FRAMEWORK FOR THE PREPARATION OF RESOURCE MANAGEMENT PLANS FOR MANITOBA'S PROVINCIAL PARKS

By

John S. Marczyk

A Practicum Submitted
In Partial Fulfillment of the
Requirements for the Degree,
Master of Natural Resources Management

Natural Resources Institute
The University of Manitoba
Winnipeg, Manitoba, Canada
April 1980

FRAMEWORK FOR THE PREPARATION OF RESOURCE MANAGEMENT PLANS FOR MANITOBA'S PROVINCIAL PARKS

By

JOHN S. MARCZYK

A practicum submitted to
the University of Manitoba in partial fulfillment of the
requirements of the degree of

MASTER OF NATURAL RESOURCE MANAGEMENT

ABSTRACT

The practicum was initiated in response to Manitoba Provincial Park legislative and policy requirements which reflect the necessity for comprehensive management of park, natural and cultural history resources.

The complexity of resource problems in Manitoba's resource-based Provincial Parks clearly dictates that resource management must be more than a series of unco-ordinated reactions to immediate problems. Because the incremental approach currently pursued by the Manitoba Department of Natural Resources does not facilitate the short and long-term resource management requirements of Provincial Parks, a framework for Resource Management Plans was developed. The resource management planning framework was prepared following an extensive literature review process in which Canadian and American park agencies were contacted for published and unpublished information; and through an examination of potential implementary constraints on the Resource Management Plan since resource management in Provincial Parks is a jurisdiction shared by many government agencies.

The synthesis of resource management planning insights gained from the literature review procedure resulted in the development of a resource management planning process that is integrated with park master planning. This integration is considered crucial since it establishes scope for resource management actions and, conversely, resource management identifies opportunities and limitations for park development.

Finally, to deal with the management of natural resources within an ecological framework, a procedure aptly demonstrating its practicality in resource management decision-making was required. The Ecological Land Classification approach currently evolving in Canada is applied for the collection and evaluation of natural resource data. This information plays an integral role in the preparation of both Resource Management Plans and Master Plans.

ACKNOWLEDGEMENTS

I would like to acknowledge with thanks the assistance received from many individuals in the preparation and writing of the practicum.

Special appreciation is extended to my committee members -- Jim Barlow, Natural Resource Management Co-ordinator, Parks Canada Prairie Region; Doug Chekay, Resource Management Specialist, Manitoba Parks Branch; Dave Freshwater, Professor of Agricultural Economics, University of Manitoba; Dave Witty, Planner-Resource Analyst, Hilderman, Feir, Witty and Associates -- for their time and patience.

In addition, special appreciation is extended to: Kurt Seel, Natural Resource Management Co-ordinator, Parks Canada Western Region and Paul Skydt, Head, Parks Resource Assessment and Management, Alberta Parks Division for their valuable planning insights; the Natural Resource Institute and Manitoba Parks Branch for funding and support services; Pat Misko for typing the manuscript; Eric Friedle for drafting; and finally my wife, Chris, for undying encouragement and tolerance.

TABLE OF CONTENTS

PAGE

ABSTRACT i

ACKNOWLEDGEMENTS ii

LIST OF TABLES vi

LIST OF FIGURES vii

GLOSSARY viii

Chapter

1. INTRODUCTION

1.1 BACKGROUND 1
1.2 THE PROBLEM STATEMENT 7
1.3 THE OBJECTIVE STATEMENT 8
1.3.1 The Objective 8
1.3.2 The Sub-objectives 8
1.4 ELABORATION OF OBJECTIVES 8
1.4.1 The Resource Management Plan in Prespective . . 8
1.4.2 An Ecological Basis for the Resource Management Plan 17
1.4.3 The Natural Resource Inventory 19
1.4.4 Resource Management Jurisdiction in Provincial Parks 20
1.5 METHODOLOGY FOR THE PRACTICUM 21
1.6 FORMAT OF THE PRACTICUM 22

2. TOWARDS A RESOURCE MANAGEMENT PLAN FRAMEWORK

2.0 INTRODUCTION 23
2.1 RESOURCE MANAGEMENT COMPONENTS 25
2.2 RESOURCE INVENTORY AND EVALUATION 28
2.2.1 Resource Inventory and Evaluation Elements . . 28
2.2.1.1 Preliminary Resource Reconnaissance 30
2.2.2 Resource Inventory and Evaluation Procedures. . 31
2.2.2.1 The Thematic Approach 31
2.2.2.2 The Integrated Approach 41
2.3 RESOURCE MANAGEMENT PROGRAMMING 72
2.3.1 An Ecological Approach for the Management of Natural Resources 72
2.3.1.2 Ecosystem Land Units 76
2.3.2.1 Potential Limitations of Land Ecosystems . . . 79
2.3.2 Cultural History Resource Management 82
2.3.2.1 Components of a Comprehensive Cultural Resource Management Program 83
2.2.3 Other Land Use Management 86
2.2.3.1 Management Alternatives of Compatible - Incompatible Uses 88

PAGE

2.2.3.2 Other Land Use Management Policy 90
2.3.3 Site Management 94
2.3.4 Hazard Management 96
2.4 CONCLUSIONS 97

3. RESOURCE MANAGEMENT PLANNING STRATEGIES

3.0 INTRODUCTION 99
3.1 PARK AGENCY SURVEY RESULTS 99
3.1.1 Resource Management Plan - Master Plan Integration 103
3.1.2 Discussion of Findings 106
3.1.2.1 General Conclusions 111
3.2 RESOURCE MANAGEMENT PLANNING HIGHLIGHTS 115
3.2.1 Illinois Department of Conservation 115
3.2.2 Nevada Division of State Parks 122
3.2.3 U.S. National Park Service 127
3.2.4 Parks Canada 137

4. THE RESOURCE MANAGEMENT PLAN FRAMEWORK

4.0 INTRODUCTION 146
4.1 RESOURCE MANAGEMENT - MASTER PLANNING INTEGRATION 148
4.1.1 Ecosite - A Basic Resource Management Unit . . . 150
4.2 RESOURCE MANAGEMENT PROGRAMS 152
4.2.1 Park Land Classification and Zoning System . . . 152
4.2.2 Program Goals 155
4.2.3 Resource Management Program Guidelines 158
4.3 ENVIRONMENTAL ASSESSMENT AND REVIEW PROGRESS 162
4.3.1 Project Description 162
4.3.2 Environmental Impact Assessment 162
4.4 RESOURCE MANAGEMENT PLAN FORMAT 169
4.4.1 Mode of Presentation 171
4.5 CO-ORDINATING GOVERNMENT AGENCIES 171
4.5.1 Department of Natural Resources Agencies 171
4.5.1.1 Current Natural Resource Management Emphasis . . 171
4.5.1.2 Wildlife Branch 173
4.5.1.3 Forest Branch 175
4.5.1.4 Fisheries Branch 177
4.5.1.5 Water Resources Branch 179
4.5.1.6 Operations Survey Branch 181
4.5.2 Other Manitoba Government Agencies 183
4.5.2.1 Environment Division, Department of Consumer and Corporate Affairs and Environment 183
4.5.2.2 Historic Resources Branch, Department of Cultural Affairs and Historical Resources . . . 184
4.5.3 Resource Management Co-ordination Shortcomings . 186

5. CONCLUSIONS AND RECOMMENDATIONS 189

LITERATURE CITED 197

PERSONAL COMMUNICATIONS 205

APPENDICES

		PAGE
1a	Categorization of Provincial Parks by Classification and Size	207
1b	Parks Systems Plan Component Definition	212
1c	Standard Park Agency Survey Letter	216
2	CLI Summary of Land Capability Classification for Recreation	218
3a	An Elaboration of Environmental Components Used in the Nevada Division of State Parks Resource Inventory	224
3b	U.S. National Park Service Environmental Impact Statement Format	227
4a	Existing and Potential Park Resource Uses	230
4b	Manitoba Parks Branch Zoning Scheme Proposed Changes	234
4c	Criteria for submittals of Project Descriptions and Environmental Impact Statements	237

LIST OF TABLES

		PAGE
2.1	Benefits and costs of the thematic inventory approach as taken from East, et al. (1979:212)	33
2.2	Levels of generalization in land classification developed by the Subcommittee on Biophysical Land Classification, 1969	48
2.3	Levels of ecological generalization proposed by the Canada Committee on Ecological Land Classification	50
2.4	An example of a wildlife legend for Land Systems of Banff and Jasper National Parks	60
2.5	Parks Canada's Ecological Land Classification hierarchy ...	65
2.6	An information matrix of national park resource data users	66
2.7	Benefits and costs of Ecological Land Survey identified at the 2nd Meeting of the Canadian Committee on Ecological Land Classification, 1979	71
2.8	Provincial Natural Parks by size and land use beyond their boundaries	81
2.9	Degree of compatibility among various forest users in Provincial Parks	89
3.1	Information summary of the park agency survey	101
3.2	Resource management plan work plans	133
4.1	Resource management program goals	156

LIST OF FIGURES

		PAGE
1.1	Phases in the development of a Park Systems Plan	10
1.2	Phase III, components found in the Park Systems Plan	13
1.3	Manitoba Parks Branch master planning procedure.....	14
2.1	The outdoor recreation management systems model, showing integration of subsystems and interactions of the phases of each subsystem	24
2.2	The resource management subsystem in park management	26
2.3	Canada Land Inventory coverage of land capabilities for recreation, forestry, wildlife (ungulates and waterfowl) and agriculture	37
2.4	Steps in reducing CLI multiple ratings	40
2.5	Integrated resource inventory and evaluation process	42
2.6	An example of vertical linkage of land ecosystems	53
2.7	A hierarchical network of Ecological Land Classification levels of generalization	55
2.8	Major steps in an ecological land survey	70
2.9	Flow plan of methodology and procedure for problem and resources management activity recognition	75
3.1	Illinois Department of Conservation Master Management Planning approach Illustrating the relationship between Phase 2 and 3	120
3.2	U.S. National Park Service planning process	128
3.3	Parks Canada overall national park planning process illustrating an integration of master planning and resource management planning	139
4.1	Manitoba Parks Branch master planning procedure integrated with resource management	149
4.2	Stages in the resource management program	158
4.3	An example of program categories and corresponding project types in the vegetation resource management program	160
5.1	Organization flow chart of the ideal resource management planning team	196

G L O S S A R Y

Abiotic

Non-biological; thus an abiotic element is a physical or chemical feature of an ecosystem q.v. or environment.

Analysis

The separation of something into the parts or elements of which it is composed and showing the results of such an examination.

Biome

A community of plants or animals extending over a large natural area; a major regional ecological community such as the coniferous forest.

Biotic

Relating to life and living systems rather than the physical and chemical characteristics of an environment q.v. biotic factors are influences in the environment that emanate from the activities of living organisms.

Classification

The systematic art or method of arranging into classes; grouping or gathering according to a definite plan or in a definite sequence by assuming static or dynamic relationships expressive of various phenomena (after Webster, 1971).

Conservation

A complex system of measures taken for the rational use, maintenance, or rehabilitation of natural resources and the protection of natural environments against impairment.

Carrying Capacity, Ecological

*1. The limit of a natural ecosystem's ability to sustain user impacts. (After Conservation Foundation, 1972).

2. 'Biotic Carrying Capacity' used in a recreation context. That level of development and use beyond which the site's capacity to provide a sustained high level of satisfaction becomes impaired due to severe damage. (La Page 1963).
3. The number (or weight) of organisms of a given species and quality that can survive in, without causing deterioration of, a given ecosystem through the least favourable environmental conditions that occur within a stated interval of time. (Ford - Robertson, 1971).

Carrying Capacity, Wildlife

1. The upper limit of population growth beyond which no major increase can occur. (After Odum, 1959).
2. The number of animals that a habitat can maintain in a healthy, vigorous condition. (After Dasmann, 1945).
3. The level of population above which intraspecific tolerance permits no further increase. (After Leopold, 1933).

Development

The installation of physical amenities in a park, as required directly or indirectly for visitor use, or for preservation and protection of the natural state of the park. The removal of inappropriate or unnecessary installations. The restoration of a natural or historical scene may also be considered development.

Ecosystem

A natural complex of plant and animal populations and the particular sets of physical conditions under which they exist; the organisms of a locality, together with the functionally related aspects of the environment q.v. considered as a single entity. The word 'ecosystem' is derived from two words: ecology and system, the 'eco' part of the work implies environment, while the 'system' part implies an interacting, interdependent complex. The word, ecosystem, was coined by A.G. Tansely in 1935.

Goal

A point marking the end of an object of effort.

Habitat

A physical portion of the environment that is inhabited by an organism or population of organisms. A habitat is characterized by a relative uniformity of thephysical environment and fairly close interaction of all biological species involved.

Impair

To damage, weaken or diminish in quality, quantity or excellence.

Inventory

The identification, tabulation, and possible mapping of some or all of the natural, historical and archeological resources within a given area.

Land Ecosystem

1. A topographical unit, a volume of land and air plus organic contents extended areally over a particular part of the earth's surface for a certain time with boundaries fixed by definition. (Rowe, 1961).
2. Ecosystems are homogeneous units, and the concept of land ecosystems refers to patterns of these homogeneous areas. (Hills, 1976).

Maintain

To keep in a predetermined condition.

Management

The executive function of conceiving, organizing, co-ordinating, directing, controlling and supervising any activity with responsibility for the results.

Master Plan

The planning document that applies park objectives and policies to the short and long term operation of a given park; it defines the broad objectives of park protection, development and management and describes the techniques required to achieve these objectives; it establishes guidelines that will control the preparation of more detailed plans for the numerous park programs, and ensures that non-conforming programs and uses are eliminated or rejected.

Methodology

A body of rules, methods and postulates employed by a discipline to analyze the principle procedures under question.

Natural Resources

a) The landscape, minerals, soils, water, atmosphere, plant and animal life that is naturally present in any area.
b) The physical assets -- natural, historical and archeological -- contained in a park and considered in the sense of contributing to its value as a park rather than for other economic uses or exploitation.

Objective

A frame or reference that provides a degree of measure in reaching designated goals.

Option

The right to choose between alternatives.

Planning

The development of an organized procedure, including the selection of goals and objectives and the tools of action necessary to achieve these goals. Planning involves taking into consideration the social, biological and physical environment of an area or park, as well as the role that planning plays in area development.

Policy

Directives, rules or regulations concerning management or procedures; they are primarily based on those interests harmonious with principle.

Policy Statement

An adopted or formally announced directive, rule or regulation which will govern future decisions.

Preservation

Keeping in existence unchanged, natural resources, structures or situations which have been inherited from the past.

Program

A plan of procedure: a schedule or system under which action may be taken toward a desired goal.

Project

A specific plan or design designed to meet desired program goals. A work item definable in terms of plans and specifications.

Research

A systematic investigation of a problem to discover new facts and interpret these in an effort to solve the problem. Research may be 'pure' or 'applied': Pure research refers to the search for knowledge for its own sake. Applied research refers to the search for the knowledge necessary to solve an immediate problem.

Resource Base

a) The combination of all individual resources which are represented in a designated geographical area.
b) The total known research data and other information concerning the natural and historical resources of an area or park, and required

for the purpose of resource management decision-making activities, e.g. planning, protection, development, etc.

Resource Management

Activities directed toward the maintenance or modification of the biotic and abiotic resources of an area to achieve a desired objective of protection and/or use.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Too often we think of outdoor recreation in the narrow sense of active sports and physical exercise and fail to appreciate its wider implications. In 1958 W. G. Carnes clearly defined the many aspects of recreation as recognized by Mission 66 of the U.S. National Park Service:

> Refreshment of strength and spirits and satisfying diversion in the outdoors may come in many different ways...through the contemplation of inspiring natural scenery; through insight into geological and biological forces of nature; through visiting sites and seeing structures and objects associated with significant events in history and with the cultures of prehistoric peoples, through activities such as picnicking, boating, skiing, and other outdoor sports; and through enjoyable community activities. (Lewis, 1961:9).

In Manitoba the Parks Branch, Department of Natural Resources, has established a park system consisting of 164 Provincial Parks to provide outdoor recreational opportunities; and to preserve unique or representive landscapes and natural and cultural history resources.[1]

Because each park cannot realistically accommodate the spectrum of visitor uses in demand within the Province and still maintain high quality outdoor recreational activities, a variety of park types have been established. In the publication "Land for the Future" (1960) Dr. Marion Clawson classified outdoor recreational areas into three broad categories[2] (see Clawson *et al.*, 1960:149). Manitoba's Provincial

---

[1] Cultural history resources include historical and archeological resources. These are defined in Chapter Two.

[2] Clawson's categorization of park types is used here to demonstrate the differences between extensively and intensively used parks. In general, the categorization is based on distance between potential park users and the park. One should note that distance does not play as significant a role today; for example, some contemporary resource-based parks are found in urban areas.

Parks fall into the first two categories:

1. *Resource-based Areas*, the superb or unusual character of which requires that they be located where the resources are, and that users travel to them. Resource-based Areas are the largest in total area, smallest in total use, and hence lowest in intensity of use. These areas are primarily used for vacations and natural parks serve as good examples; and

2. *Intermediate Areas*, are located within a reasonable distance from anticipated users -- within a two hour travel time -- and on the best available sites subject to such locational restrictions. Intermediate Areas are primarily used for all-day outings.

3. *Consumer-oriented Areas* represented the third broad category of an outdoor recreational area described by Clawson (1960). Municipal parks were taken as typical of consumer-oriented outdoor recreation areas but are not represented in the provincial park system.

