a large spatial scale. The broader information base provides an overall picture of the park assets and potential planning needs. Guidance is also required for the researcher to ensure that they provide detail in terms of how their study is useful to managers.

One contradiction noted during discussions with members of the park staff was that they said they did not make decisions. They stated that they wrote a memo to the park Superintendent with a recommended course of action and he made the ultimate choice, but that they did not make decisions. This description is in contradiction to the park Superintendent's comment that, with the decrease in the number of staff and the cutbacks over the last few years that employees were becoming more empowered (not less as indicated by the discussions with staff). Perhaps writing memos is another way of ensuring accountability in the decision-making process as well as to inform the Superintendent rather than to solicit approval for every decision.

In CBHNP, since 1996, the improvement in the quality of trails resulted through increased communication amongst the decision makers (the development of a process). Biophysical and evaluative data and the GIS model help decision makers to make more informed decisions over

the long-term. Responsibility for the development of the trail plan has been given to the Heritage Presentation and Trails Coordinator and it is up to him to incorporate the information from the GIS model into the trail plan. Without a decision-making process that specifically incorporates the data and the interest of decision makers, the information will not be used to its fullest extent. The *Canada National Parks Act* specifically states that scientific principles and sound environmental data should form the basis of decision making and that ecological integrity will be the primary concern in decision making. The reality is that other factors such as political will and money may have an equal or greater influence on decision making.

7 Conclusions and Recommendations

7.1 Introduction

The goal for this thesis was to clarify the decision-making process surrounding visitor management in the PCA. The expected result was to improve the understanding of the process so that we can learn how to ensure that data and information (either social or biophysical) specific to visitor management are used by decision makers and influence the decision-making process. To accomplish this goal the author needed to evaluate how decisions are made, who makes them and the types of information and data that are fed into the decision-making process.

7.2 Chapter 2 – The Research Process

The author adopted an adaptive interactive approach by delving into the literature on the theory behind decision making and visitor management, analysing the different levels of the organization using the IAD framework and providing an on-site case study of the decision-making process. It was necessary to be adaptable. During fieldwork and after completion of reports (biophysical inventories, impact assessments, visitor infrastructure inventories on trails) the author participated in the trail management process in CBHNP and realized that a greater contribution could be made to trail research by focussing on the decision-making process. The data and information from the trail study were only one part of the process of decision making; the decision maker and process often have a greater influence on the final decisions. The research direction was changed to adopt this new focus.

The methods used to address the goals of the thesis were literature review, fieldwork, participant-observation, discussions with park staff either through e-mail, telephone or face-to-face, and the application of the IAD framework. The methods used were diverse and necessary to obtain a greater understanding of the decision-making process. The initial literature review revealed a variety of different methods for assessing hiking trails. The subsequent testing of these methods in the field provided the author with in-depth knowledge of trail impacts and visitor issues in CBHNP. Subsequent participant-observation at trail meetings allowed the author to determine what other issues were being addressed in trail management. As well, the meetings revealed that the reports completed by the author were not used to a great extent in trail management. This led the author down a new path, which involved determining the decision-making process surrounding visitor management in the PCA.

7.3 Chapter 3 - Approaches to Decision Making

Because visitor management comprises both an environmental component and a social element, the author decided to review and evaluate three fields that appeared to influence the decision-making process with respect to the environment. Chapter 3 compared and contrasted frameworks from the fields of planning, ecosystem science and decision theory. National parks visitor management did not fall specifically into any of these three frameworks. The frameworks represent a spectrum of approaches available to decision makers. The PCA traditionally uses a synoptic approach, in which decisions are made by park staff with little involvement from the public or ENGOS. In some situations that are particularly political or that involve native groups, however, the PCA has adapted to incorporate elements of the civics approach. This approach requires much greater public involvement and the acceptance of other types of data and information found in traditional knowledge.

Three frameworks in the ecosystem science field were also examined. The review of these frameworks revealed that the PCA loosely fell into the ecosystem based approach, but has now adopted the adaptive management approach. The specifics of these decision-making processes are not provided by the PCA; instead, a basic philosophy is followed. With the case of the adaptive management approach, decision makers are expected to make decisions with the best available knowledge, monitor effects of decision, then adapt accordingly. None of these approaches has a strong mandate to have multi-stakeholder involvement and greater public participation, however they do recognize that decision making requires the input of different types of knowledge.

The three decision theory models provide options for incorporating data and information in the decision-making process. These approaches are not followed formally by the PCA, though Underwood's model clearly outlines the way in which data and information should be incorporated into the decision-making process. Chapter 3 reveals that the decision-making process used by the PCA falls generally within the broader frameworks of planning, ecosystem science and decision theory. It does not follow a specific framework, but adopts different frameworks to address new situations. The review reveals that different types of information are used depending on the decision maker and type of decision that needs to be made. Different types of data and information are also required at different parts of the decision-making process. Underwood's decision theory model identifies where data should be put into the decision-making process; the analytical hierarchy model and multi-criteria model detail a method for valuing data. The models are explicit that data have different values and it is up to the decision maker to determine these values and provides a structure for decision making so that they are more aware

of where they are placing their emphasis. There is potential for the PCA to outline a more formal process for decision making so that it can be more easily followed and so that researchers could have a better idea of how their studies can be more easily incorporated into the process. They would also know what types of information are required and when. It also reveals that options are available, in approaches such as civics and in terms of incorporating a diversity of data and information types. There is no need to rely specifically or solely on biophysical data.

7.4 Chapter 4 - Visitor Management

The visitor management framework review was significant to understanding how visitor management issues can be addressed formally. Visitor management models are based on the synoptic model. They require agency professionals, a strong emphasis on biophysical data, and present a clear decision-making framework. Models such as LAC have a civics or transactive element, in which the public is more likely to be involved in decision making. The latest visitor management models are more outward looking, both with their involvement of other stakeholders in the decision-making process and their use of a variety of data and information. TOMM especially embraces the concept of a regional approach to optimizing tourism. The philosophy is that communities around national parks should work with the park to adopt a single marketing tool to bring people to an area. A unified approach to visitor management will result in the protection of the environment and an optimization of tourist infrastructure. This regional integration would recognize that some activities are acceptable in a national park but that many others can be accommodated outside the park perimeters.

The literature reveals many benefits to utilizing formal management methods in addition to explaining why informal management leads to bad and/or reactionary management rather than proactive management. Managers are, however, reluctant to use them. Their reluctance results from the costs of implementation, lack of human resources, and unwieldy or complex frameworks. They are not legislated to use them and so they do not. Implementing a framework such as TOMM requires capacity building (i.e., educating all stakeholders to a common level of understanding of visitor issues), which is expensive. With reduced funding in national parks, it would be difficult to rationalize increased spending in this area.

In terms of the PCA's current decision-making set-up, no single model is currently promoted. As a result, Field Units have to chose an appropriate framework for their site, and often do not. Researchers recognize that if a visitor management framework was integrated into legislation as well as the general park management plan, it is more than likely that a formal model will be applied.

Perhaps a better way of dealing with visitor management issues is to examine a situation and identify the types of information required to properly manage it. The next logical step is to clarify the roles and responsibilities of decision makers. If managers are already using part of this process, it may be adapted slightly to incorporate data and information. It would be easier to adapt a current process then to try to implement a completely new one. Accountability measures can be built into the decision-making process by documenting the history of an issue, the rationale for the solution, types of information consulted, who made the decision and what type of follow-up is to be implemented to determine success of a management action on an issue.

7.5 Chapter 5 – Decision Making in the PCA

Now that it has been determined that the PCA does not follow a specific visitor management framework but that the staff are generally aware of the options, it is appropriate to examine in more detail the decision-making process. This was determined using both literature (mainly government publications) and discussions with parks staff and by applying the IAD framework so that all levels of management in the organization could be assessed consistently.

Decision-making in the PCA is generally divided into three management levels. Two levels, the National Office and the Field Unit's, have clearly defined mandates: the National Office sets the conceptual framework within which the SC and Field Units act, and the Field Units apply this framework on-site in the national parks. The information requirements to carry out these mandates are clear. The National Office requires data in summary form, where it can clearly see the spectrum of issues facing the national parks and recognize the outer limits of the situation. The Field Units require data and information in a variety of forms, from the raw data when addressing a specific issue, to summary data when addressing a planning issue. The Service Centre's mandate theoretically involves playing a coordinating role for the Field Units in a region, assisting in the preparation of planning documents and providing expertise when invited. In practice, however, this role is less clear. The reorganization of Parks Canada into an Agency changed its reporting structure. Field Units are no longer required to report to a Service Centre. Field Units also have the option to include or exclude the Service Centre in decision making. The Field Unit has gained much greater autonomy. As a result, the Service Centre is struggling with its mandate and consequently data requirements are not clearly defined.

Only three National Office staff positions, and no SC staff positions, specifically address visitor management issues. As determined earlier, the National Office does not promote any specific visitor management framework. Visitor management is the responsibility of the Field Units. The guidance provided by the National Office is in the form of the *Canada National Parks Act* and *Guiding Principles and Operational Policies.* Field Units, therefore, have the flexibility

to choose a visitor management framework or to use an *ad hoc*, informal approach to visitor management issues.

7.6 Chapter 6 – Case Study

The case study detailing the management of hiking trails in CBHNP revealed that the types of issues being addressed result in different management approaches. The decision-making structure in a single Field Unit is to have three sections, Natural Heritage Protection, Heritage Presentation and Visitor Services and General Works. Staff members in each of these areas are expected bring their expertise to the table when addressing an issue. The case study was most revealing in relation to the way in which decision-making works in the field.

First, the Field Unit works within the conceptual framework provided by the National Office. Field Unit staff members are aware of the policy and legislation. As well, the Park Management Plan, the Park Conservation Plan and Visitor Services Plan provide general guidance about issues and appropriate actions. It is important to note that built into the legislation is discretion for the Park Superintendent to act as he/she sees appropriate for park management, either in terms of the unique environment and/or visitor safety concerns.

The three case studies that were examined reveal that each type of trail management requires a different set of data, decision makers and decision-making process. In terms of trail maintenance, raw data in the form of the inventory is required, summary data on trails is used to a minor degree, and GIS is used minimally. For trail planning, the focus is on the GIS of landscape suitability. The decision to recapitalize the Skyline Trail was based mostly on the fact that funds were secured to complete the project. The initial assessment required some background information, but the judgement of staff members was also very important.

The primary decision maker for all projects was the Park Superintendent. He set the budget for the trail maintenance, secured funding for the Skyline Trail, approved the plan and provided input into the planning process. A formal process was not followed for visitor management issues relating to hiking trails. Accountability is built into decision making through broader terms, namely the *Park Business Plan*. Interestingly, before this work commenced on hiking trails in the park, it was lamented that staff did not know why decisions to close or open trails were made; all information was held by the Park Superintendent. In essence, the decision-making process started from the beginning, addressing a trail, determining needs, and making decisions. No documentation outlining the rationale for decisions was available. In terms of the Skyline Trail, more documentation was necessary because so much effort went into writing funding proposals and because outside partnerships were developed.

This thesis clarifies decision making in the PCA. A review of the various frameworks identifies the major influences on the PCA decision-making process. The review of the visitor management framework identifies potential options for decision making. The PCA does not promote a visitor management framework, however, the IAD framework helped to determine the elements of each level of the organization, recognizing the types of data that were needed, and the roles and responsibilities and hierarchy of the participants, though the specific process for decision making in the PCA is not there. The case study revealed, in more detail, the data, decision maker and process and further supports the argument that a specific structure does not exist. However, the case studies as presented document elements of the decision-making process. If decisions were documented in this way then other researchers would know where their research might fit into the management process.

This thesis research provided a rare opportunity to examine the way in which field studies are used in park management. Although the data varied from information on the natural environment to human activities, the studies have the potential to assist in other aspects of park management. Using an adaptive interactive approach provided the author with the opportunity to gather data, produce documents and allow for a subsequent reflective period.