The basis for a statement of 'park purpose' is found in The Provincial Park Lands Act,[1] 1972, and its corresponding regulations. The Manitoba Regulation 199/74 under the Act identifies the six types of provincial park lands:

1. *Provincial Natural Parks:* areas which possess exceptional value or quality in illustrating or interpreting the natural heritage of the Province:

2. *Provincial Wilderness Parks:* areas which, through their management and use, will be perpetuated in a primitive state, free of development, and accessible only be non-mechanized means;

---

[1] The Provincial Park Lands Act S.M. 1972, c. 67--Cap. P. 20, (12(1)b lists the various types of provincial park lands.

3. *Provincial Recreation Parks:* spacious areas close to concentrations of people, the natural attributes of which make it possible to serve large numbers of recreational users without degredation of the basic natural resources of the area;

4. *Provincial Recreation Travelways:* lineal areas illustrating or interpreting the natural travel routes of our Province, including Provincial Recreational Trailways, Parkways and Waterways;

5. *Provincial Heritage Parks:* areas established to preserve and interpret key elements of Manitoba's natural and human history;

6. *Special Use Parks:* small land areas developed for express recreational purposes, including:

   i) Wayside Parks, for highway roadside picnic stops;

   ii) Provincial Campgrounds, for overnight use along travel routes or adjacent to resource areas such as lakes and forest lands;

   iii) Marine Parks, for service to boating areas which may include marinas, docks and camping;

   iv) Access sites, for boat launching or trailhead parking;

   v) Information centres, manned and unmanned, for the purpose of giving information and direction to vacationers and tourists; and

   vi) Seasonal dwelling areas, to provide developments for cottage subdivision, group camps, cabins and trailer villages for recreational purposes.[1]

Manitoba's 164 Provincial Parks encompass a total area of 1,033.208.5 hectares or two per cent of the total land and water area of the Province of Manitoba. Of this total area, nearly 95 per cent is designated as 'Provincial Natural Park'; about 5 per cent is under 'Provincial Recreation Parks'; and less than 1 per cent is under 'Provincial

---

[1] Taken from Manitoba Regulation 199/74. The Manitoba Gazette. Vol. 103, No. 34, August 13, 1974. For a more detailed discussion refer to Manitoba (1974).

Heritage Parks'; and 0.055 per cent is under 'Special Use Parks'.[1]

Based on the statement of the park purpose and physical area, 'Provincial Natural Parks' most closely represent the 'Resource-based Areas' category developed by Clawson. Because Provincial Natural Parks comprise the largest land and water areas and must be managed so as to perpetuate the unique or representative natural features they possess, it would be logical to expect most of the resource management efforts should be focussed here on this type of park. This axiom is further supported by the fact that Provincial Natural Parks are generally operated on a multiple use basis comprising four sometimes conflicting uses of park resources. The four uses are outdoor recreation, preservation, research and commercial activities.

The systematic and comprehensive co-ordination of these resource uses calls for both short and long-term planning in order that citizens of Manitoba obtain optimum benefit from Provincial Parks.

Currently, the management of the parks' natural and cultural history resources is based upon the incremental or *ad hoc* approach. While the incremental approach has its place in the management of provincial parks on a day-to-day basis, it is not optimal for the short-term or long-range management of park resources. Incremental resource management does not foster the comprehensiveness required for the management of complex, dynamic ecosystems. Stability is both rare and short

---

[1]For a complete breakdown refer to Appendix 1a.

lived in nature, particularly in the environments of Provincial Natural Parks. In these areas resource management must be more than well-intentioned; it must be well-grounded in the dynamics of natural systems and be designed to accommodate and respond to the challenges imposed by constant change. The primary characteristic of natural environments is the interaction of their most dynamic parts or elements (man included) through time (Carbyn, 1978). Therefore, the first step in resource management is to understand the dynamics of natural systems and their interacting elements (Dolan *et al.*, 1978:249); something incremental resource management can not effectively accommodate.

For instance, in response to growing concern over man-induced modifications to natural parks, the U.S. National Park Service developed a philosophy for their Natural Area National Parks management in the 1960's through a Committee chaired by Dr. Starker Leopold (Smathers, 1975). The Leopold Committee, as it has come to be known, found that the majority of management programs had been designed to fill the immediate needs of single use activities and to solve single resource problems. In general there had been an insufficient appreciation for the ecological consequences of action programs and projects. As a result, parks in 1968 represented a mosaic of modified artificial environments which were ecologically unstable (Reid, 1968). Modification of park environments on a piece-meal basis was increasing at an alarming rate due to the tremendous and diverse pressures of rapidly expanding population and technology. To halt and reverse this trend, the Leopold Committee recommended that major policy change be instituted so that the National Park Service could recognize the enormous complexity of ecological

communities and the diversity of management procedures required to preserve them (Reid, 1968:161). In 1968 Reid stated: "We realized early if we are to maintain biotic associations unimpaired for the enjoyment of this and future generations, we must focus our attention on the total environment". (Reid, 1968:161). The goals of natural areas preservation were clearly defined as being the maintenance and restoration of natural conditions and processes.

Ad hoc resource management is not equipped with mechanisms for monitoring both the short and long-term impacts of management actions. Rather, as Webster's Third New International Dictionary states, it is for "...the particular end or purpose at hand and is without reference to wider application or employment."

Without management plans, derived from an orderly planning process, resource management can be no more than a series of uncoordinated reactions to immediate problems (Hendee and Kock, 1978). Incremental management can be counter productive to the overall park preservation goals because management direction can be easily shaped by a succession of minor decisions -- a tyranny of small decisions -- one leading to another, with cumulative results which are at best undesirable and which at worst might be irreversible. McTaggart Cowan best described the incremental approach to resource management when he stated: "The destruction of the environment in insignificant increments". (Peterson and Wright, 1978:viii).

Unplanned management can be recognized by a shifting focus on

the problem as each becomes pressing; inconsistent, conflicting actions; and a loss of overall direction toward park resource preservation goals. Formal plans that establish clear objectives which are to be pursued, are essential to guide park resource management toward consistent outcomes. Good plans can stabilize management, despite changes in personnel or the simultaneous influence of several managers on parks governed by more than one administrative unit.[1] The planning process also gives the interested public an opportunity to learn about, evaluate, and provide input to management; it makes planning explicit and visible. Therefore, the effectiveness and consistency of park resource management, as well as the involvement of the public and their acceptance of that management, are highly dependent on plans and the planning process.

1.2 THE PROBLEM STATEMENT

The Parks Branch must comply with The Provincial Park Lands Act, 1972, which under Section 2(3) calls for the development and maintenance of Provincial Park lands:

a) for the conservation and management of flora and fauna therein;

b) for the preservation of specified areas and objects therein that are of geological, cultural, ecological or scientific interest; and

c) to facilitate the use and enjoyment of outdoor recreation therein.

The attainment of these goals cannot be effectively achieved through an incremental resource management approach. The Parks Branch

---

[1] The Manitoba Parks Branch is authorized under The Provincial Park Lands Act, 1972 to preserve park resources. However, the operational management of natural and cultural resources is shared by other Governmental Departments.

has therefore expressed an interest in an alternative approach; a resource management planning procedure.

1.3 THE OBJECTIVE STATEMENT

1.3.1 The Objective

The objective of the study was to produce a framework for the preparation of a Resource Management Plan which would serve as a guide to resource planners. By planning and documenting proposed management actions to resolve resource problems, issues or concerns in Provincial Parks, the resource planners can ensure that resource management outcomes are consistent with the management goals of the park.

1.3.2 The Sub-objectives

1. The first sub-objective was to base the Resource Management Plan framework upon the ecosystems concept where it was possible to do so.
2. The second sub-objective was to identify alternative approaches for the collection, storage, retrieval and evaluation of natural resource inventory data.
3. The third sub-objective was to prepare an extensive list of compatible and incompatible park land uses and to identify other Manitoba government agencies responsible for the co-operative management of park resources.

1.4 ELABORATION OF OBJECTIVES

1.4.1 The Resource Management Plan in Perspective

In order to provide an appreciation of the role of the Resource Management Plan in the overall park management process, a historical perspective is required. Manitoba's Provincial Parks Systems is the

product of an elaborate total park planning process which for the convenience of discussion may be subdivided into areas: Park Systems Planning and Park Master Planning. The reader should note, however, that these two subsystems are not mutually exclusive processes; each is related to the other in terms of function and process.

The concept of Park Systems Planning as a tool was first clearly identified by W. J. Hart in his publication, "A Systems Approach to Park Planning" (1966):

> Within a given land area all parks, no matter how large they may be or for what purpose they are established are related to each other to the use of the resource and the landscape which includes them and to the society that supports them. Reservations of land and water resources particularly for parks and recreation exert as profound an influence on the use of the resources surrounding them and upon societies that control their fate as society and historic land-use patterns exert on its resources; Parks cannot be considered in isolation. When one consciously takes into account as many of the biological, physical and social inter-relationships as possible in considering various kinds of parks and park programmes for a region, a nation or group of nations, one is engaging in planning systems of parks or park systems planning.

Numerous park agencies throughout the world have accepted the Park Systems Planning concept and a few have made some initial steps in this direction (Nuxoll, 1975:1). In Manitoba, Park Systems Planning has been recognized for many years and by 1975 the concept received full time attention. Prior to this time, a systematic approach for the Parks Branch was not operative as such, "...reasons for parkland acquisition and facility, services and program development were not tied into a logical sequence. Therefore the main purposes for the

decision to follow a Park Systems Planning course of action were to establish a logical sequence for the planning growth of the Manitoba Provincial Park System, and to guide the thinking and action of all Parks Branch planners and managers in a co-ordinated fashion". (Nuxoll, 1975:2).

The Manitoba Parks Branch has developed a three phase Parks Systems Planning process (Figure 1.1). The first phase deals with the

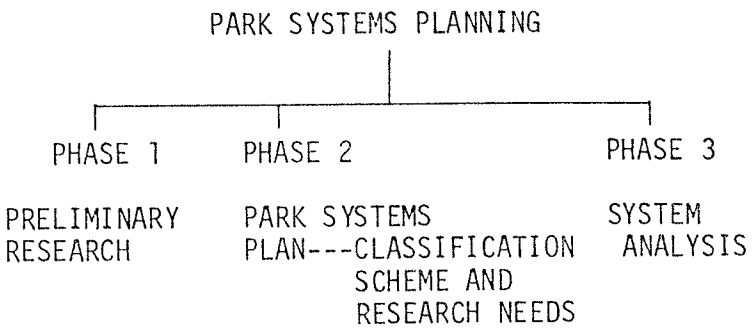


Figure 1.1 *Phases in the Development of a Park Systems Plan.*

gathering of pertinent information related to the concept of Parks Systems Planning. The second phase sets the ground work for the preparation of a Parks Systems Plan, which indicates the direction and future growth of the Provincial Park System. An integral component of the Parks Systems Plan is a parks classification scheme. A classification scheme's purpose is to identify a complete range of park-related experiences in view of the need for the provision of all required types within a park system. Since each park unit within the system cannot and should not accommodate the full spectrum of visitor uses, the classification scheme establishes and clarifies the 'park purpose' -- the purpose of each park type. In general terms, the park purpose is determined in accordance with

its significance in the parks system. Significance may be determined in terms of exceptional, natural, and cultural features and/or a variety of *social, political* and *economic* considerations:

1. Recreation Use:
   -- Public wants and preferences,
   -- Trends,
   -- Participation,
   -- Existing mix of recreational opportunities in the Province;
2. Provincial Goals:
   -- Legislation,
   -- Provincial Parks Policy,
   -- Government Policy;
3. Regional Aspects:
   -- Provincial and Municipal factors; accessibility; economics; and patterns of resource utilization, (Nuxoll, 1975).

Recreational Use is the initial element considered in the establishment of a park system since the acquisition or reservation policy dealing with potential park lands must have a public demand response component. Clawson (1960a) established a measure of future demand for outdoor recreation by examining four factors which appeared to be the main components of the total demand. These factors were: 1) *Population,* the number of potential park visitors that could be anticipated using existing and projected information; 2) *Buying Power,* the economic impact of recreation cost considerations (i.e. travel cost, equipment cost) on individuals' disposal income; 3) *Leisure Time,* the amount of additional time available to individuals for personal use due to shorter working days and weeks and the general

adoption of paid vacations; and 4) *Mobility*, the degree to which the average yearly travel distance rises for individuals.

The third and final phase in the development of the Park Systems Plan is by far the most detailed and time consuming; it entails both the identification and the analysis of the various components involved, that together interact to determine direction for the Park Systems Plan (Figure 1.2). These interacting components are defined in Appendix 1b.

In summation, the Park Systems Plan acts as a guide in the selection of provincial park lands and is concerned with the number of different kinds of parks which should be established, not only to meet present needs, wants and capabilities of the public, but, also estimations of future total demands. Population forecasts and knowledge of the characteristics, needs and desires of Manitobans are but a few of the subjects that require study as background information for Park Systems Planning.

Once the park land has been legally established, the Park Master Planning process is initiated to facilitate the long-range planning requirements of the park. The product of this elaborate process (Figure 1.3) is the Master Plan. In general terms, a Master Plan serves as a 'guide' for resource protection, management, interpretation and development of outdoor recreation facilities that combines concepts and objectives basic to the park, and the park system of which it is a part. The Master Plan must be viewed as a guide since, over the long term, the document cannot accommodate changing park objectives, anticipate unforeseen public attitudes and events, or reflect changes in dynamic resources patterns. The Master Plan should be a flexible document that

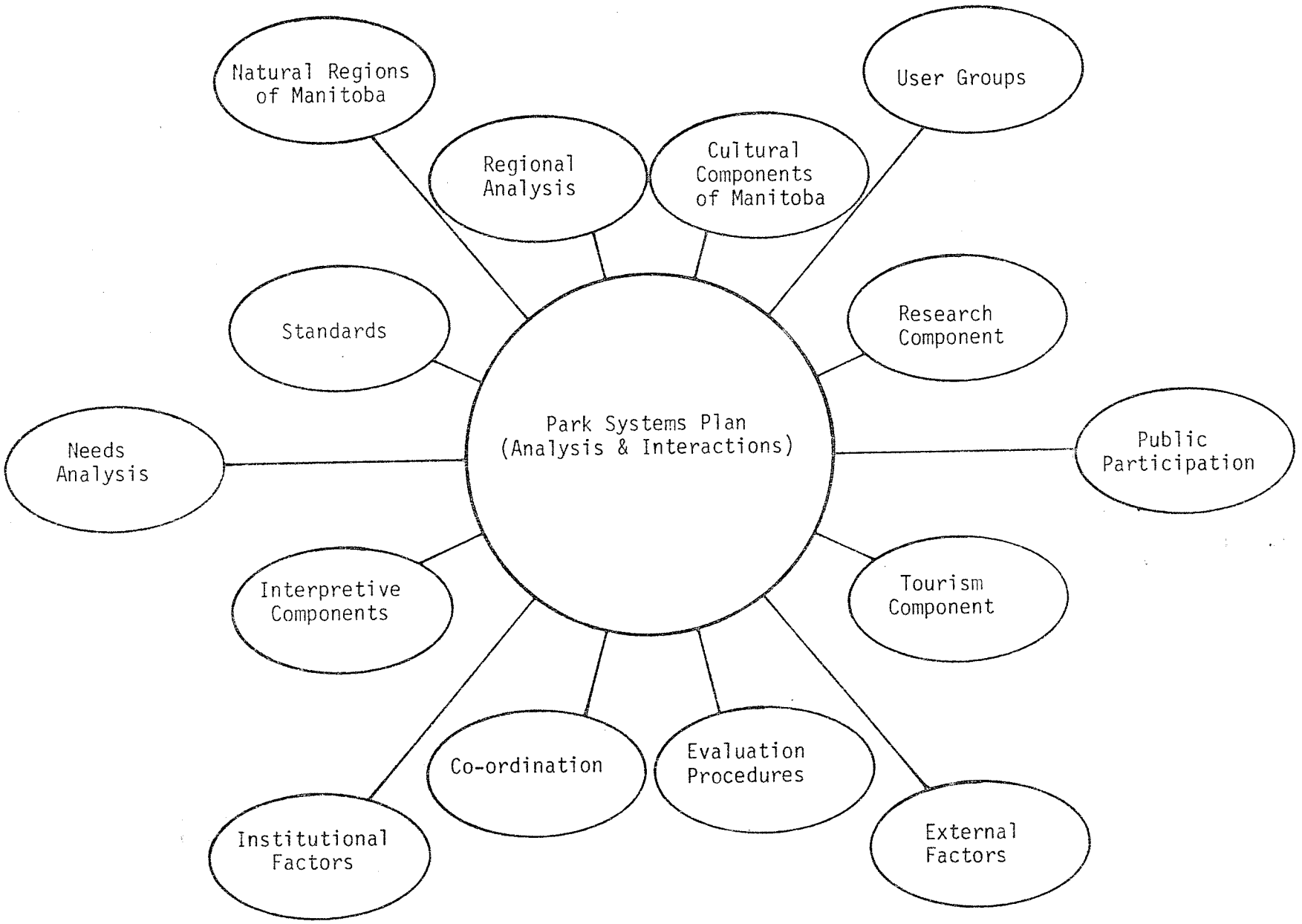


Figure 1.2 Phase III, components found in the Parks Systems Plan

Source: Nuxoll (1975)

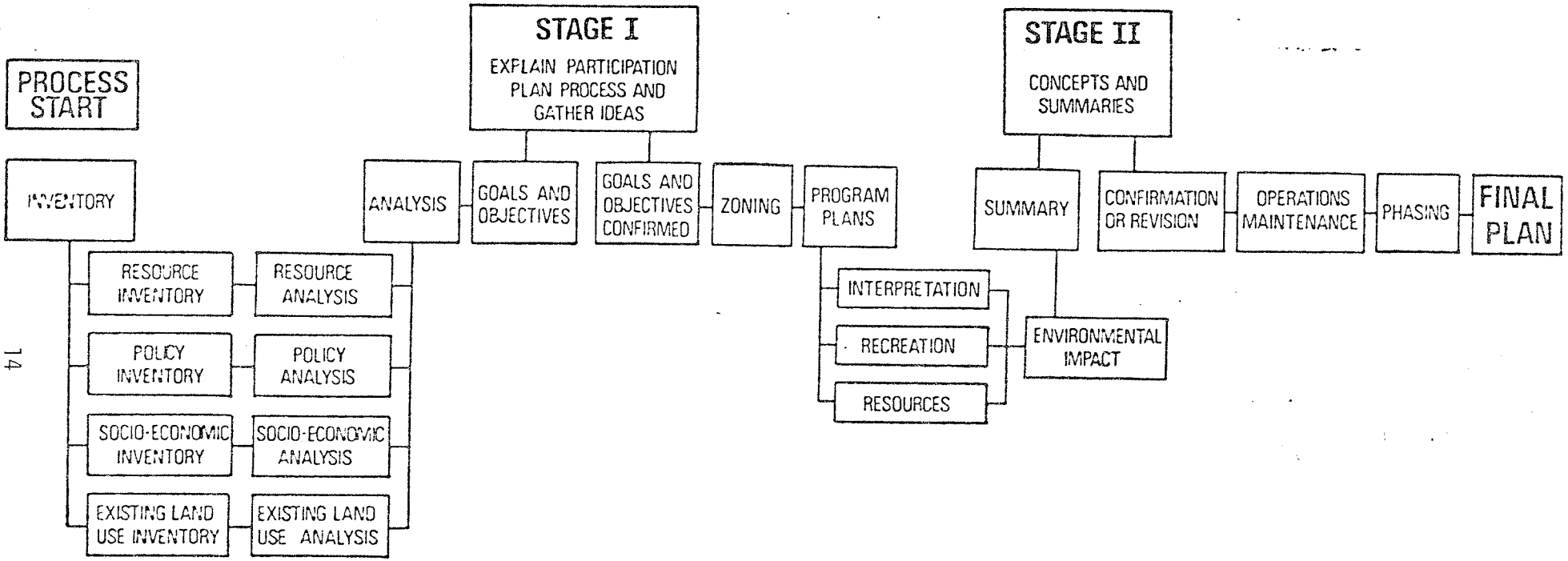


Figure 1.3 *Manitoba Parks Branch master planning procedure.*

Source: Manitoba (1979).