The second focus made the author re-evaluate what a good decision is, as well as the elements of a decision-making process. Data are only one part of a good decision-making process; decision makers and the decision-making process itself are even more important. Although data and information are relevant and significant, without a clear understanding of decision makers and process it is difficult to target the study so that it is used in decision making.

The author ultimately found that the PCA has a dynamic decision-making process. Changes in the organization structure, the weak leadership provided by the National Office with respect to visitor management, the low priority of visitor management in the organization, and the lack of an easily applied formal visitor management framework result in diverse decision-making approaches with respect to visitor management. Decisions are made under the umbrella of the conceptual framework provided by the National Office. More specific guidance is provided in the Field Unit Park Management Plan and the Visitor Services Management Plan, but the ways in which data are used and valued are largely up to the discretion of the decision makers in the individual Field Unit. Decision making with respect to visitor management would become more consistent and accountable, if a greater priority was placed upon visitor management issues, and an increase in funding to address these issues more fully, was provided.

7.7 Recommendations

7.7.1 Field Units

Informal decision-making processes need to be documented to facilitate the incorporation of data and provide accountability and rationale for decisions (even if a process is informal there are still decision points and different types of data that feed into it).

Data gaps and limitations are often identified in the initial stages of a project. However, the types of data that are required should be identified as well as how these data feed into decision making and how the use of such data will improve decision making

There is a need to give greater recognition to the influence of the National Office conceptual framework on decision making in the Field Unit: although there is substantial autonomy there is a general set of rules that need to be followed

It is necessary to document and publish methods and processes for addressing visitor management issues in each park to increase transparency and so others can learn from examples rather than reinventing a process for each issue.

7.7.2 Service Centre

The expertise of the Service Centre should be used to coordinate visitor management information amongst Field Units and to develop a database to document examples from the various Field Units. Centre There will be common issues among Field Units under the jurisdiction of a single Service Centre. Sharing of information through the Service Centre will facilitate learning from experience and permit issues to be addressed holistically rather than in isolation. This should help to avoid duplication in services and ensure consistency amongst Field Units in the approaches that they adopt.

Increase contact amongst Service Centres should be fostered to increase awareness of issues and solutions in other geographical areas.

7.7.3 National Office

Field Unit managers lack the time and funds to sift through the complexity of the various models to determine which one to use for each situation. As the National Office is recommending that various models be used for visitor management issues, they should provide specific examples of when a model is used, the benefits of using a model, and the subsequent success of the application of the model. This will facilitate the use of various visitor management frameworks at the Field Unit level. A central repository and database should be developed for information on visitor management issues.

A State-of-Parks Report should be developed for visitor management issues (similar to the one used to address environmental issues) to ensure that:

1) visitor management issues are identified;

2) the complexity of issues is recognized; and

3) a means is provided to assess the activities and progress of each Field Unit as well to compare situations across the Parks Canada Agency.

7.7.4 Researchers

Researchers who wish to influence the decision-making process should determine the types of data and types of data presentation that facilitate the incorporation of information into the decision-making process.

Researchers need to target decision makers to ensure they are aware of the importance of studies and how they may assist in decision making, both in explaining processes and how they fit into the overall understanding of an issue.

7.8 Further Research

The completion of this thesis has helped to identify areas where further research should be concentrated.

With respect to visitor management frameworks, there are many frameworks to apply in a variety of situations. However, more information is required on how to apply the frameworks as well as case studies that illustrate the benefits and constraints of using the frameworks. As well, there should be a focus on determining how data resulting from the application of the frameworks can be incorporated into decision making.

The IAD Framework was a useful analytical tool for assessing the roles and responsibilities of each level of the Parks Canada Agency with respect to visitor management issues. It would be useful to analyse the organization using the IAD framework to determine if it has a similar or different approach to addressing other types of management issues such as wildlife management or encroaching development outside the park. This would provide a useful comparison of how the agency functions and help to promote consistency in approaches to different issues.

It also would be useful to analyse other Field Units to determine if there are differences in their approach to decision making with respect to data, decision makers and decision-making processes. Field Units with much higher visitation and associated environmental impacts than CBHNP, may be required to monitor more rigorously and evaluate situations more regularly because the potential for negative consequences is high.

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Appendix 1

Gathering Information from Parks Canada Staff

Contacts with Parks Canada Staff took place either through e-mail, telephone or face-to-face discussions.

Step 1:
Parks Canada Staff involved directly with trail management and decision making were contacted first through an e-mail. At this point in time, the author briefly discussed the fact that she required more information to complete a chapter on decision making at the Parks Canada Agency. She identified a series of questions that she would like answered then asked if staff could contact her either through e-mail, telephone or face-to-face for a follow up.

An example of an initial contact letter is as follows:

Hi_____.

How are you? I hope you are having a great summer. As you know I am studying the trail management process in CBHNP. I was hoping that you could help me clarify a few points.

Just as a bit of a background, the goal of one chapter of my thesis is to clearly outline what the trail management process is in Cape Breton Highlands National Park, and to determine the decision-making process. As part of this, I am trying to determine how scientific data and information either in the form of scientific documents or personal experience is incorporated into this process.

To understand trail management, I need to know who is involved in trail management, and what their roles are, how they differ from each other, what types of information they use to manage trails and what decision-making process is followed.

I know that one of your responsibilities is to manage the Trail Crew in Ingonish and to develop a trail management plan for CBHNP.

Are their other activities that you are actively involved in for hiking trails?

A: Trails and Trail Management

I was wondering what amount of time you spend on trails versus your other responsibilities. .5 days, 1 day, 2 days.

You have mentioned previously that the trail crew and his co-worker are independent workers and do not require a lot of supervision.
Do you detail a work plan weekly as they do in Cheticamp? or every two weeks?

Who decides on the work plan, and the priorities? collaboration with head trail crew and his co-worker, Manager of Natural Heritage Protection or the Park Superintendent?

When you make decisions on trail maintenance, what are the priorities of conservation, safety, economics and education (are their other priorities that you use that I have missed here)?

What information inputs do you use to make your decisions?
National Parks Act
Guiding Principles and Policies
Trails Manual
Canadian Environmental Assessment Guidelines
Published literature
GIS produced by James, Kim and Dawn
Trail inventory produced by Kim Lemky
Published literature
Personal Experience, Best Professional Judgement
Best Practices for Hiking Trails

What types of decisions do you make on the hiking trail management?
(Prescriptions and worklogs, other?)

How do these differ from the types of decisions that head trail crew and his co-worker would make?

(Implementation of worklogs, actual carrying out of the maintenance.)

Do you ever use expertise from other National Parks to make your decisions? Atlantic Service Centre (formerly Regional Office)? National Office?

B: Recapitalization of Trails

Who makes the decision to recap a trail?

Trail Planning Team (which differs from the trail team)

What are the primary criteria for deciding on recapitalization?

Where does the funding come from?

How much influence does Park Superintendent, Manager of Heritage Presentation and Visitor Activities or General Works Manager have in this process of recapitalization (upper management)?

With recapitalization projects, who decides on the types of educational materials that will be incorporated into the trail for interpretation?

C: Trail Management Plan

You have been pondering about this plan for awhile now and have outlined a few themes to follow, Where the Mountains meet the Sea, and an Historical Theme of trails.

What types of information will you be using to develop this Trail management Plan?
National Parks Act
Guiding Principles and Policies
Trails Manual
Canadian Environmental Assessment Guidelines
Published literature
GIS produced by James, Kim and Dawn
Trail inventory of impacts and maintenance structures produced by Kim Lemky
Published literature
Personal Experience, Best Professional Judgement
Best Practices for Hiking Trails

Is there an actual manual put out by the National Office that identifies specific requirements for the trail management plan?

Do you have a specific timetable for the completion of the trail management plan?

What is the state of progress on the new trails that you were thinking of for the park, such as the Trappers Trail that we all hiked, or the trail from Cap Rouge to Fishing Cove?

I look forward to hearing from you either by e-mail, or by phone (902-224-1683), or to set up a meeting in person.

Sincerely

Kim Lemky

Step 2:
The Parks Canada Staff members contacted me through e-mail, telephone and/or face-to-face informal interviews.

The initial letter was used as a guideline for the discussion and more detailed questions were asked to verify the observations made during the course of field work and participant observation at trail team meetings.

Questions in a more detailed e-mail or discussion.

Park Superintendent,

How are you? How is your summer going?

I am writing a chapter in my Ph.D. dissertation on hiking trail management in Cape Breton Highlands National Park. To this end I am trying to determine what the roles and responsibilities various people in the Parks Canada Agency that are involved in hiking trail management at the Park, Atlantic Service Centre and National Office.

To this end, I have discussed trail issues with the Managers of Heritage Presentation and Visitor Services, Manager of Natural Heritage Protection, the trail crew Supervisors, the Park Ecologist, staff from the Service Centre,

Q1. I wondered what your role is with respect to hiking trail management. I know as Superintendent that you must have a say on whether new trails can be built, whether trails should stay open or be closed. As well I know you have a role to play on determining which trails should be recapitalized and the extent to which this can occur, e.g., the size of the budget, human resources available etc.

Q 2. What types of information or documentation do you use to make these decisions?

Are they based on best professional judgement? or the many documents that are available from Parks Canada?

e.g.,
National Parks Act
Guiding Principles and Policies
Trails Manual
Canadian Environmental Assessment Guidelines
Published literature
GIS produced by James, Kim and Dawn
Trail inventory produced by Kim Lemky
Published literature
Personal Experience, Best Professional Judgement
Best Practices for Hiking Trails

Q 3. I was wondering as superintendent what priority trails management would have in your list of responsibilities?

Q 4. What are your main responsibilities in the park? I know that you are the liaison person for political issues, development issues, you discuss the park with the local communities and deal with issues that they may have.

Q 5. Is it safe to assume that hiking trail management is a priority where it may impact on ecological integrity or safety issues?

Q 6. What is happening with trail planning?

Q 7. Does the Atlantic Service Centre have a role to play in trails management?

Q 8. What other types of influences are there in how trails are managed?

Q 9 What did the ecological integrity panel say to this?

Q10. What is your role in developing partnerships, for the Skyline trail?

Q 11 What are the main priorities you address in the park?

Q 12 What is the current status on other trails such as the Heritage Trail?

Q 13 What are the other main issues that the Management team are addressing?

Q 14 Does the Atlantic Service Centre have any input into decision making?

Q 15 Do you follow the Canada National Parks Act and the Guiding Principles and Operational Policies for guidance?