Note: This procedure has not, at the time of writing, received ministerial approval.

is susceptible to necessary changes, otherwise, it may rapidly become obsolete and a hindrance to effective planning. The Manitoba Parks Branch has established the scope for a Master Plan to be 15 to 20 years, with a systematic review and evaluation every five years (Manitoba, 1974a).

Compiling information on the resources and values of an area is the first step in the establishment of a Master Plan. Information gathering may be costly. However, this is offset by the major long-term benefits of better management and interpretation of the resources of the park, therefore, much better preservation of park values. For example, if a certain wildlife species is one of the natural, outstanding features of a park, hence a feature to be protected, it becomes imperative to know what factors are responsible for its existence. In addition, resource base information is required for the comprehensive development of the park for visitor use.

The establishment of clear goals and objectives and their ratification in a public participation process is an important stage in the master planning process. These goals and objectives not only provide the overall goals for park employees, but more importantly set the stage for subsequent management actions in a manner that facilitates a clear understanding of what should be done. The goals and objectives are the guiding principles that must be adhered to so that a particular park unit and the park system as a whole fulfill expectations. In addition, the goals and objectives should recognize that visitor use and resource management are integrated: High quality outdoor recreational experiences for the park visitor can only be continued as long as the natural and cultural resources[1] that

---

[1]Cultural resources includes historical and archeological resources.

make up the park are perpetuated (Linn, 1976:1).

The next stage in the development of a Master Plan is the preparation of a zoning scheme. Zoning is one of the most widely used land resource management methods. The zones define areas of the park within which certain types of activities may or may not be established, on the basis of uniqueness, fragility and the value of various resources found within the zone. In summary, zoning is a tool that helps to ensure that uses and combinations of uses are implemented in locations well suited to accommodate them.

Zonal boundaries have in the past been established with a very poor understanding of the park resource base and therefore to a large extent zones were delimited without an appreciation of ecological factors. For instance, the drawing of a boundary for an intensive use area such as a campground or cottage development without regard to black bear (Ursus americanus) ranges could lead to unnecessary user/wildlife conflicts. The costs involved in resolving conflicts would not be insignificant: Public safety considerations should be foremost to park management (Seel, 1979; pers. com.) and therefore could lead to the reallocation of the campground and cottage development or result in the removal of nuisance bears or other wildlife. Only in this manner would public safety interests be maintained and a wildlife value be preserved.

The park planning and management goals and objectives are formulated for the development, visitor use and resource management considerations in conjunction with the park's purpose and land use zoning scheme. The land use zone boundaries, determined by an intensive resource inventory and assessment provide guidance for development of facilities, visitor services and resource management.

The development of planning and management goals and objectives from the conceptual level to an operational level may result in the establishment of a number of sub-activity plans. The names for these Master Plan extensions vary considerably from park agency to park agency. However, three appear to be the most common: Action Plans, Operational Plans and Implementation Plans. These Plans are necessary because the level of detail in the Master Plan is not intended to provide detailed guidance for all geographic areas and for all facets of park management (U.S.D.I., 1978: 7-12; Theberge, 1978:35).

The Manitoba Parks Branch has chosen to call these Plan extensions 'Program Plans' (Figure 1.3). Under this designation, three specific subject areas have been identified: Interpretation, Recreation and Resources (Manitoba, 1979). The 'Resource Program Plan' is the Parks Branch term for a Resource Management Plan.

1.4.2 An Ecological Basis For The Resource Management Plan

The first sub-objective in Section 1.3.2 indicates that the Resource Management Plan framework would be developed using the concept of ecosystems where it was pragmatic to do so. This section will briefly discuss the merits and limitations of such an approach.

Because land consists of a highly differentiated series of ecosystems[1] which respond differently to similar actions occurring in

---

[1]An ecosystem is a natural complex of plant communities and animal populations and the particular sets of physical conditions under which they exist: The organisms of a locality, together with functionally related aspects of the environment are considered a single entity. Because an ecosystem occupies space and time it has a position of the earth's surface (Daubenmire, 1968). This position can be accurately described by noting latitude, longitude and altitude (Van Dyne, 1969:16; Carbyn, 1978:9).

them, an understanding of the components of ecosystems found in Provincial Parks could provide the Parks Branch with a means of: 1) reducing development and natural resource management costs; 2) creating developments which would have fewer deleterious repercussions; and 3) maintaining more pleasing natural environments (see May 1973:3).

Stephen Spur argued that the ecosystem concept was an appropriate framework in which natural resource management decisions could be made:

> Our problems of management of our natural resources are clearly critical, whether we concern ourselves with land, air or water resources. We have every reason, therefore, to devote substantially increased effort to the application of ecosystem analysis to natural resource management problems. (Van Dyne, 1967:7).

However, while many natural resource management professionals agree that the ecosystems concept is the appropriate framework for natural resource management decisions (Van Dyne, 1969), some have argued that the ecosystem concept is no more than a concept and has no direct application in real world management decisions (Holling, 1977). Based on my observations the problem appears to lie in the failure of natural resource managers to synthesize the two major components of ecosystems, structure[1] and function[2]. Because integrated natural resource management is predicated on ecological principles, which in turn rely on a synthesis of structure and function, many natural resource managers have not used

---

[1]Ecological structure contains the following components: Inorganic substances, organic substances, climatic regime, producers, macroconsumers and microconsumers (Odum, 1971).

[2]Ecological function is based on systems relationships and process. Odum (1971) divided ecosystems into six functional categories: energy circuits, food chains, diversity patterns in time and space, nutrient (biochemical) cycles, development and evolution and control (Cybernetics).

ecosystem concepts to their full potential.

The Ecological Land Classification approach to ecosystem analysis currently being developed in Canada was used in the formulation of the framework because it has clearly demonstrated its operational capabilities. While the Ecological Land Classification approach focusses primarily on the structural aspects of ecosystems, it has the capability of aiding the identification and synthesis of the functional aspects should the resolution of a resource management problem require an intensive ecosystem analysis (see Kilgore, 1976).

1.4.3 The Natural Resource Inventory

The second sub-objective in Section 1.3.2 called for the identification of alternative approaches for the collection, storage, retrieval and evaluation of resource inventory data. The Manitoba Parks Branch has not developed or adopted a systematic and comprehensive approach and has requested that alternative approaches be outlined.

The inventory of natural and cultural history resources and resource management in parks are not mutually exclusive processes. To make informed resource management decisions requires up-to-date resource inventory information (Skydt, 1979; Linn, 1976; Edwards, 1973). Therefore, the nature and provision of resource inventory information that is required is a function of the decision-making process it must support.

The practicum will examine the two major categories of inventories used for the collection of natural resource data. These are the *thematic* and *integrated* approaches. The thematic inventory may be defined as that approach in which elements of the natural environment are surveyed and

analyzed separately, resulting in a horizontal separation of the land into themes such as soils, vegetation, wildlife and so on. The integrated inventory differs from the thematic in that the natural environment is examined holistically; ecological insight is used for the collection and analysis of data. The integrated inventory approach recognizes that a true interpretation of the natural environment cannot be gained by merely summing together individually analyzed elements. The resources are analyzed and described as interlocking portions of homogeneous land units.

1.4.4 Resource Management Jurisdiction in Provincial Parks

At the time the terms of reference for the practicum were established, the Manitoba Department of Mines, Natural Resources and Environment was undergoing reorganization. Parks Branch, previously with the Department of Tourism and Cultural Affairs, had been transferred to the Department of Mines, Natural Resources and Environment. Associated with the transfer was the decentralization of the Parks Branch's resource management jurisdiction to the other Branches within the Department. Therefore, while the Parks Branch has administrative jurisdiction over crown lands within the Province known as 'Provincial Parks', it no longer has the operational infrastructure to manage park natural resources. The management of park, natural and cultural resources is dependent on other agencies within the Department, the Historic Resources Branch, Department of Cultural Affairs and Historic Resources and the Environment Division, Department of Consumer, Corporate Affairs and Environment.

The third sub-objective of the practicum, as listed in Section 1.3.2 was to prepare an extensive list of compatible and incompatible park land uses and to identify those agencies which could play an

important role in the management of these areas. A brief analysis was made of the objectives, mandates and personnel infrastructures of these agencies and some shortcomings were outlined.

1.5 METHODOLOGY FOR THE PRACTICUM

By definition, resource management in the parks context consists of activities directed toward the maintenance or modification of abiotic and biotic resources of an area to achieve a desired objective of protection and/or use; and to preserve and restore cultural resources (Dolan *et al.*, 1978; Eidsvik, 1977; Campbell, 1976; Reid, 1968). Therefore, resource management within parks differs significantly from that of most other lands, where objectives are directed to modifying or controlling nature, producing crops or extracting natural resources. Within parks, objectives are usually directed towards protecting natural and cultural resources by maintaining the physical and cultural environment. Consequently, many concepts or ideas which are relevant or essential to the effective management of other lands have limited relevance to the management of park lands.

In light of the time limitations on the practicum, the Resource Management Plan framework that is proposed could not be applied in a test case in order to identify its shortcomings. An effort was therefore made not to 'reinvent the wheel', but rather, to gain from the experience of other park agencies that may have dealt with a similar problem. For this reason, an extensive literature survey was undertaken.

The extensive literature review, conducted to obtain insights into park resource management planning, consisted of the following:

1. *Survey of Conventional Sources* -- University and government library holdings were examined.

2. *Personal Interviews* -- interviews were held with park resource management specialists in Canada and the United States in order to obtain unpublished information.

3. *Mail Survey* -- a standard letter was prepared (Appendix 1c), and with the aid of the "1979 Conservation Directory", park agencies within Canada and the United States were contacted for information. The mail survey was initiated in early May 1979 and had a closing date for replies in late August 1979.

1.6 FORMAT OF THE PRACTICUM

Chapter Two puts resource management in parks into perspective by examining its role in total park management; and deals with approaches used in resource data collection and analysis.

Chapter Three presents the results of the park agency survey, states general conclusions and highlights procedures used by four park agencies.

Chapter Four represents the framework or guide to be used in the preparation of Resource Management Plans, and outlines some jurisdictional constraints on its application.

CHAPTER 2

TOWARDS A RESOURCE MANAGEMENT PLAN FRAMEWORK

2.0 INTRODUCTION

In Chapter 2 resource management is brought into perspective through a brief discussion of its role in total park management. Then, moving from the definition, two resource management components are examined in detail. The two components include the resource inventory and evaluation,and resource management programming.

Jubenville (1978:24) designed a total park management system model demonstrating that a comprehensive approach had to be taken to park management due to the interdependence between three basic management 'subsystems'. Figure 2.1 identifies the elements of 1) Resource Management, 2) Service Management and 3) Visitor Management. In Figure 2.1 Jubenville attempted to illustrate that "...there is an interdependence within the system; a decision made in one place can have a drastic effect on the other phases. Thus, the manager must consider all the ramifications of a particular decision; or one can, with an understanding of these interactions, manipulate one phase to produce a desired outcome in another". (Jubenville, 1978:24). Figure 2.1 also illustrates that the three management subsystems all focus on a common goal, the production of defined recreation experiences for the park visitor.

Jubenville's model has merit in demonstrating that park resource management should not operate in a vacuum, as an end in itself; but rather, that resource management must be cognizant of other management endeavours and *vice versa*. The model, however, has two major shortcomings

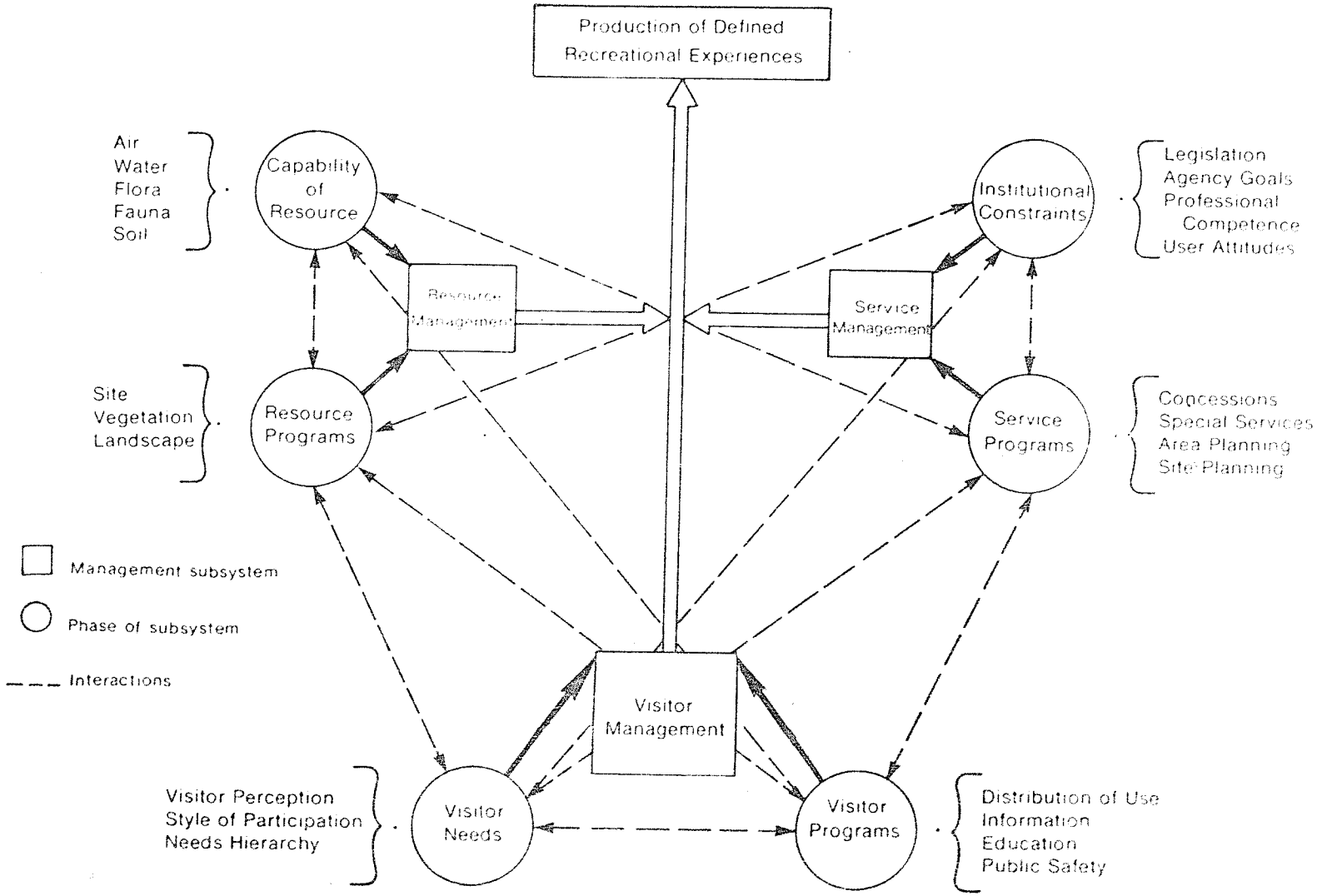


Figure 2.1. The Outdoor Recreation Management Systems Model, showing integration of subsystems and interactions of the phases of each subsystem. An asterisk (*) indicates points where external environment may affect internal parts of the system.

Source: Jubenville (1978)

which would become very apparent if it was to be applied in the management of Manitoba's Provincial Parks:

1. Because resource management must also be directed toward resource protection, the production of defined recreation experiences is not a primary goal. In fact, the provision of recreation experience may in certain cases be in conflict with resource protection. Therefore, the model's failure to deal with this internal conflict makes it too simplistic to apply directly when park objectives comprise more than a single oriented activity (i.e. recreation).

2. The resource management 'phases' do not contain a realistic complement of elements. Resource management is far more complex than the model tends to indicate.

In Manitoba, Provincial Natural Parks were defined as areas which possessed exceptional value or quality in illustrating the natural heritage of the Province. Therefore, total park management should not be directed completely towards the provision of outdoor recreation experiences, but must also ensure that the resource base of the parks are protected so that present and future generations of Manitobans may appreciate the Province's natural heritage. In effect, resource management programs based on a comprehensive resource inventory and evaluation must attempt to maintain the existing resource base of Provincial Parks within acceptable limits of alteration; these limits being defined in park legislation, regulations and policies.

2.1 RESOURCE MANAGEMENT COMPONENTS

Resource management in parks may be subdivided into essentially two components, these are the *Resource Inventory and Evaluation* and *Resource Management Programming*. Figure 2.2 identifies the basic elements

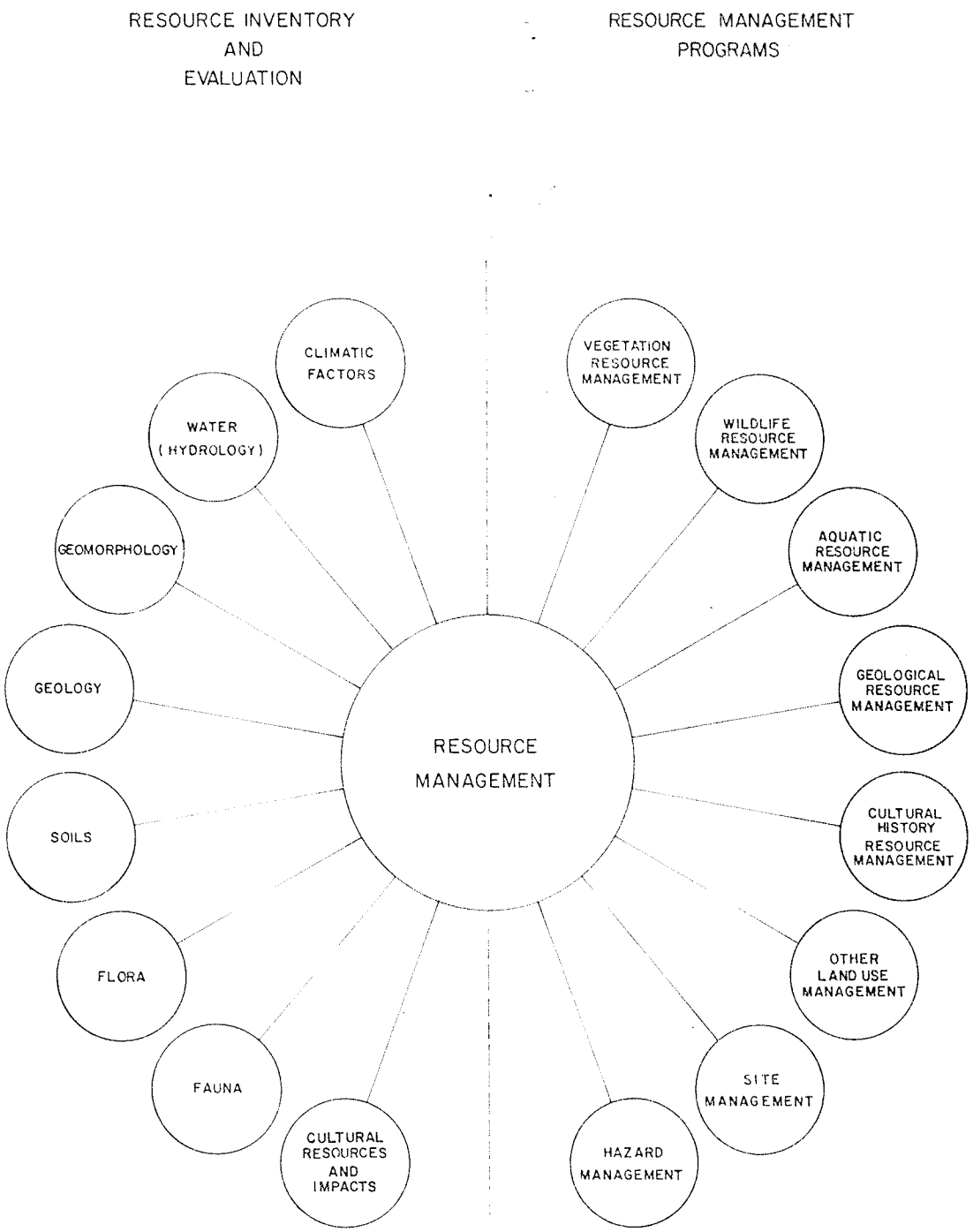


Figure 2.2. *The resource management components and their associated elements*

found in each component.

The *resource inventory and evaluation* involves the collection of both quantitative and qualitative data on climate, hydrology, geomorphology, geology, soils, flora, fauna and cultural history resources and impacts. This inventory data collectively represents the baseline information upon which planning and management strategies are developed. In addition, the baseline data is essential to resource base monitoring by providing a comparative reference point for changes (Jubenville, 1978; Dolan *et al.*, 1978; Linn, 1976). According to Jubenville (1978:21), inventories and monitoring are "...one important aspect of management that is often forgotten or considered unnecessary, until management plans are to be developed". Without these initial data, however, the park manager has no basis for comparison to determine change. Change can be defined here as the product of either ecological dynamism or the result of human impact.

Resource Management Programming,[1] the other side of park resource management, includes the following broad category programs: vegetation resource management, wildlife resource management, aquatic resource management, geological resource management (includes soils), cultural history resource management, other land use management, site management and hazard management.

The remainder of this chapter will focus on the dual aspect of resource management in greater detail.

---

[1]Resource Management Planning is defined here as the framework within which resource management action is undertaken to achieve a desired program goal. Programming establishes a comprehensive and systematic basis for the preparation of specific project plans which satisfy program goals. Program goals are a product of park legislation, regulations and policy.

2.2 RESOURCE INVENTORY AND EVALUATION

The resource inventory and evaluation plays a prominent role in the total park management system. The collection and evaluation of resource base data are crucial for two reasons:

1. The preservation and conservation of the park's resources requires a comprehensive inventory and description of these resources. Sound resource base information, in a readily retrievable and manipulatible form, provides the resource manager/planner with a reference point from which change can be monitored. Change, can be defined as the outcome of either natural ecological process or human impact.

2. The resource inventory facilitates an assessment of the limitations and opportunities for park development. The provision of intensive and extensive park development opportunities must be consistent with the capabilities of the park resource base to sustain them. To ignore differences in the resource capability for development can jeopardize the success of the proposed development; and more importantly, it can be contrary to preservationary and conservationary goals of the park.

The purpose of this section is to identify the major components of the resource inventory and evaluation.

2.2.1 Resource Inventory and Evaluation Elements

Figure 2.2 illustrated eight basic elements of resource base data which have to be collected and analyzed to meet the requirements of a variety of resource management program applications. A more detailed description of the general inventory content of each resource base element is provided below:

Climate: Regional macro-climatic patterns of temperature, precipitation, and wind regime, known meteorological anomolies, and major topographical effects.

Water: Physical drainage characteristics, hazard conditions, water quality, land-water interface descriptions (i.e. land-water ecotones), flow regime and timing of major events.

Geomorphology: Landforms by genetic class, type and description of materials, drainage characteristics and dynamic state descriptions.

Geology: Geologic formations, structure, petrology/lethology, presence of fossil bearing strata, locations of known hazard areas.

Soils: Soil orders and major soil characteristics (e.g. texture, structure, calcareousness, salinity, etc.).

Flora: Description of major terrestrial and aquatic plant communities and their distribution.

Fauna: Occurrence and distribution of major terrestrial and aquatic species, their general habitat types, and broad description of behavioral characteristics.

Cultural History Resources and Impacts:

a) Location and description of major historical and archeological features and artifacts; and documentation of principal events.

b) Description and location of past and present land uses including land settlement and ownership, resource extraction, development of transportation systems, etc.

2.2.1.1 Preliminary Resource Reconnaissance

Regardless of the methodology that is chosen for the collection of resource base information, it is crucial that all existing information be consolidated and evaluated in an attempt to avoid unnecessary duplication. The *Preliminary Resource Reconnaissance* also helps to identify information gaps in the resource base of the park.

The Preliminary Resource Reconnaissance consists of three stages, which include:

1. Literature Review and Synthesis

The Literature Review and Synthesis involves the preparation of a selective bibliography on the resource base elements identified in Figure 2.2; and represents a balance sheet of present knowledge that will permit a systematic and comprehensive approach to the future inventory. This step is the single most important aspect of the resource reconnaissance. The primary objectives are:

1. to thoroughly review the literature to identify the existence of material relevant to a description of the natural and cultural history resources and impacts; and
2. to identify gaps in the resource information base.

The bibliography should not be limited to published studies, unpublished reports should also be listed. Once the bibliography is completed, new studies should be listed to keep the Literature Review and Synthesis up-to-date.

2. Maps and Aerial Photographs

The second stage in the preparation of the Preliminary Resource Reconnaissance involves the collection of base maps and photo-

graphic coverage of the park.

Clear, accurate and reproducible base maps are very important because they will serve as the basis for all future studies and data base reference. It is crucial, therefore, that the base maps be carefully prepared.

Available aerial photography and satellite imagery should be used whenever possible. In the case that adequate aerial photography is not available at the required scales, procedures should be initiated to ensure it is obtained.

3. Field Verification

Field work may be required for the confirmation of data obtained in the previous two stages. This stage in the resource reconnaissance is not primary field work, it is a general review of the accuracy of collected information.

2.2.2 Resource Inventory and Evaluation Procedures

Over the years a variety of resource analysis techniques and methods have been developed, all with their specific advantages and disadvantages. Generally speaking, however, two fundamental approaches have emerged, the thematic and integrated approaches (Belknap and Furtado, 1967).

2.2.2.1 The Thematic Approach

The thematic method is conducted by producing forest inventories, pedological, geomorphological surveys or other similar specific data. The process relies on a horizontal cleavage of the inventoried land. Viewing the land in this manner results in a series of layers which are initially considered in isolation from one another, then subsequently

inventoried, mapped and described. The pratical outcome is a series of geomorphological, pedological, forest and other similar maps, one being totally independent of the others. The thematic approach is used to examine particular resources independently and therefore does not address the state of interdependency that exists between resource components. Attempts can be made to interrelate the resource components through the use of common base map overlays. However, it is crucial to bear in mind that 'the whole' is not always 'equal to the sum of its parts', when land ecosystems are viewed in this manner (Day, 1979).

The benefits and costs associated with the thematic approach are summarized in Table 2.1. In qualitative terms, the costs clearly outweighed the benefits.

While the thematic approach provides a wealth of information, the difficulties associated with its interpretation demonstrates some serious shortcomings. Two common shortcomings are:

1. the lack of a common denominator, i.e. a specific and permanent spatial unit used as a basis of reference for describing land, assessing resources and locating change; and
2. the difficulty of paying sufficient attention to dynamic forces and inter-relationships between land ecosystem resources at large scales of mapping.

Because thematic resource data is not collected within a fixed spatial and temporal unit (e.g. an ecosystem) that readily facilitates categorization and storage of information by digital computers, the best procedure involves the preparation of a resource atlas. Linn (1976)

Table 2.1 *Benefits and costs of the thematic inventory approach as taken from East et al. (1979:212).*

BENEFITS	COSTS
Offers the advantage of providing detailed information on individual resources which could be directly related to user requirements. Levels of comprehension vary from project to project and user understanding, by virtue of the methodological tradition is enhanced.	Relatively expensive, time consuming and logistically awkward. Projects are organized and administered separately, logistical support costs are duplicated; and usually projects were conducted sequentially rather than concurrently. Fails to integrate, co-reference and synthesize collected data. Multiple studies on different resource components generates immense volumes of material which is separately presented and most often geo-referenced in incompatible fashions. A great deal of additional effort is required to ensure that some notion of resource interrelationship exists.

suggested that thematic maps could be used to accurately illustrate or delineate a variety of resource characteristics. These included: geologic formations, vegetation types, elevations, local climatic differences, location of major wildlife habitats, herd migration routes, colonial bird rookeries, and other wildlife information; and the location of historic and prehistoric sites, structures and artifacts and all unique or special natural, historic, prehistoric or cultural features.

In order to further aid wise development planning and good management and interpretation of resources, each of the resource atlas maps should be supplemented with text material, including tables, graphs and references, to clarify or give more specific information.

(a) The Canada Land Inventory

The Canada Land Inventory (CLI) is a thematic survey in that it provides land capability assessments for agriculture, forestry, wildlife, present land use, pilot land use and finally recreation. Undertaken as a co-operative federal-provincial program administered under The Agricultural Rehabilitation and Development Act (ARDA) of June 1961, the CLI program is currently under the jurisdiction of Lands Directorate, Canada Department of Environment.

In the terms of reference for the CLI program, it was recognized that the inventory and classification of the biological and physical features of the land resource was to be conducted without reference to any particular land use (Rees, 1977; Wiken, 1978). In 1963, a federal-provincial committee, the National Committee on Forest Land (NCFL), was

established to advise the Federal Government on forest land classification and capability (CCELC, 1979). One year later, to further support the work of the NCFL, a Subcommittee on Biophysical Land Classification was established to explore the alternatives (Wiken, 1978). The responsibilities of the Subcommittee included:

1. the examination and revision of existing systems at both the federal and provincial level; and
2. to make recommendations to the NCFL regarding a hierarchical classification structure that would meet a variety of user requirements (Day, 1979).

The Subcommittee published their guidelines for biophysical land classification in 1969 (see Lacate, 1969). Accordingly, the CLI program adopted these guidelines in order to differentiate and classify ecologically significant segments of the land surface (Rees, 1977). The significance of the adoption of the biophysical land classification framework in the preparation of capability classifications rested in the 'value free' characteristic; the capability classifications were less subject to the vagaries of changing social and economic values.

Lands assessed for the CLI were evaluated, classified and mapped separately for each of the four resource sectors, which included agriculture, forestry, wildlife and recreation. The survey data were compiled from soil surveys, maps and other published sources, aerial photographs, and from field studies. Seven classes of land ranging from very high (Class 1) to virtually zero capability (Class 7) were used in each of the four sectors.

In the recreation sector, classes[1] were established on the basis of the intensity (quantity) of outdoor recreational use which might be sustained per unit area; that is, on the basis of resource base capability. Sub-classes were used to indicate the specific features of the resource providing opportunity for recreational use. In an attempt to demonstrate in greater detail how the land capability classification for recreation operates, a brief summary is provided in Appendix 2.

The analysis of inventory data was completed in 1970 and covered the settled parts of Canada (Rees, 1977). In Manitoba, the 55th parallel marks the northerly extent of the CLI. Figure 2.3 illustrates the coverage of the CLI program for the four sectors.

Mapping was carried out at two scales. Maps at a scale of 1:50,000 are utilized as the basic documents for planning, are available only in the provinces. The 1:250,000 scale maps. of limited use to area or site-specific park planning purposes, were published by the Department of Regional Economic Expansion.

Maps at a scale of 1:50,000 are currently available in a map sheet or micro-film format from the Remote Sensing Centre, Manitoba Department of Natural Resources.

In the early stages of the CLI program it was recognized that the development of a versatile, computerized data storage, processing, and

---

[1] The basis of the classification is the quantity of recreational use that a land unit can attract and withstand without undue deterioration of the resource base. Thus, a land unit with a high capability feature such as a bathing beach could accommodate a large number of users with little damage to the beach area, whereas an alpine meadow would rank much lower because heavy use by visitors would very quickly damage the fragile ground cover.