Appendix 2

Figure 1: Rational Planning Model Applied to Decision Making

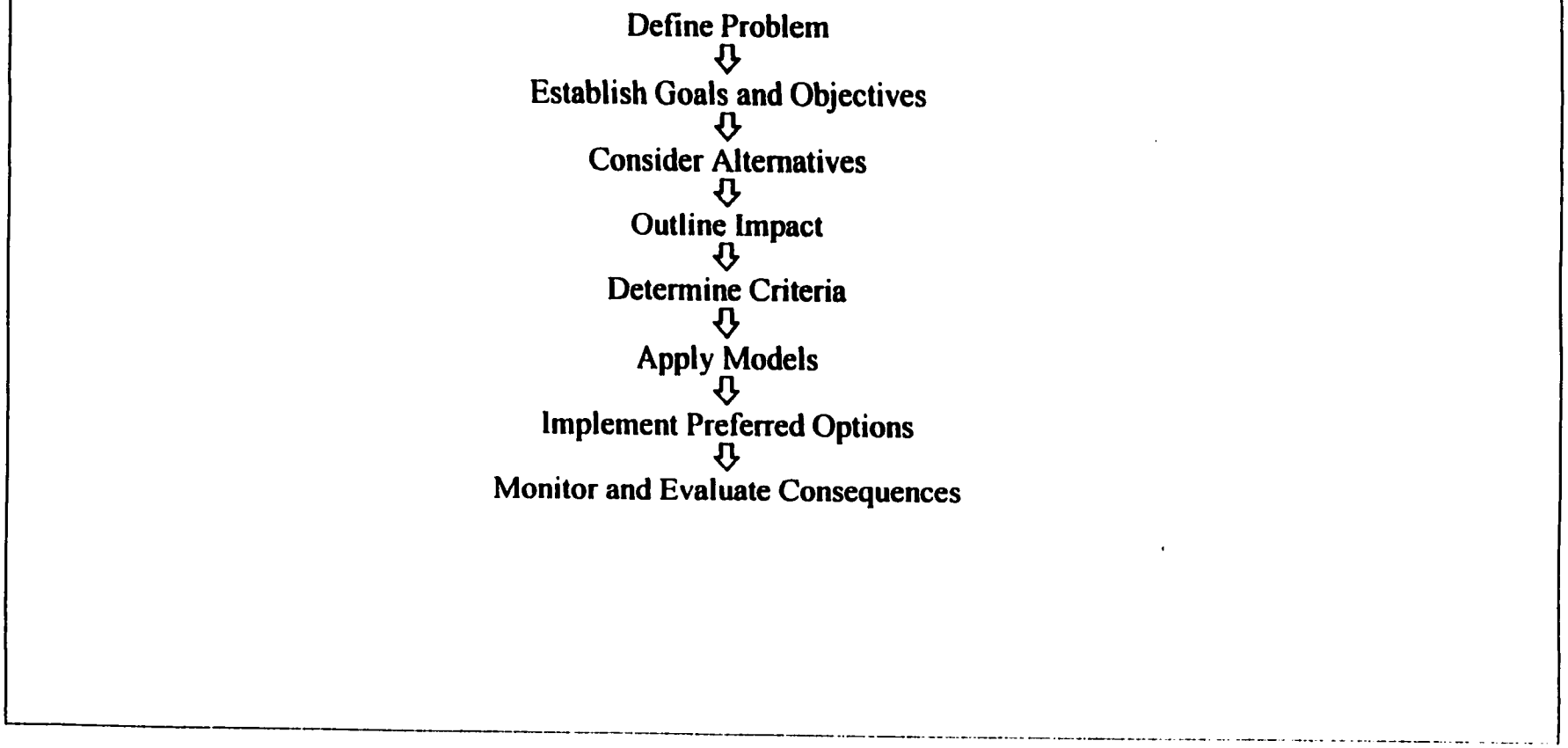


Figure 2: Incremental Planning Model

Ill-considered, Often bumbling Incompleteness In analysis	Seat of pants semi-strategies	Seat-of-pants plus studied strategies	Strategic Analysis: Informed and thoughtful Choice of methods of Problem simplification
	Present state of analysis	*Preferred state of analysis*	

Figure 3: Civics Framework

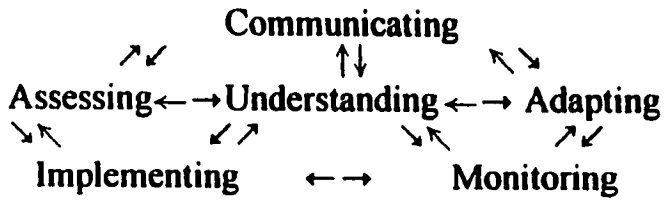
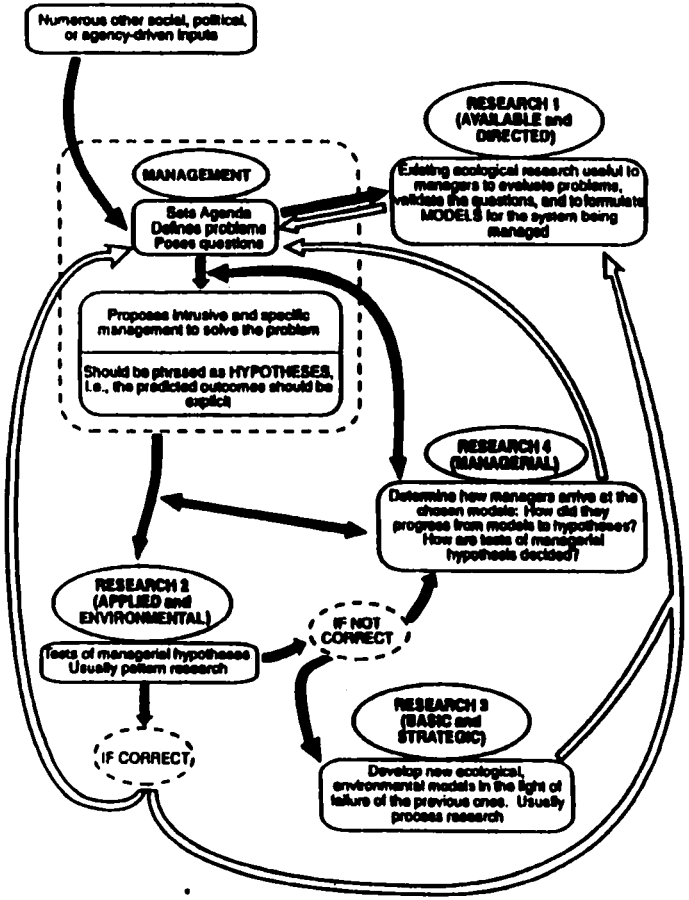