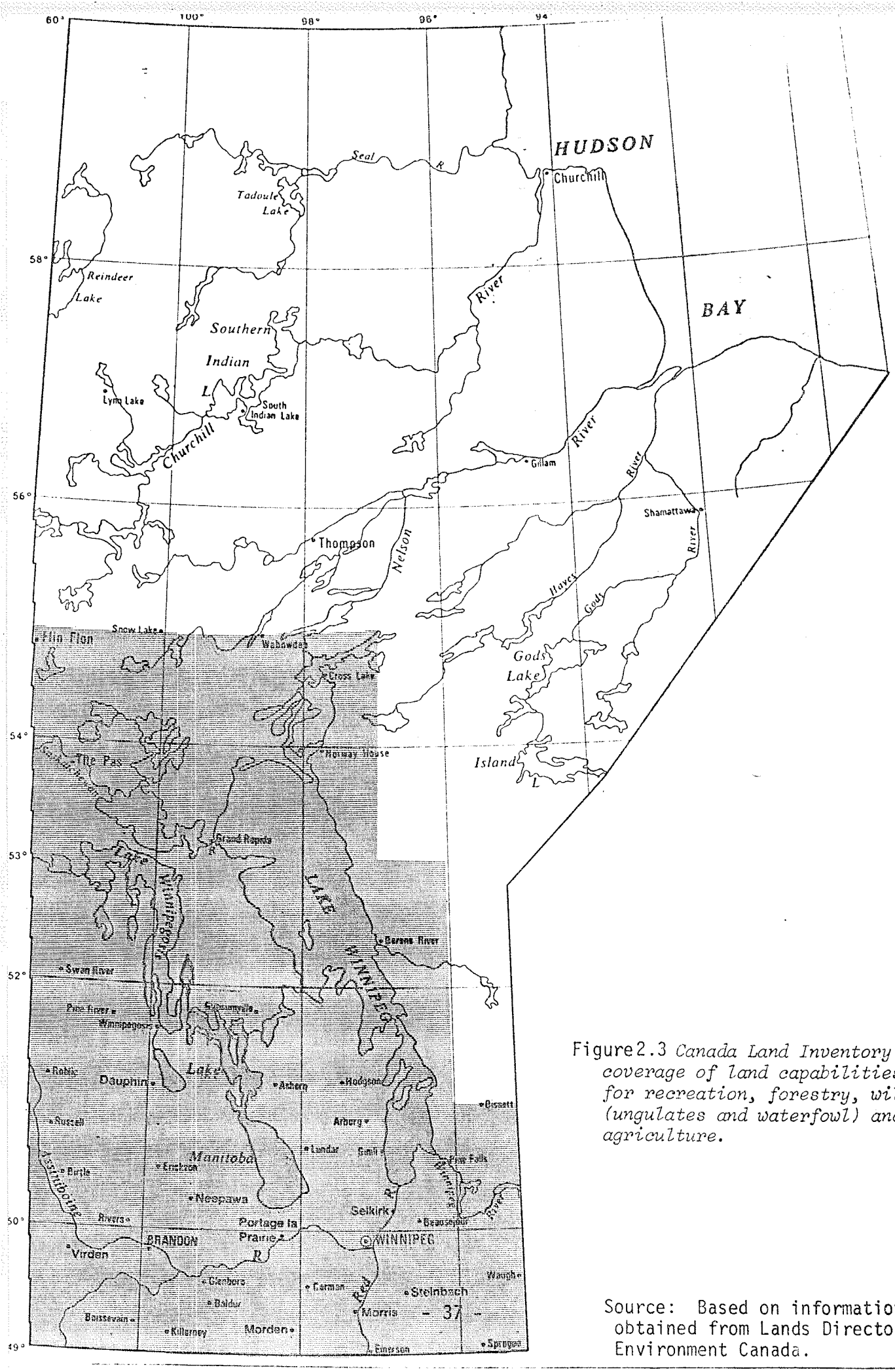


Figure 2.3 *Canada Land Inventory coverage of land capabilities for recreation, forestry, wildlife (ungulates and waterfowl) and agriculture.*

Source: Based on information obtained from Lands Directorate, Environment Canada.

retrieval system was crucial to the inventory program. Unfortunately, the technological capabilities in the early 1960's were still embryonic, and only after nearly ten years of forced evolution did the Canadian Geographic Information System (CGIS) finally become operational in 1972 (Rees, 1977). The system was designed:

1. to present the data in a form required for land use planning at the local, regional, provincial and national level;
2. to design a system which would collect and store data from maps and statistical tables in a form that could be quickly analyzed;
3. to permit concise and compact data storage;
4. to allow comparisons within and between sectors (coverages);
5. to permit output in a map or statistical form; and
6. to permit comparison of data for given regions and correlation of selected socio-economic or other related data (Environment Canada, 1978).

The system was designed as a general processing tool with capabilities to process any data with characteristics similar to those of the CLI: Map data composed of bounded areas (polygons) and an identifier or description for each polygon (Switzer, 1977). In addition, the system has the potential to store data for points or for lines and to interface that with the data for areas.

CGIS can accept data at scales of 1:370 to 1:1,000,000. Maps have been processed at scales of 1:1,200, 1:10,000, 1:25,000, 1:50,000, 1:100,000, 1:125,000, 1:250,000 and 1:1,000,000. The bulk of the current data base is at a scale of 1:250,000 and 1:50,000 representing

various characteristics for large portions of Canada (Switzer, 1977).

(b) The Alberta Energy and Natural Resources Approach

Ojamaa (1978) described a procedure for Ecological Land Classification and capability evaluation for the Little Smoky Study Area, located 216 miles (348 km) northwest of Edmonton. The area was approximately 1,050 square miles (2,720 sq. km.) in size.

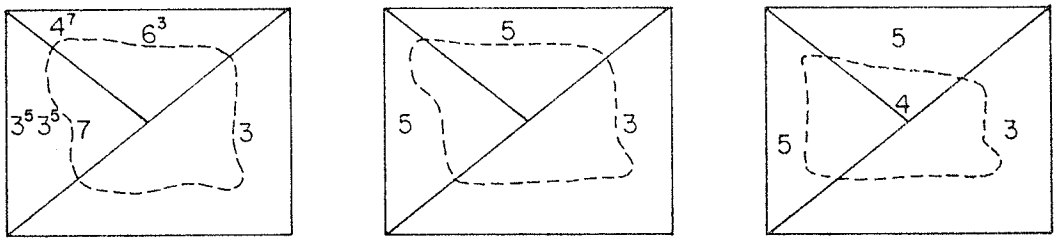
Lands in the Little Smoky River Basin had been reserved for forest utilization and management. However, with the expansion of agricultural lands in the southern Peace River area, there was increased pressure to turn the Little Smoky River Basin over to agriculture. In an attempt to resolve the conflict of land resource allocation, a procedure was developed to facilitate an informed decision-making process. The methodology used to obtain a better definition of land suitability for agriculture, forestry and other uses was based on biophysical analysis. To do this, the work of Lacate (1969), Hills (1961) and the Canada Land Inventory (CLI) were used.

The classification of the landscape was based on a three tiered hierarchical classification system (Lacate, 1969) which included: Land Region, Land District and Land System. The Land Systems, mapped at a scale of one inch to two miles (1:125,000), formed the basic units of specific description and capability ratings.

The Canada Land Inventory (CLI) maps of the land capability for agriculture, forestry, ungulates, outdoor recreation and waterfowl were the basic documents used in the estimation of capability. In the simplist case, a CLI map was overlain onto the Land District Map of

the study area and the capability ratings were subsequently extracted for a particular Land System. In cases where the biophysical land system included areas of several CLI capability ratings, however, an averaging technique had to be used. Hills' (1961) method of reducing multiple ratings for a single figure was employed here. Figure 2.4 illustrates the procedure in which a set of multiple ratings are reduced to a single rating.

The resultant single rating (Step 3) was termed the 'use potential rate'. These use potential rates were given with the Land System description and the Land District Map.



Example of multiple CLI ratings.

Multiple rating reduced to single rank by Hills' (1961) method.

Three single CLI ranks in Land System reduced to one 'Use Potential Rate' of 4.

Figure 2.4 *Steps in reducing CLI multiple ratings.*
Source: Ojamaa (1978)

The significance of this approach rests in its potential to aid the assessment of the capability of the resource base to support various forms of outdoor recreational use. CLI maps at a scale of 1:50,000 could be used in conjunction with delimited land ecosystem management units for

the determination of recreational use opportunities and limitations.

2.2.2.2 The Integrated Approach

The integrated approach to environmental inventory is based on the recognition of landscape characteristics within an ecological framework. Figure 2.5, a generalized integrated resource inventory and evaluation process, contains a component not found in the thematic approach -- the 'Land Classification'.

Mabbutt (1967) defined land classification as the process where the complex of surface and near-surface attributes of the solid portions of the earth's surface are identified and organized into some system of mappable units according to some set of criteria or principles for relatedness.

'Land Classification' creates a framework of generalization about the complexity of 'land' properties which enables common characters to be defined and described, and units with similar properties to be regarded as equals although geographically separate.

The Preliminary Resource Reconnaissance as described in Section 2.2.1.1 is the mechanism for synthesizing existing information. The arrow between the preliminary resource reconnaissance and resource inventory in Figure 2.5 indicates that the former provides: 1) identification of specific information deficiencies, and 2) a structure for ranking data requirements in the 'resource inventory' process.

The resource inventory is defined here as the process of acquiring information not contained in the preliminary resource reconnaissance. The resource inventory is the process by which new data

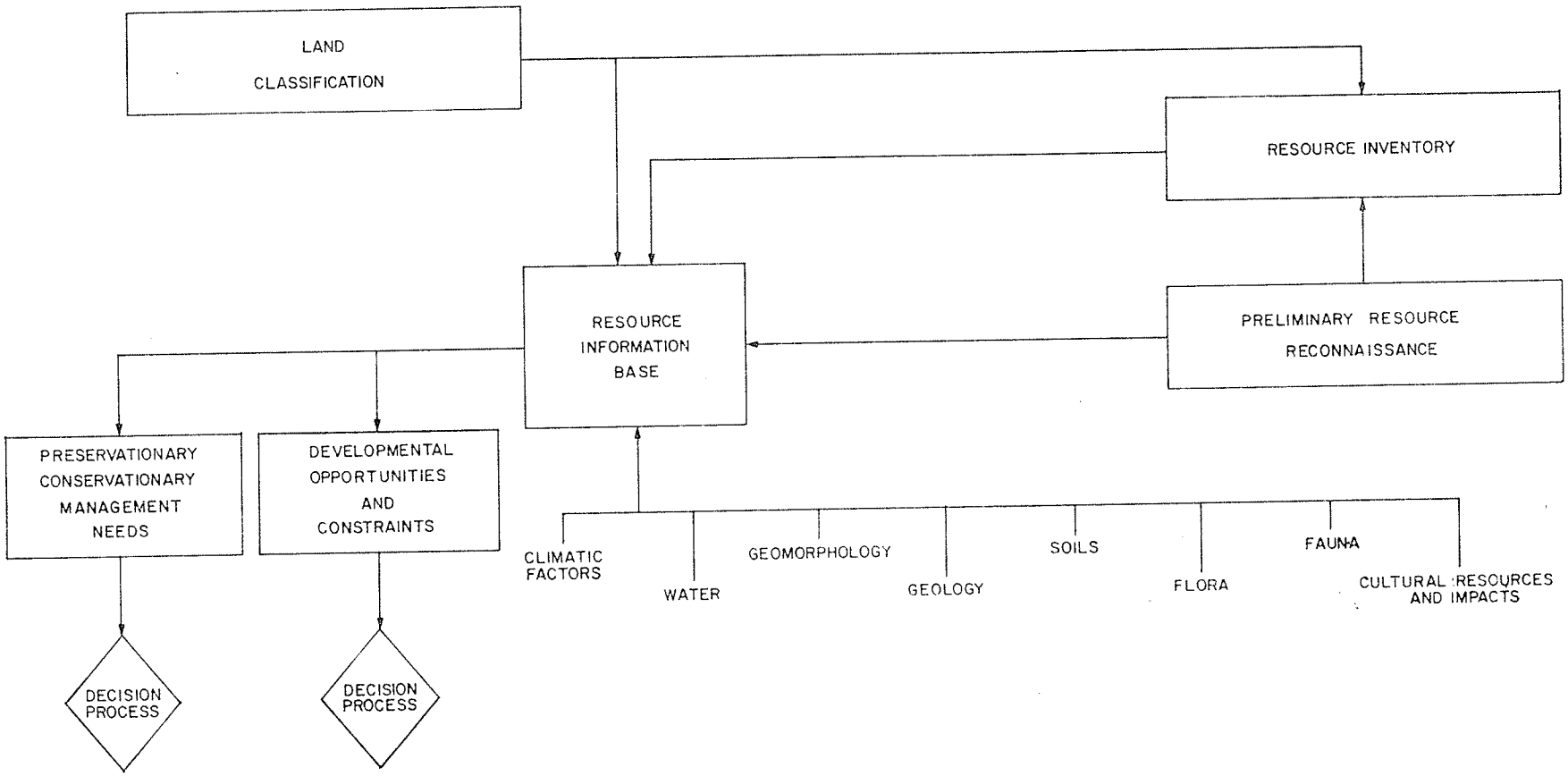


Figure 2.5 *Integrated resource inventory and evaluation process*

is collected from the field, or extracted from sources such as remote sensing products.

The resource information base component illustrated in Figure 2.5 represents the point at which resource information is collected, synthesized and described. Based on the description of the natural and cultural history resources, an evaluation is made regarding park development and natural resource protection requirements. The integrated resource inventory and evaluation process ends at the decision making stage, i.e. it provides resource base information upon which informed management decisions may be made by administrators.

(a) Land Classification

Land classification is central to the development of integrated resource inventories because land units provide the spatial and temporal framework for the collection and evaluation of resource base data; the land unit serves to link together the resource inventory elements found in Figure 2.2.

The terminology in land classification today tends to be confused with a multitude of synonyms and inconsistent usages in current literature and throughout current classification efforts within government and the scientific community in Canada (Wiken, 1978) and the United States (Hall, 1976). This factor makes a description of methodology difficult.

The Canadian approach to land classification shows a great deal of merit as a base for integrated resource inventories. The land classification approach to resource evaluation in Canada is now beyond the experimental stage, and in spite of some variations in methods, its application

in several operational resource-related projects, has provided encouraging results (Canada Committee on Ecological Land Classification, 1979).

The approach also has some practical advantages: it allows the most effective use of remote sensing technology, eliminates or reduces costly duplication of resource data acquisition efforts, and has a 'built-in' provision to integrate subsequent, more intensive investigations into previously completed reconnaissance surveys (Gimbarzevsky,1978).

(b) Ecological Land Classification[1] in Canada

Ranging from complex and broad area designations like 'tundra', 'prairie grassland' and 'boreal forest' through to less complex and smaller area designations like 'bottomland', 'tidal marsh' and 'river terrace', these terms represent a series of generalizations. The generalizations derived primarily on the basis of the continuity of external land characteristics, are discerned by associated vegetation, topography, soils and climate. When they are compartmentalized and ranked with greater scientific precision, the parts or categories of a hierarchy become apparent. Ecological Land Classification as practiced in Canada consists of such a vertical and horizontal hierarchy, and provides a framework to comparatively index land ecosystems relative to each other. The subsequent analysis of these land ecosystems provides the basic resource information required for land resource planning and management.

---

[1] The adjective 'ecological' placed before 'land classification' is used to convey the concept of ecosystem. Therefore, the word 'ecological' qualifies the term as a real system, either natural or man-made.

Theories of natural land units were first introduced in the late 19th Century in a number of Russian works. In 1898, V.V. Dokuchaev, in his philosophical view of natural historic zones, expounded upon the unity and shared characteristics displayed by independent and territorially bound parcels of land (Ivachenko, 1977). The major concepts involving a hierarchical classification structure and integrated resource analysis emerged during this century. Russian, English and German researchers periodically contributed to establishing the basis for 'land classification'; a result of their views of landscape as holistic natural systems (Wiken and Ironside, 1977).

During the mid 1940's to late 1950's studies in Australia by the Commonwealth Scientific Industrial Research Organization (CSIRO) on foreign approaches revealed numerous commonalities. It was concluded that the same principles and means of defining units of similar size and complexity were being used even though the respective terminology in cases differed because of their basic aims (Wiken, 1978a). In 1946, 'land system', defined as 'a region throughout which a recurring pattern of topography, soils and vegetation can be reorganized', became the basic unit and level of land classification for CSIRO's Land Resource Survey Program (Day, 1978). Christian and Stewart (1957) of CSIRO are credited for the development of the land system framework.

In comparison to many countries, Canada's involvement in land classification has been recent. To provide land information for agriculture and forestry, several classification schemes were developed in Canada. These were based on three general concepts: pedological, developed for soil surveys; phytosociological, developed for the determination of

forest site classes; and physiographical, developed for the determination of forest sites and for multiple purpose land classification (Gimbarzevsky, 1978). All three concepts have contributed to the development of the Ecological Land Classification presently used in Canada. However, the physiographic approach is likely the most prominent of the three.

G. Angus Hills, a researcher employed by the Ontario Department of Natural Resources, was undoubtedly the pioneer of integrated resource mapping in Canada. In 1961, Hills published, "Ecological Basis for Land Use Planning", within which he devised a system for dividing land into geographical units having common physiographic features which could be related with associated biological factors. Through the 'Hills System', as it came to be known, it was possible to conduct land use assessments as well as land capability studies at predetermined levels of resource integration (Day, 1979).

By 1964, the National Committee on Forest Land (NCFL) was established to advise the Federal Government on forest land classification and capability (CCELC, 1979). To further support the work of the NCFL, a 'Subcommittee on Biophysical Land Classification' was established: to examine and revise existing systems at both the federal and provincial levels; and to make recommendations to the NCFL regarding a hierarchical classification structure to meet a variety of user requirements (Day, 1979).

The interdisciplinary subcommittee was chaired by Dr. D.S. Lacate, and consisted largely of federal and provincial representatives. Benefiting from the work of Hills and international benchmarks, the subcommittee published guidelines for biophysical land classification. Lacate (1969) credited for compiling the document, prepared a framework for classifying

terrestrial and aquatic ecosystems in terms of recognizable and reoccurring relationships between climate, geology, landforms, surficial deposits, soils, vegetation and hydrology. The guidelines, proposed a hierarchy of generalizations which relied heavily on air photo interpretation and supportive ground truthing (see Table 2.2), became the Canadian benchmark for subsequent land classification development.

In 1976, a small *ad hoc* committee representing Lands Directorate (DOE), Soil Research Institute (CDA), Terrain Sciences (EMR) and Water, Lands, Forests and Environment Branch (DINA) in co-operation with the provinces organized a meeting in Petawawa, Ontario. At this meeting, the Canadian Committee on Ecological (Biophysical) Land Classification (CCELC) was founded. The CCELC was organized "...to encourage the continued development of and to promote the application of a uniform ecological (biophysical) approach to land classification for resource planning, management and environmental impact assessment purposes". (CCELC, 1976:ix). This objective is currently being satisfied through four sub-objectives. These are:

1. the exchange of technical information and organization of the problem oriented working groups and workshops;
2. the encouragement and wide distribution of information methodology and applications of ecological land surveys;
3. the initiation of dialogue with the general public, users and potential users on the presentation and application of ecological information; and
4. the recommendation and advice on the application, feasibility, methodology, benefits and costs of ecological type surveys (CCELC, 1979).

Table 2.2 *Levels of generalization in land classification developed by the Subcommittee of Biophysical Land Classification, 1969.*

CLASSIFICATION AND MAPPING SCALE (Levels of Generalization)	DEFINITIONS
LAND REGION 1:1,000,000 to 1:3,000,000	An area of land characterized by a distinctive regional climate, as expressed by vegetation.
LAND DISTRICT 1:500,000 to 1:1,000,000	An area of land characterized by a distinctive pattern of relief, geology, geomorphology.
LAND SYSTEM 1:125,000 to 1:250,000	An area of land through which there is a recurring pattern of landforms, soil and vegetation.
LAND TYPE 1:10,000 to 1:20,000	An area of land on a particular parent material having a fairly homogeneous combination of soil and chrono-sequence of vegetation.

Source: Lacate (1969)

The CCELC uses the term 'Ecological Land Classification' as a banner to designate biophysical or related approaches to ecological land surveys (Wiken and Ironside, 1977).

Even though users of Ecological Land Classification (ELC) have not yet achieved concensus on a totally uniform methodology, they have generally agreed on the basic structure -- a hierarchy of ecological generalizations (Wiken, 1978:21). However, there is no single description of either the parts of that hierarchy or of the network which bonds these together.

Because the hierarchical structure of ELC accommodated a variety of survey mapping scales, not all levels of the hierarchy are used by a single agency or institution. Instead, the level(s) of generalization chosen appear to reflect a specific user requirement (see CCELC, 1979). For example, when overviews were required in the Yukon Territory (Oswald and Senyk, 1977) only broad levels of generalization was required. The James Bay hydro-electric project, on the other hand, associated with large scale environmental impact and specific engineering data requirements, relied on a variety of levels (Gantcheff *et al.*, 1979).

In an attempt to stabilize the terminology and definitions currently in use, the CCELC (1979a) proposed the following levels of generalization: Ecoprovince, Ecoregion, Ecodistrict, Ecosection, Ecosite and Ecoelement (Table 2.3). The Ecoprovince is the most general category while, Ecoelement, is the most detailed.

Because land ecosystems are natural entities the hierarchical network cannot consist of mutually exclusive categories as might otherwise be implied. The hierarchical network is coalescent, grading land ecosystems

Table 2.3 *Levels of ecological generalization proposed by the Canada Committee on Ecological Land Classification.*

Definitions for the levels of generalization.

ECOPROVINCE - an area of the earth's surface characterized major structural or surface forms, faunal realms, vegetation, hydrological soil and climatic zones.

ECOREGION - a part of an ecoprovince characterized by distinctive ecological responses to climate as expressed by vegetation, soils, water, fauna, etc.

ECODISTRICT - a part of an ecoregion characterized by a distinctive pattern of relief, geology, geomorphology, vegetation, soils, water, and fauna.

ECOSECTION - a part of an ecodistrict throughout which there is a recurring pattern of terrain, soils, vegetation, waterbodies, and fauna.

ECOSITE - a part of an ecosection having a relatively uniform parent material, soil and hydrology, and a chronosequence of vegetation.

ECOELEMENT - a part of an ecosite displaying uniform soil, topographical, vegetative and hydrological characteristics

LEVEL OF GENERALIZATION Common map scale*	COMMON BENCHMARKS FOR RECOGNITION					
	Geomorphology	Soils	Vegetation	Climate	Water	Fauna
ECOREGION 1:3,000,000 to 1:1,000,000	Regional landforms or assemblages of regional landforms	Great groups or associations thereof	Plant regions or assemblages of plant regions	Meso or small scale macro	Water regime	High species diversity; may correspond either to a widely distributed species (eg. deer mouse), or to the habitat of individuals within a species.
ECODISTRICT 1:500,000 to 1:125,000	Regional landform or assemblages thereof	Subgroups or associations thereof	Plant districts or assemblages of plant districts	Meso or large scale micro	Drainage pattern; water quality	
ECOSECTION 1:250,000 to 1:50,000	Assemblages of local landforms or a local landform	Family or associations thereof	Plant Associations or a plant association	Large scale micro to small scale micro	River reaches, lakes and shoreland	Less diverse species complement habitat requirements of typical species more restricted (eg. beaver, otters); may coincide with specialized
ECOSITE** 1:50,000 to 1:10,000	A local landform or portion thereof	Soil series or an association of series	Plant association or seral stage	Small scale micro	Subdivision of above	areas of animal total habitat (eg. wintering area, calving grounds).
ECOELEMENT 1:10,000 to 1:2,500	Portion of or a local landform	Phases of soil series or a soil series	Parts of a plant assoc. or sub-association	Small scale micro	Sections of small streams	Low species diversity habitat of smaller mammals, reptiles and amphibians etc., specialized areas of some fauna's habitat requirements (eg. denning areas, local wintering deer yards).

* Map scales should not be taken too restrictively, as they will vary with the environment setting and objectives of the survey

** This level is frequently subdivided into phases according to the stage of plant succession.

Source: Wiken and Welch (1979).

according to a vertical and horizontal continuum (Wiken, 1978). The differentiation of land ecosystems is determined by the kinds and degrees of 'unity' that can be discerned in respect to the biological and physical land characteristics. The horizontal differentiation allows the separation of units of similar rank; that is, units which exhibit forms of ecological relatedness not manifested by units belonging to other horizontal scales. For example, Ecotype, could be expressed by a particular soil series, plant community, micro-climate and landform characteristics possessed by each unit. An Ecosection represents more general characteristics such as soil association, a plant association, local climate and a landform type. Vertical differentiation, on the other hand, allows units of different horizontal scales to coalesce.

As one descends through the hierarchy, certain trends are identifiable. On an average, the map units become smaller, the variability in characteristics decreases and the descriptive data becomes increasingly specific. Table 2.4 provides further amplification of the hierarchy relating definitions, common map scales and recognition criteria.

In characterizing a land ecosystem, Wiken and Welch (1979) stated: "...one attempts to TRAP the essence of each by describing the:

T -- things or components present
R -- relationships of components
A -- abundance of components
P -- pattern of components".

Things: Components or 'things' are examined as indicators of the land ecosystems. Because it would be impractical from the point of cost, to totally specify and quantify every biological and physical land characteristic, the components are used to provide a framework. This

permits the infilling of non-measured data by extraplation or deduction. The components examined consist of:

1. terrain (soils, landforms, geology)
2. vegetation
3. hydrology
4. climate
5. fauna

The first three are most commonly used in Ecological Land Surveys. The fourth component -- climate -- is typically interpreted from trends in soil, vegetation and landform development. However, where weather stations are present the data is incorporated. The faunal component is least employed currently.

Each of the five components are described as they occur spatially within the pedosphere (upper few meters of the earth's surface) and the lower biosphere. Together the components illustrate the dimensions of the land ecosystem.

Relationships: An inclusive term which is meant to cover notions which go along with such prefixes as inter-, intra-, trans-, or otherwise. Relationships largely refer to process and function. Hydrological regime, plant succession, podzolization and climatic regime are examples which indicate factors related to process. Functional relationships may be related by such things as the role of an organic layer as an insolating agent against solar energy penetration or how a water table becomes perched on an illuvial clay horizon.

Abundance: The relative quantities or percentages of components associated with each land ecosystem are identified. Abundance may be expressed as a relative percentage of sand, silt, and clay in soils, or

alternatively, it may cover other characteristics such as plant biomass production, estimates of water flow, growing degree days, hydrogen ion concentration, available plant nutrients and species abundance.

Pattern: The arrangement of component parts in either the vertical or horizontal planes directs pattern. For vegetation, pattern could cover the distribution of species in a spatial sense, or their structure (overstory, shrub layer, groundstory layer). Topography sequences and spatial arrangements of climates or soils, depths to water tables, are additional examples.

Figure 2.6 illustrates the vertical linkage of land ecosystems. As scale becomes smaller, land ecosystems become more general because the number of shared characteristics, and consequently, the overall unit of the system decreases. In addition, Figure 2.6 suggests that the flow through a vertical scale may involve two or more horizontal scale units.

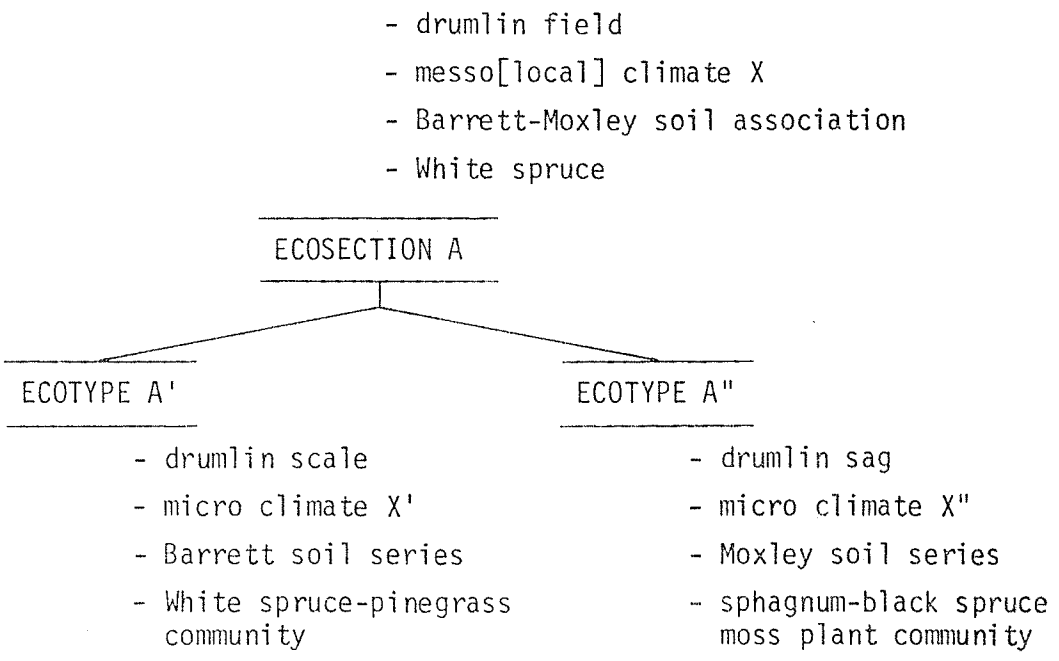


Figure 2.6 *An example of vertical linkage of land ecosystems.* Source: Wiken (1978).

A generalized diagram of the hierarchical network of the ELC is presented in Figure 2.7. Ascending from the primary units, the Ecotype, the land ecosystems associated with each succeeding level (i.e. Ecosection, Ecodistrict) become increasingly complex, inclusive, general and large.

Gimbarzevsky (1978) found that a systematic analysis of aerial photographs, air photo mosaics, Landsat and other remote sensing imagery was extremely useful in delineating land ecosystems. Landsat imagery and small scale conventional photography were used for the identification of general physiographic features and associated patterns from which Ecoregions or Ecodistricts could be delineated.

The Ecosection, as recurring patterns of landforms, was delineated on intermediate scale aerial photographs (1:30,000 to 1:50,000) as simple or compound land units, occupying areas of 2 km^2 or more. An ecosection is identified by a uniform regional climate, a characteristic relief, geomorphic origin, drainage conditions and associated vegetational complex. A simple ecosection is made up of a single landform, as for example, a relatively homogeneous lacustrine plain. A compound ecosection, which is most common, consists of several landforms where, in addition to the dominant landform, there occur two or more other landforms forming a complex landscape pattern. For example, a drumlinized plain, which in addition to drumlins, may include organic-filled depressions, portions of flood plain, and other small landforms.

The Ecosites, as subdivisions of Ecosections, are land ecosystem units characterized by a relatively homogeneous combination of soils,

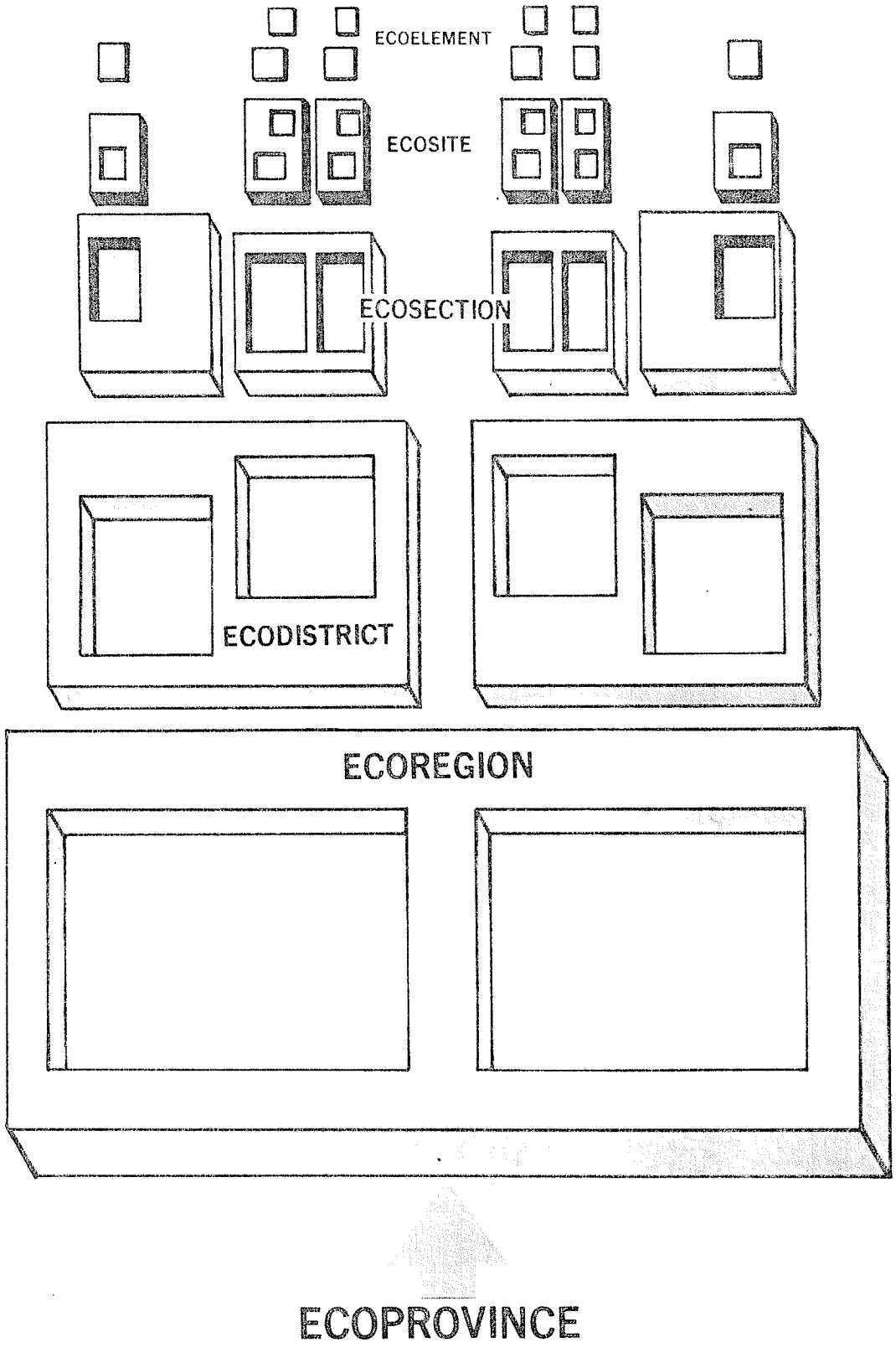


Figure 2.7 *A hierarchical network of Ecological Land Classification levels of generalization*

topography, drainage conditions, geomorphic origin of parent material and chronosequence of natural vegetation. Ecosites, as fundamental units for resource management[1], are identified on medium or large scale aerial photographs by local topography, soil texture, drainage class and geomorphic origin of parent material. A more detailed description of these features is given below:

Local Topography: A component of the general relief pattern expressing a particular surface configuration of a land unit; its dominant smoothness or roughness, type of slope and degree of incline, or steepness class.

Soil Texture: Expressed by seven textural classes - from very coarse, which includes sand and gravel, to very fine (clay).

Drainage Class: Drainage condition or moisture regime of an ecosite is a combination of local climate, surface runoff, and internal drainage or permeability. The soil texture and depth to underlying bedrock control the permeability, while the rate of surface runoff is a function of topographic features, internal drainage and vegetation cover. From the analysis of these parameters the moisture regime of an ecosite is expressed as six drainage classes. Class 1 and 6 are two extremes: Class 1 indicates a rapid runoff and/or high permeability, and generally 'dry' moisture conditions, while Class 6 indicates very wet, saturated conditions, due to poor permeability, lack of surface runoff, or both.

Geomorphic Origin of Parent Material: The geomorphic origin of an ecosite is determined from the analysis of landforms

---

[1]The ecosite level of generalization facilitates detailed area planning and its subdivision to ecoelements facilitates site-specific planning, (Wiken and Welch, 1979).

and recognition of significant processes of deposition and erosion performed by the glacier, water, wind, gravity or a combined action of these forces. To provide additional information on physical characteristics of surface material that may indicate some inherent soil properties related land opportunity or limitations, the ecosites are identified as: a) glacial (till, fluvial, lacustrine), b) waterlaid, c) aeolian, d) organic, e) marine, f) gravity or bedrock.

The ecosite resource management units, delineated from the recognition of geomorphic landforms and their significant physiographic characteristics provide a land base for mapping biotic components of the landscape -- forest cover and non-forest plant communities (Gimbarzevsky, 1977). The ecosite is further subdivided into phases according to the stage of plant succession (see Table 2.3).

The field verification, or ground truthing is an integral part of the Ecological Land Classification. As the field work is usually the most expensive portion of any survey it requires proper planning and preparation. According to Gimbarzevsky (1978) all essential field observations on physical land features, forest cover, non-forest plant communities, water bodies, etc. are recorded along pre-determined transects or in selected localities. Samples of plants and soils, ground photographs, slides, strip aerial photography, and other field documentations on specific aspects of the area provide valuable support for the final classification and validity of survey data. Therefore, field sampling plays a crucial role in the ELC approach. Because a discussion of techniques used is so highly variable and would itself constitute a major research report, refer to CCELC (1979) and (1980) for an outline of procedures.