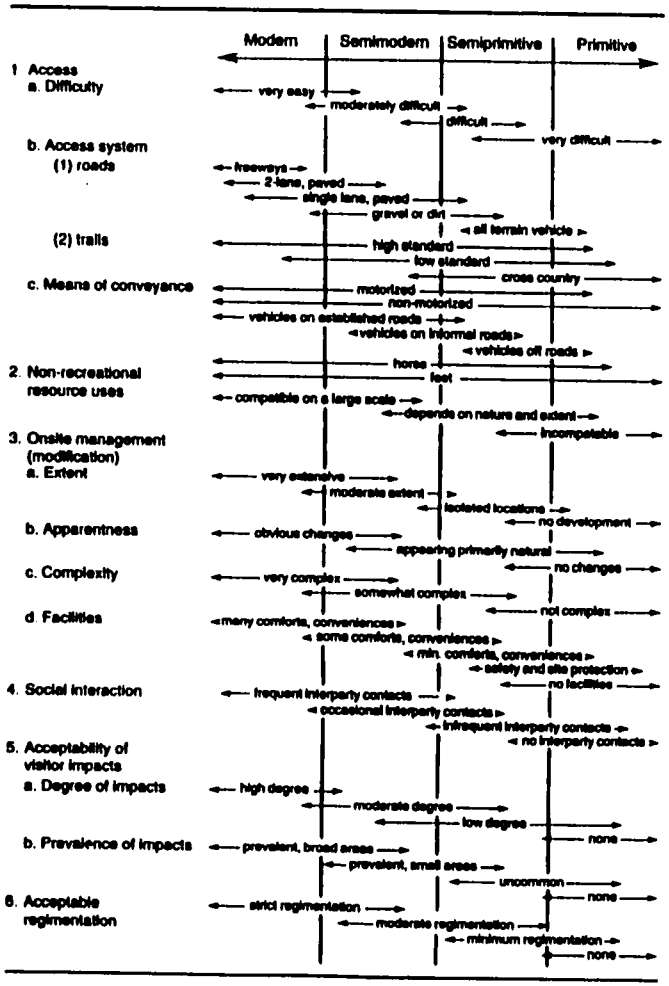
Figure 4: Underwood's Flow Diagram of the Linkages Between Research and Decision Making



(Source: Underwood 1995)

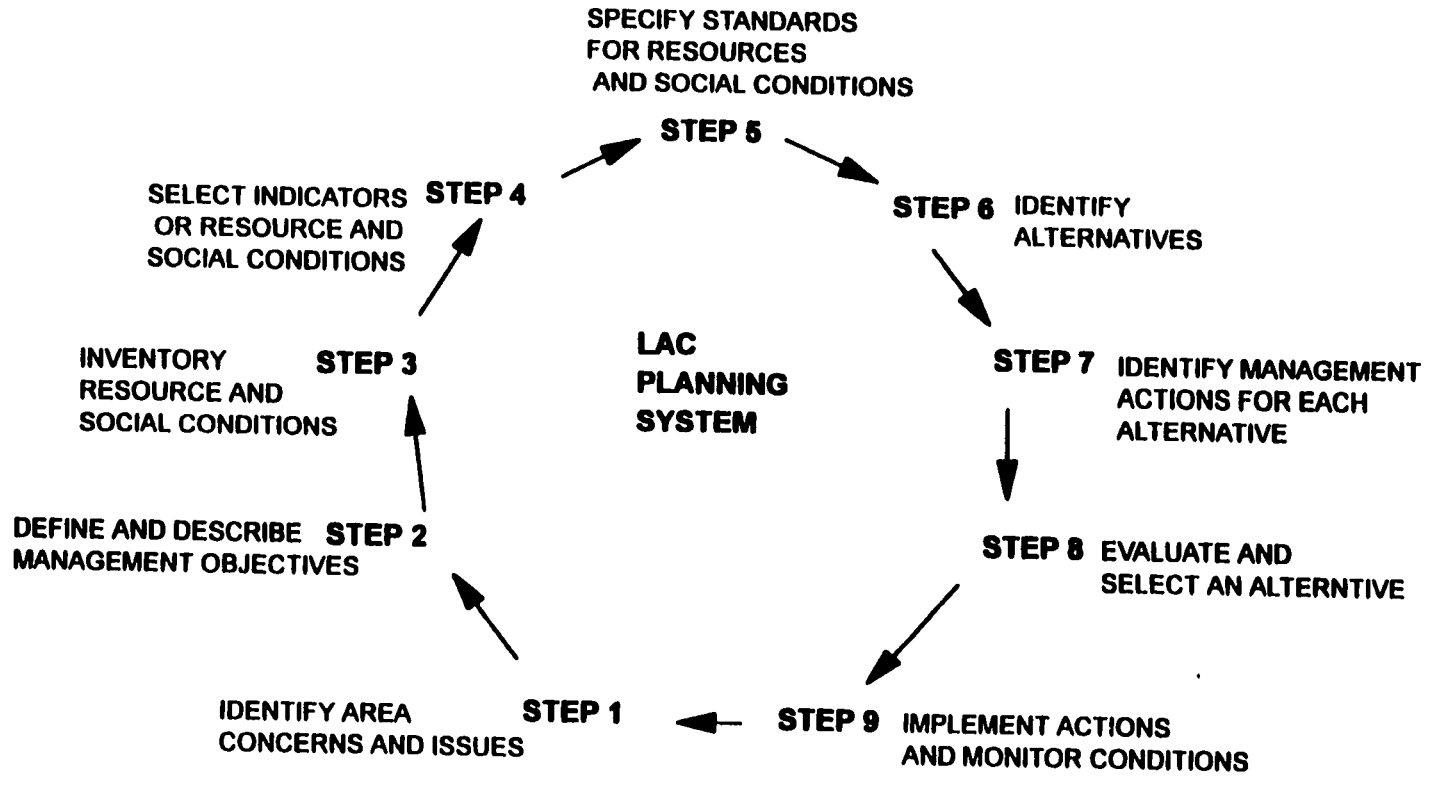
Appendix 3

Figure 1: The Recreation Opportunity Spectrum (ROS)