The final activity to perform in an ELC is to present the collected data in a textual and cartographic form, and increasingly so in computer form (CCELC, 1979). The exact format of the presentation depends on the requirements of the user.

(i) Wildlife - Land Integration in the ELC Approach

A major criticism of the Ecological Land Classification approach to ecological land surveys has been that it has failed to integrate the wildlife component in land ecosystems. Therefore, the ELC was not really ecological. Because wildlife management is an important consideration in park resource management this section will be used to discuss the integration and establish broad guidelines for a truely ecological approach.

Holroyd (1979) demonstrated that wildlife maps prepared at a scale of 1:50,000 and based on the existing ELC approach can accurately depict wildlife abundance and distribution. Using Land Systems (i.e. Ecosections) as the basic mapping unit, a wildlife inventory was successfully integrated with the ELC data base for Banff and Jasper National Parks. The wildlife inventory methodology permitted a limited number of personnel to sample the relative abundance and distribution of approximately 300 wildlife species in more than 160 Map Units.[1] The sampling program is being conducted over six years (1975-1981) to gather data regarding wildlife occurrence in each Map Unit. Samples are randomly located in polygons of each Map Unit and are distributed to sample all geographic

[1] The Map Unit represents a subdivision of the Land System so as to reflect wildlife habitat characteristics.

areas of the two Parks. The 300 species identified were grouped for quantitative sampling by relatively few techniques.[1]

One of the objectives for the wildlife inventory was to present information on the seasonal abundance of wildlife that could be displayed on maps. This objective was accomplished by ranking the occurrence of wildlife species (either singly or in a group) on each Map Unit. The rank was then evaluated for its importance to the requirements of the inventoried species or group of species. The process of ranking is outlined below:

1. The data for each sample method are manipulated to produce an average quantity for each Map Unit and each vegetation type.
2. The quantities for each Map Unit are then ranked as none, low, medium, high and very high so as to compare the wildlife species use of each Map Unit.
3. The ranking is determined by dividing the number of non-zero quantities by 3 and assigning one-third of the Map Units to each of low, medium and high.

The ranks then are used as a legend for wildlife maps depicting seasonal abundance (see Table 2.4).

This approach to integrated wildlife inventory has solved some of the problems that plague ecological inventories. All the information is plotted at one scale, 1:50,000, thus simplifying the production of maps and overlays. The key element of this approach is the Map Unit which is used to describe the importance of a specific habitat area to

---

[1] Census techniques included pellet group counts, track count transects, snap trap lines, pitfall traps, call count transects, breeding bird grids, road surveys and random observations.

Table 2.4 *An example of a wildlife legend for Land Systems of Banff and Jasper National Parks.*

LAND SYSTEM	Map Unit	Season	Caribou	Mule deer	White-tailed deer	Moose	Elk	Mountain goat	Bighorn sheep	Timber wolf	Coyote	Red fox	Black bear	Grizzly bear	Marten	Fisher	Weasel	Mink	Wolverine	Cougar	Lynx	Varying hare	Beaver	Porcupine	Marmot	Columbian Grd. Squ.	Red squirrel	SMALL MAMMALS DENSITY INDEX	SMALL MAMMALS SPECIES TOTAL	SMALL MAMMALS COMM. TYPE	BREEDING BIRDS DENSITY INDEX	BREEDING BIRDS COMM. TYPE	BREEDING BIRDS SPECIES TOTAL
Altrude	AL1	Winter		M	P	M	H				L		P	P	L		L	L	L		P	L											
		Summer		L		L	L																	P		P	M	L	6	3	M	4	25
	AL2	Winter		L		H	M	L	L	L	L				M		M	L	L		P	M											
		Summer		L		L	L		L													L		P		M	L	2	4	M	4 25,5	20
	AL3	Winter		P		L	M			-	-	-	-	-	-	-	-	-	-													
		Summer		L			L						P											P		H			-	H	4	17
Athabasca	AT1	Winter		V		L	V			M	H				M		L					L			P	H	H	2	3,2	M	14,4	11
		Summer		L	P	L	H						P	P						P												
	AT2	Winter		H		M	H		L		H				M							H			P	H						
		Summer		L		L	H		L																P	H	H	6	3,2	M	4	19
	AT3	Winter		-	-	-	-	-	-	M			P	P	M		M			P		-				M	M	1	2	H	14	18
		Summer		P	P		P															-										
	AT4	Winter		H			H				-	-	-	-	-	-	-	-	-	-						-	-	-	-	-	-	-	-
		Summer		L	P		H						P	P																		
	AT5	Winter		H		L	H		H		-	-	-	-	-	-	-	-	-	-						H	H	2	2	H	14	10
		Summer					L		M																							
Baker Creek	BK1	Winter		L		M	L				L		P		L		L		L	P						H	M	4	3	M	4 11,5	21
		Summer				L	L																									
	BK2	Winter		L		L	L				M				L		M		M		L					H	L	1	3	H	4 11,5	24
		Summer					M						P	P																		

Key: L Low use; M Medium use; H High use; V Very High Use; P Species Present but level of use unknown; - Not sampled. Actual values and details of community types are reported in Holroyd et al, 1979.

Sourece: Holroyd (1979).

wildlife species.

Guidelines for Wildlife - Land Integration

There are two areas that must be addressed to integrate wildlife with land ecosystems:

1. Wildlife Data Requirements

   a) Wildlife data should be incorporated into the Ecosite data base at the species level.

   b) Wildlife distribution data should be integrated with other information in the Ecosite data base (e.g. vegetation, soils, landforms, micro-climates).

   c) Cultural data (i.e. Land Use) as it effects wildlife should also be incorporated in the Ecosite data base.

2. Relationships Between Land Ecosystems and Wildlife Habitat

   a) Vegetation plays an important role in the abundance of wildlife species. Therefore, the vegetation classification of the Ecosite must present information on vegetation structure (e.g. foliage height and diversity, stand age and density) and the distribution of physiognomic types.

   b) Emphasis should be placed on the collection of the following kinds of data, which is used to analyze environmental qualities affecting wildlife:

      - climate
      - water (distribution and frequency of aquatic habitats)
      - snow (distribution, depth and duration)
      - seasonal uses of areas by wildlife
      - winter range
      - summer range
      - preferred forage species (distribution and frequency)
      - distribution of key industry organisms (i.e. prey species that are abundant and may support many other species in a food chain)
      - plant succession stages

- intensity of wildlife use
- time of habitat assessment
- landforms

(c) The Parks Canada Approach

Prior to the inventory studies undertaken by the National Resource Studies Program (NRSP), the thematic approach was the only strategy available to govern the collection of data in national parks (East *et al.*, 1979). The Ecological Land Classification approach gained initial acceptance by the Ottawa based Resource Inventory group in 1971. Acceptance of concepts advocated in Canada by Hills (1961) and subsequently expanded by Lacate (1969), was largely based on the perceived advantages of integrated field mapping and data description. Initially, the thematic approach consisting of the preparation of individual inventories for each environmental component was the only strategy available to govern the collection of resource data in the parks. The thematic approach was so plagued with shortcomings that alternative approaches were continually sought. The major drawback was its failure to integrate, coreference and synthesize collected data. Multiple studies on different components generated immense volumes of information that were separately presented and most often geo-referenced in incompatible fashions. A great deal of additional work was required to ensure that some notion of resource inter-relatedness was derived from the studies. The Ecological Land Classification approach, on the other hand, offered a global view of a park and presented data to users in an integrated form using ecological land units. Through an analysis of the environment as a whole, it provided useful information more quickly and at a lower cost than the thematic approach (East *et al.*, 1979).

After nine years of experience with the integrated resource inventory, Parks Canada has concluded that one notion had emerged above all others as an operational precept or guideline to dictate inventory design: The product must be oriented to the needs of the user. In addition to the resource management planners, who have the responsibility to develop conservation strategies to maintain or enhance the natural resources, East *et al.*, identified six other users: master planners, whose task it is to direct the integration of proposed interpretive, visitor use and other facilities proposals into long-term park management strategy; park managers, whose task it is to provide for the day-to-day conservation of natural resources as well as monitoring natural and artificial changes; interpretive planners, who provide proposals and plans detailing the form and direction of the park experience; engineers and architects, whose responsibility it is to design criteria and construction guidelines; interpreters, who impart the park theme and selected relationships within and between the natural resources components and human culture to the park visitors; and systems planners, who on the basis of natural regions and features, identify suitable areas for inclusion into the national park system.

In summation, Parks Canada's resource information requirements tend to fall into four major categories: planning, construction, management and interpretive/educational. As a result, the determination of resource information demands is a function of the probable decisions to be made within the functioning of each category.

The beauty of the Ecological Land Classification approach for the collection of resource data is that its hierarchical framework facilitates

the delivery of information at the required scale. Parks Canada's Ecological Land Classification hierarchy consists of five scales, each of which is defined in a manner that makes it distinct from another. The levels and their definitions are given in Table 2.5.

Table 2.6, *An Information Matrix for National Parks*, demonstrates the relationship between the various generic classes of resource information, level of integration, and Parks Canada users. It is easy to conclude that the requirements vary from user to user based on application, importance and frequency of use.

Through the application of the Ecological Land Classification approach to resource inventory and evaluation over the last nine years, the Inventory Group (NRSP) in Ottawa has made several significant discoveries. The most important of these concerns the level at which resource inventories should be conducted (East *et al.*, 1979). NRSP has found that there is a standard level of information required beyond which additional data collection must be specifically justified. This 'basic information required approach' was based on the realization that there is a geometrically incremental relationship between greater levels of detail and costs of acquisition (see Walker, 1978).

Three criteria have been developed to justify the survey of land ecosystems at lower levels of generalization (i.e. Landtypes, Landphase):

1. areas known to be particularly sensitive or significant;
2. areas where development was likely to occur; and
3. areas that contained biota requiring special management such as rare or endangered species (East *et al.*, 1979).

Table 2.5 *Parks Canada's Ecological Land Classification Hierarchy.*

LEVEL OF INTEGRATION	DEFINING CHARACTERISTICS	ACTIVE ECOLOGICAL VARIABLES
LAND REGION 1:500,000 - 1:3,000,000.	An area of land characterized by a distinctive regional climate as expressed by vegetation.	Regional climate, major vegetation cover, vegetation dynamics.
LAND DISTRICT 1:250,000 - 1:500,000. 25-100 sq. mi.	An area of land characterized by a distinctive pattern of relief, geology, geomorphology and vegetation.	Physiography, topography, geology surficial materials, visible aspects of water bodies.
LAND SYSTEM	An area characterized by a recurring pattern of landforms, surficial material, soils, vegetation chronosequence, and water bodies.	Landforms; origin, nature and depth of surficial materials; nature and extent of aquatic ecosystems.
LAND TYPE 1:10,000 -	An area having a fairly homogeneous combination of soil and chronosequence of vegetation on the same surficial material.	Surficial material, drainage, soil series, vegetation series. (The basic ecological cell of the biophysical classification).
LAND PHASE 1:5,000 - 1:10,000. 0.05 sq. mi.	A subdivision of the land type based on the stage of vegetation succession expressed by existing vegetation at the time of the survey.	Plant community: forest cover and plant sub-strata (Basic cell in vegetation descriptions).

Source: Day (1979).

Table 2.6 *An information matrix of national park resource data users.*

Level of Information Required / Sub-Activity or User Information / Type of Information	Land Region and District						Land System						Land Type					
	Systems Planning	Master Planning	Resource Conservation	Interpretation	Visitor Services	Engineering	Systems Planning	Master Planning	Resource Conservation	Interpretation	Visitor Services	Engineering	Systems Planning	Master Planning	Resource Conservation	Interpretation	Visitor Services	Engineering
Economic					●			●			●			●			●	
Cultural Social			●	●	●											●	●	
Historical	●		●	●			●	●								●		
Archaeological							●	●	●	●						●		
Flora	●							●	●	●					●	●		
Fauna	●							●	●	●					●	●		
Limnology				●					●						●	●		
Hydrology	●		●	●				●	●							●		●
Climatology	●		●	●				●							●			
Pedology				●				●	●			●			●	●		●
Geomorphology	●							●	●	●		●			●	●		●
Geology	●	●	●	●		●						●				●		

Source: East et al. (1979).

Using Ecological Land Classification as a framework for the collection and evaluation of resource base data in this manner should prove to be very cost effective. Herein lies the principle benefit of the ELC as an integrated approach for resource management decision making.

Parks Canada uses a number of techniques for the storage of resource inventory information. In general, storage takes two forms: 1) Reports and Maps; and 2) Reports and Maps, supplemented by a computerized data bank and analysis (see East *et al.* 1979; Day, 1979).

The preparation of maps involves a sophisticated information coding system. Using the ELC hierarchy at a pre-determined scale (generally at Ecosite, i.e. Parks Canada designation Land Type), the park base maps contain the polygonal land ecosystem units. Within each polygon, the broad descriptive land ecosystem features are given in a code form. Supplementing these maps, reports are prepared to provide a more detailed description of each land ecosystem (see Gimbarzevsky *et al.*, 1978; Gimbarzevsky, 1977; Walker, 1978). The reports contain a large number of aerial photographs, tables and illustrations in support of textural description.

Five National Parks in the System have had resource base information computerized (East *et al.*, 1979; Day, 1979). A number of computer 'software' packages have been used to digitize inventory data. Computerization, is a highly elaborate process requiring user training, but is beneficial in the long-term. Information needs can be rapidly retrieved for designated areas. The information can be manipulated for analysis and evaluation of resource management projects or for park development projects. The Banff-Jasper inventory is presented in the second format described above.

The Banff-Jasper inventory program, to be completed by 1981, was contracted to the Canadian Forestry Service (Edmonton) and the Alberta Institute of Pedology, University of Alberta, Edmonton. The data is currently being stored in the Canadian Soil Information System (Can SIS) (see Dumanski, 1978).

East *et al.* (1979) indicated that the Canadian Geographic Information System (CGIS) has recently been used to digitize the Gros Morne National Park biophysical data (see Switzer, 1977).

There are obviously a large number of computer systems currently available for the digitization of integrated resource inventory data. This area deserves further evaluation because it is still evolving and it is very likely that some systems will be better than others in terms of operating costs and capacity to meet user requirements. However, such an evaluation is beyond the scope of this report.

While Parks Canada's approach is still evolving, it is clear that other park agencies will benefit from these endeavours. To conclude this section on Parks Canada, it would be appropriate to cite C.K. Campbell (1976:iii) who, at the Federal-Provincial Parks Conference in October 1976, argued that the future of recreational and preservational use of park lands in Canada "...will require a better information base than we now possess and [inventory] programs must be designed to obtain the most relevant data at minimum costs".

(d) Evaluation of Benefits and Costs of the ELC Approach

Ecological Land Classification, itself, could be evaluated but the result would not be very meaningful. It is necessary to evaluate the ELC

approach as a land survey process. To do this, the ELC hierarchy is incorporated in a functional framework known as the 'Ecological Land Survey'. The Ecological Land Survey (Figure 2.8) consists of three stages: Survey Proposal, establishes the study objectives and terms of reference; Ecological Land Classification, contains prefield preparation, field investigations and post-field activities; and Ecological Land Evaluation, interprets the ecological data base and prescribes management plans or strategies (CCELC, 1979a).

In Victoria, British Columbia on April 4-7, 1978, a workshop was held by the CCELC (1979:xvi) to examine the Ecological Land Classification data base and the Ecological Land Survey approach in contrast to conventional surveys from a benefit-cost point of view.

The results of this workshop are summarized in Table 2.7.

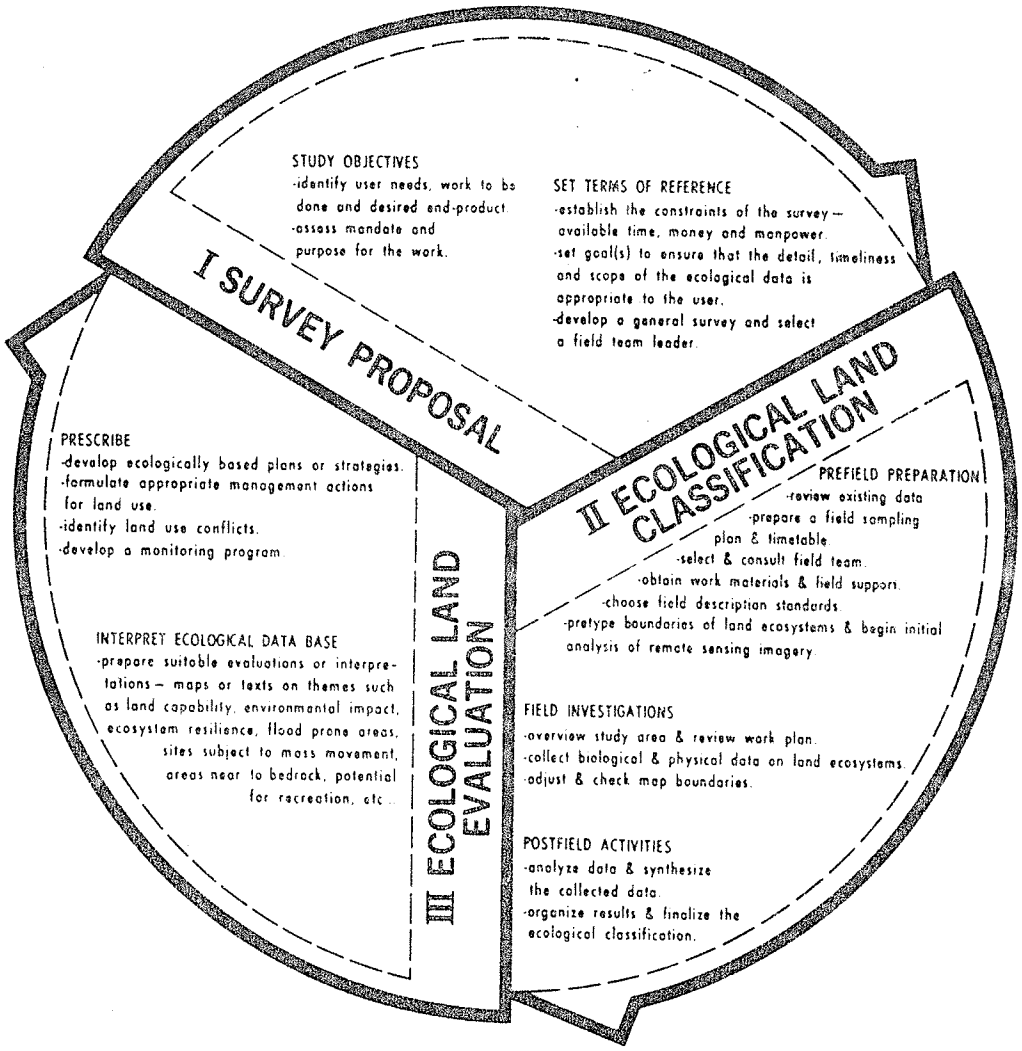


Figure 2.8 *Major steps in an ecological land survey.*

Source: Wiken and Welch (1979).