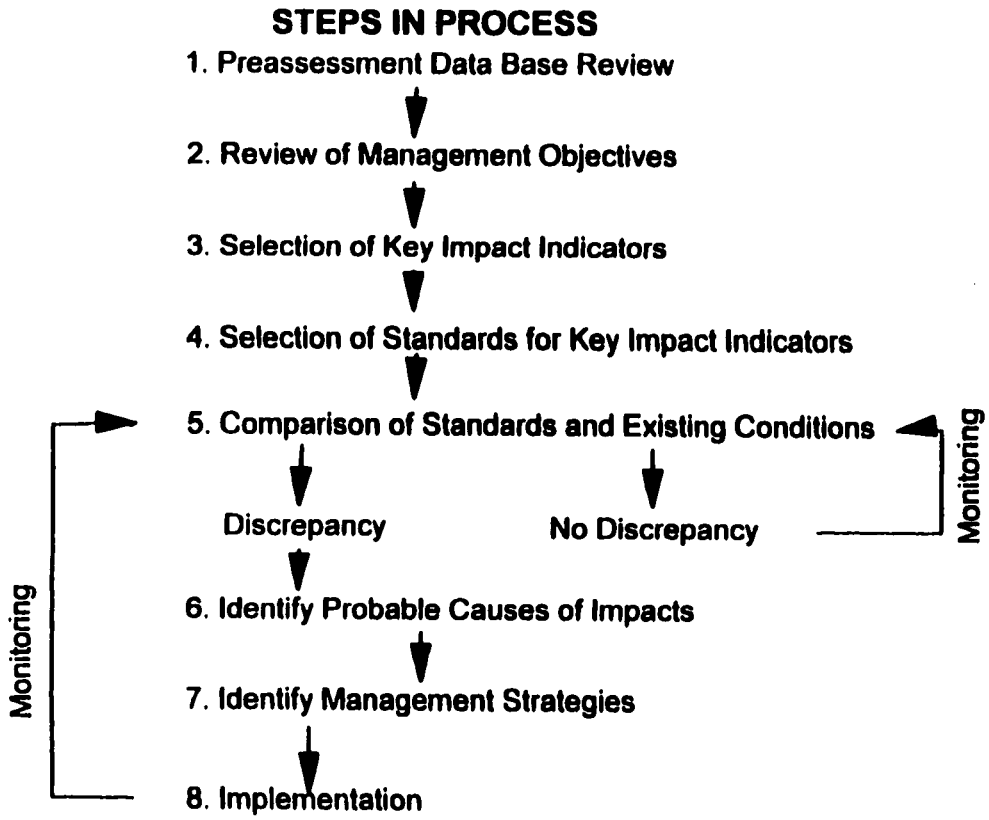
Source: Clark and Stankey 1979)

Figure 2: The Limits of Acceptable Change (LAC) Planning System



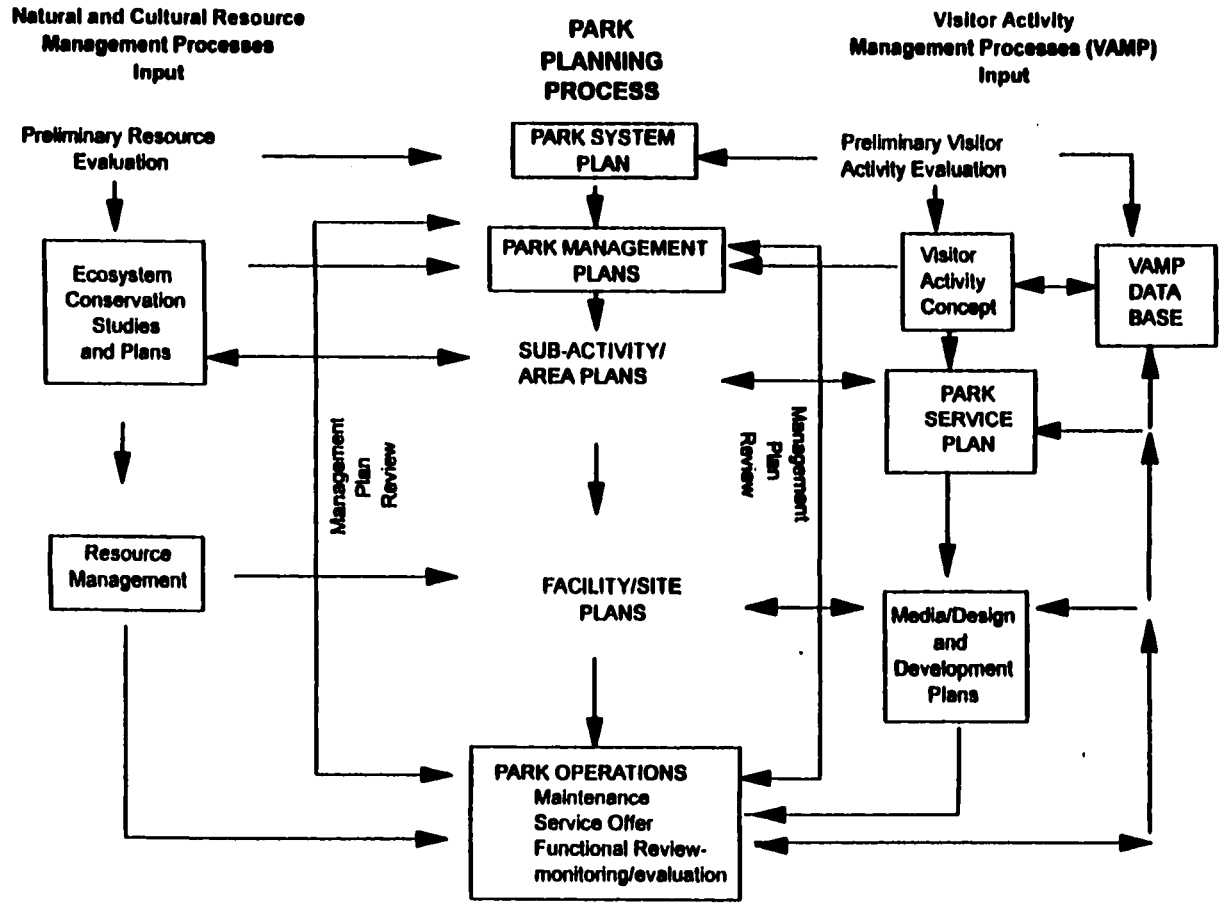
(Adapted from Hendee *et al.* 1990)

Figure 3: Visitor Impact Management (VIM) Planning Process



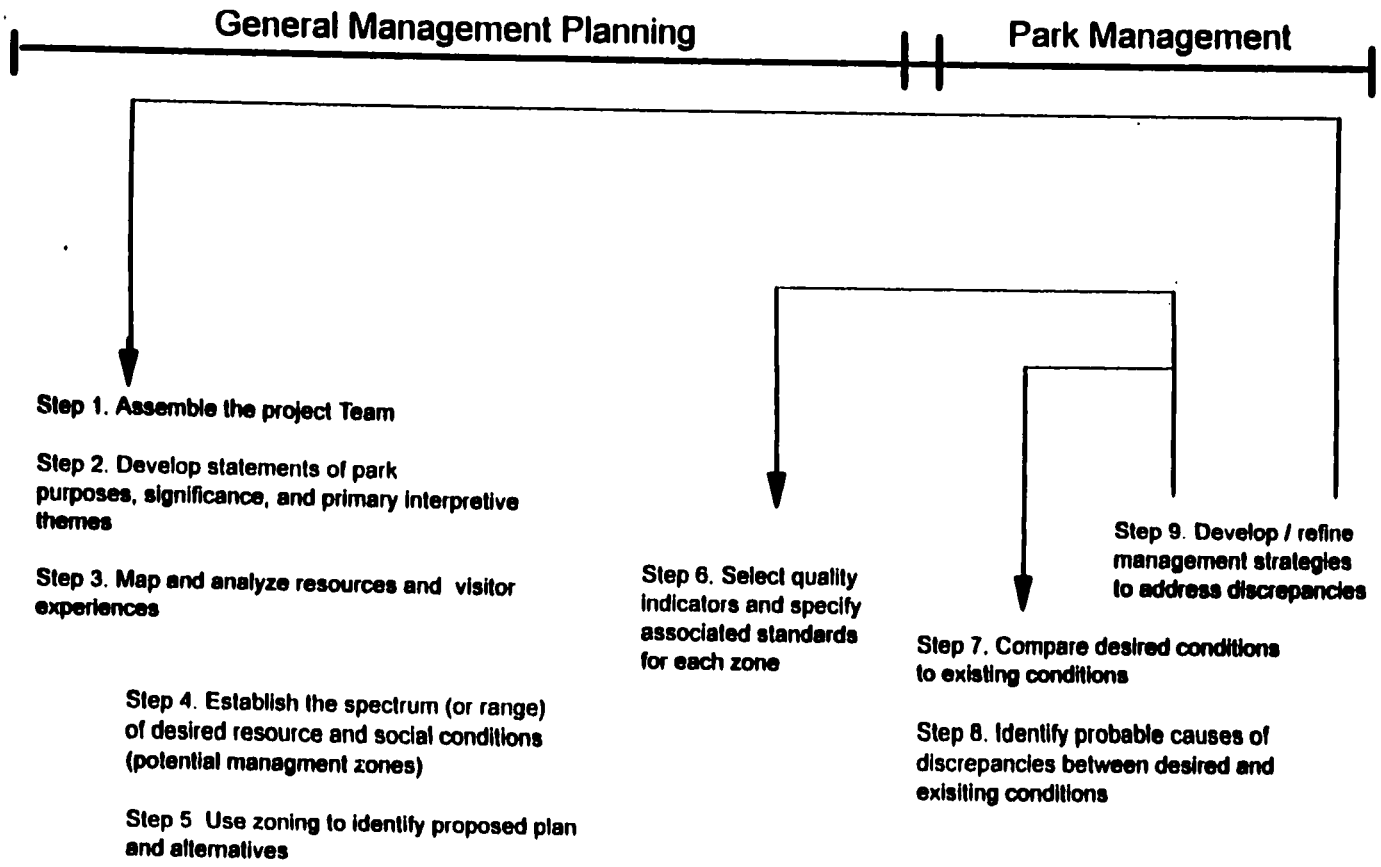
(Adapted from Graefe 1989)

Figure 4: The National Park Planning Process, showing the role of the Visitor Activity Management Planning (Vamp) Process



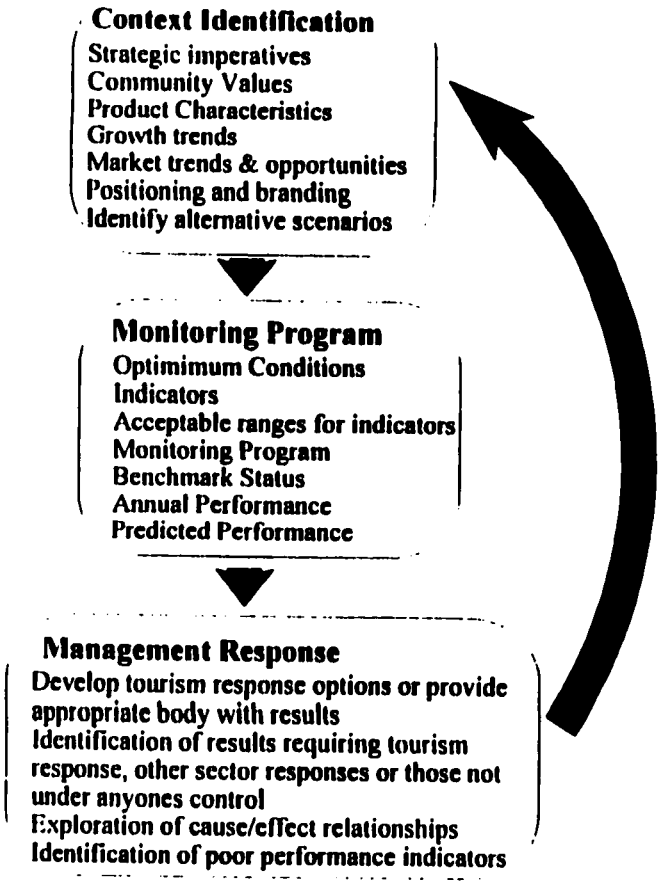
(Adapted from Canadian Parks Service 1988)

Figure 5: Visitor Experience and Resource Protection (VERP) Process



(Adapted from Manning *et al.* 1996)

Figure 6: Tourism Optimization Management Model (TOMM)



(Adapted from Manidis Roberts Consultants 1997)