Table 2.7 *Benefits and costs of Ecological Land Survey identified at the 2nd. Meeting of the Canadian Committee on Ecological Land Classification, 1979.*

BENEFITS	COSTS
1. Integrated data is flexible and provides a common framework.	The data base is too flexible and possible causes information retrieval problems for single disciplines.
2. Common mapping scales and boundaries make data easier and cheaper to store.	User training is required for the use of the data.
3. Field support costs are minimized through sampling stratification.	The survey team may not be workable in the field because some disciplines work at different rates and have seasonal components governing data collection.
4. It is more economical to produce one base map for integrated data presentation.	One base map can result in highly complex data presentations.
5. It is durable over time as stable environmental factors are depicted.	At detailed scales (e.g. Ecotype and Ecophase) boundaries and map units are not necessarily durable.
6. ELS rationale is easy to sell administrators.	Too much data can be generated while expenditure and support costs to participants must be controlled.
7. ELS allows planning in a holistic framework of the environment.	

From an evaluation of benefits and costs listed in Table 2.5, it is difficult to make any definite conclusions. The ELS approach has nearly as many costs as it does benefits. However, the Ecological Land Classification approach will still be superior to the thematic approach.

2.3 RESOURCE MANAGEMENT PROGRAMMING

Resource management programming is the second component of park resource management identified at the beginning of this chapter. The eight management programs include natural resources (i.e. vegetation, wildlife, aquatic, and geological resources), cultural history management, other land use management, site management and hazard management. The objective of this portion of the practicum is to briefly discuss the broad program requirments.

2.3.1 An Ecological Approach for the Management of Natural Resources

The management of natural resources should be conducted so as to reflect ecological interactions and interdependencies. The vegetation, wildlife, aquatic and geological resource components should be managed within an ecological framework (see Smith, 1974:677). A form of integrated management is required in order to preserve or conserve dynamic ecosystems. In effect, an ecosystems approach should be used.

Ecosystems vary in their spatial extent as a function of the scale at which they are viewed. For example, at a scale of 1:1,000,000 or smaller, major biomes are the dominant land features. As scales become larger, major ecological associations and communities become more distinct. The biotic community as described by Smith (1974:21) displays "...a naturally occurring assemblage of plants and animals that live in the same environment, are mutually sustaining and interdependent, and are constantly fixing, utilizing and dispensing energy".

Because ecosystems occupy space and a given period of time they can be located on the land surface (Van Dyne, 1969). Riskind (1977:130) demon-

strated that the ecosystem concept can be readily applied in parks. Using the ecosystem concept at the community level, Riskind has developed management plans aimed at the restoration of grasslands and forests in Texas State Parks. Smathers (1975:10) in a treatise on research and resource management planning in U.S. National Parks stated: Resource management planning is an interdisciplinary team effort that uses the natural ecosystems of the park as the base for evaluating all park operations, planning and developments to assure their maintenance in accordance to enabling legislation.

The ecosystem type, as the basic management unit, appeared to be the most appropriate and functional concept for park management purposes.

In 1968, Reid (1968) recognized that a sound and workable ecosystem strategy had to meet the following criteria:

1. The objectives had to be consistent with the park purpose, readily understood and uniformally interpreted by all levels of management.
2. The terms employed would have to have the same precise meaning to management and the scientific community. Without such a condition, terms lost their validity and the communication process deteriorated.
3. Immediate goals must be economically and biologically sound and attainable within the limits of existing manpower and funds.
4. The individual action programs and the park purpose had to be understood and supported by the general public.
5. The logical movement units did not always have boundaries that were identical to recognized biotic associations and communities. In some cases, it was necessary to combine

several associations into a single 'management ecosystem'.[1]

6. 'Cultural climax' was a valid and useful concept to define ecosystem types composed of relatively modified areas which would not be restored to natural conditions.

Using ecosystems as basic management units in the Resource Management Plan, Reid outlined the procedure used in the preparation of the Plan:

1. Definition of the park purpose.
2. A brief but comprehensive description of the park, covering the geographical location, and salient geological, topographical, climatological and biological features including major ecosystems.
3. Division of parks into major ecosystems.
4. Preparation of concise management objectives for biotic and abiotic resources within each ecosystem type.

Smathers (1975) indicated that resource management planning team members became familiar with park ecosystems by recognizing vegetation type boundaries, aquatic systems, and physiographic features. Ecological units were readily delineated by using park resource maps thematically depicting vegetation, soil, geology, topography, animal ranges and climatology.

Smathers developed concise management objectives by referring to problem areas in the park. A map overlay methodology was developed (Figure 2.9) and aided in directing resource management activity. At

---

[1]The most obvious situation would be the aggregation of various community types in order to manage key wildlife species whose territories or home ranges extended over a number of plant community types.

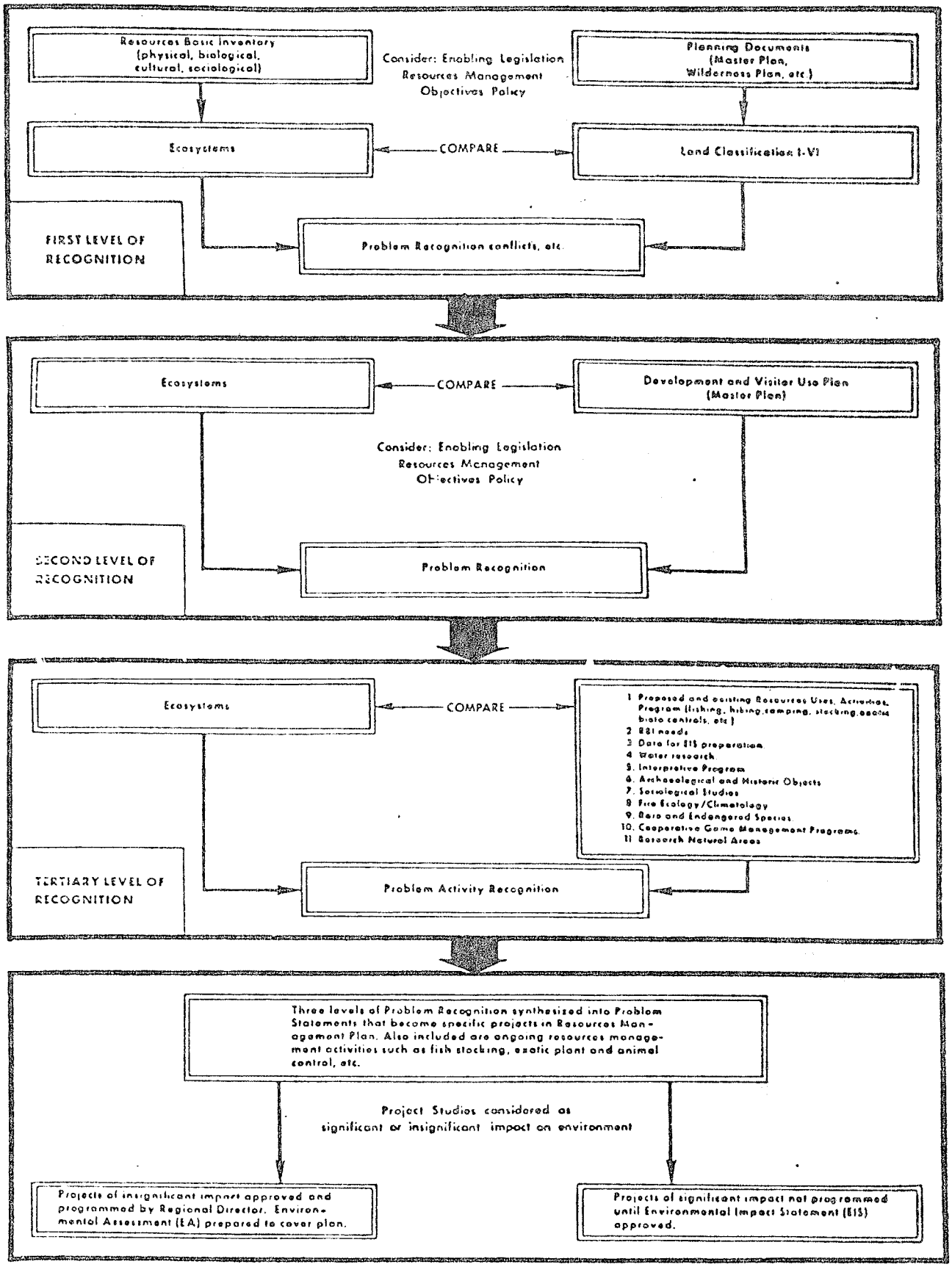


Figure 2.9 *Flow plan of methodology and procedure for problem and resources management activity recognition (After Smather, 1975).*

the first level in Figure 2.9 the park land use zoning scheme was overlayed upon a base map containing the ecosystems of the park. In this manner, potential conflicts with land use were identified based on the natural capabilities of the resource base to sustain a particular use.

The second and third levels of problem recognition relied on a more detailed examination of existing and proposed resource base uses. A detailed evaluation of the ecological carrying capacity was conducted by an interdisciplinary team which identified resource use conflicts and research requirements.

Smathers demonstrated that the introduction of an ecological framework for resource management in parks could be used after a park had been master planned on a poor resource inventory. However, it would appear that the model could be of greater benefit if it was used in conjunction with a master planning process that was based on a sound inventory procedure.

In conclusion, ecosystems may be used as a basis for the determination of park land use and for the management of park resources.

2.3.1.2 Ecosystem Land Units

In many contemporary works, ecosystems maintain a collective identity. The scientific literature uses the work quite loosely to infer a natural complex of plant and animal populations and the particular sets of physical conditions under which they exist; the organisms of a locality, together with the functionally related aspects of the environment are con-

sidered a single entity. Because the science of ecology is a relatively new one, the work ecosystem has been modified from the broad definition given above to meet the needs of specific disciplines. Plant ecosystems, forest ecosystems, aquatic ecosystems, animal ecosystems and land ecosystems are terms in common usage today. Although it would be difficult to clearly differentiate the kinds of ecosystems, there are significant differences between them (Wiken, 1978). Each ecosystem type has a particular bias towards a component within the whole; for example, botanists concentrate on plant ecosystems, whereas zoologists find the animal ecosystems concept best fits their needs.

For the purpose of this report, the 'ecosystem' had to be a tangible concept that could be used in the management of park resources. Therefore, the concept has to be easily defined, practical and acceptable to resource managers, planners and the public. To meet these objectives the term 'land ecosystem' has been adopted; its definitions centred on land. Schwarz *et al.* (1976:105) defined land:

> ...as a specific area of the earth's surface. Its characteristics embrace all reasonably stable, or predictably cyclic, attributes of the biosphere directly above and below this area including those of the atmosphere, the soil and underlying geology, the topography, the hydrology, the plant and animal populations, and the results of past and present human activity...

This holistic definition of land embraces all the attributes of the natural environment and is especially useful in promoting the term, land ecosystem.

Wiken (1978:8) identified three universal elements that characterize land ecosystems: location, pattern and durability. A land ecosystem requires

that its component parts have a commonality of location. Through interactions with a common locale, many constituent parts form cohesive networks. Boundaries of land ecosystems are determined through an assessment of parts and interactions. Where differences are more common than similarities boundary distinctions can be made. The separation interface may be abrupt or a gradual continuum; some parts or interactions of locales can be simultaneously shared. Patterns are defined as the unity and conservation of parts and interactions displayed within a given locality. The continuity of the patterns tends to degrade towards the peripheral limits of a land ecosystem resulting in ecotones. Finally, land ecosystems are not static entities, they change continuously over time. However, despite the constant change, a degree of stability and constancy in pattern can be recognized. This persistence involving relatively sustained ties of interaction among the component parts is manifested by states of dynamic equalibrium.

The detection of land ecosystems is based on the most obvious descriptive (i.e. structural) components which include climate, vegetation, geomorphology and parent materials. The wildlife component is the more obscure component of the land ecosystem and due to its mobility in three dimensional space can be said to comprise ecological units within land ecosystems delimited by the more obvious components. Daubenmire (1968:5) concurred with this notion:

> The plant constituent of a community is usually the more bulky, the more continuous, and the more regularly manifest through the year -- the animal component is obscure or, if evident, the species tend to be few in numbers and to move freely from one type of [plant] community to another. Nevertheless, the animals have many important inter-relationships with the plants... Plant distribution

> is controlled primarily by the physical factors of the environment. But animal distribution is often determined more by the types of food and shelter afforded by vegetation types than by physical factors; hence their distribution tends to conform with patterns of plant communities.[1]

Daubenmire continued to point out that the mobility of larger animals (e.g. ungulates, carnivores) complicated this relationship because different plant communities were commonly used at different times of year. Therefore, wildlife species such as elk (*Cervus canadiensis*) and black bear (*Ursus americanus*) which have ranges and territories that could occupy a number of readily discernible land ecosystems, would require further examination.

Recall that Reid (1968) indicated that logical management units sometimes required the aggregation of several ecosystem types to form what was called a 'management ecosystem'. In the case of large, mobile wildlife species it may therefore be necessary to group the discernible land ecosystems to conform with wildlife territories and ranges.

2.3.2.1 Potential Limitations of Land Ecosystems

Van Camp (1973), in a critique on the applicability of the ecosystem concept in park resource management concluded that the size of the park, the manner with which legal boundaries were determined and surrounding land uses were potential limiting factors. As parks become smaller in size, the likelihood that entire biotic communities are contained within their boundaries diminishes. In addition, because park boundaries in

---

[1] Wiken (1979: pers.comm.) also felt that vegetation played a critical role in wildlife integration. However, the influence of vegetation diminished and terrain played a larger role with decreasing geographic latitude (i.e. in subartic and artic environments).

general have seldom been based on ecological criteria, they will not be ecological islands, but rather, integral elements for a regional mosaic of land management systems. Therefore, resource management projects such as forest insect control will have limited effectiveness when a forested land ecosystem extends across the park boundary and outside of park management jurisdiction. Co-operative management with other agencies or private interests may therefore be required.

In Manitoba, the Provincial Natural Parks vary in size from 5.5 sq. km. to 1700 sq. km. Unfortunately, a formula for the determination of critical park size has not yet been developed. However, the Ecological Land Classification (ELC) hierarchy used by Parks Canada for the isolation of land ecosystems for inventory purposes, has the capability of identifying ecosystems at fairly large scales (e.g. land type and land phase). In fact, Parks Canada, Ontario Region, has used the ELC of Point Pelee National Park, a park characterized by a very small land base, to isolate land ecosystem management units (Parks Canada, 1978).

Surrounding land uses, the third limiting factor, is closely associated with the size of the park. In large parks, surrounding land uses may not be an important factor because the park could function somewhat like an island. However, the smaller the park the greater the influence the surrounding land uses will be. Technically, though, a small park which is surrounded by semi-natural landscapes may function like a large park.

Table 2.8 contains the Provincial Parks currently classified as Provincial Natural Parks, their relative size, and a description of the environments immediately beyond their boundaries. In the case of the large

Table 2.8 *Provincial Natural Parks by size and land use beyond their boundaries.*

PROVINCIAL NATURAL PARK	SIZE		IMMEDIATE ENVIRONMENT
	UNDER 160 SQ. KM.	OVER 160 SQ. KM.	
Asessippi	X		Agricultural
Beaudry	X		Sub-Urban-Agricultural
Birds Hill	X		Agricultural-Sub-Urban
Clearwater Lake		X	Natural*
Duck Mountain		X	Natural Buffer Zone**
Grand Beach	X		Natural-Agricultural
Grass River		Marginal	Natural
Hecla Island		X	Natural
Nopiming		X	Natural
Spruce Woods	X		Agricultural
Turtle Mountain	X		Agricultural
Whiteshell		X	Natural

* The word natural is to infer a reasonably unaltered landscape.

** Duck Mountain Provincial Park is buffered from agricultural land use by the Duck Mountain Forest Reserve.

parks (over 160 sq. km.) each is surrounded by a natural environment suggesting that co-operative planning between Parks Branch and other Crown land management agencies or private interests could maintain the integrity of peripheral land ecosystem management units. However, for small parks (under 160 sq. km.) the surrounding landscapes have been so largely modified that the effectiveness of management on the basis of land ecosystems is questionable. In this latter situation it would be appropriate to manage such areas under the concept of 'Cultural Climax' (Reid, 1968).

2.3.2 Cultural History Resource Management

Cultural History Resource Management is a valid consideration in the resource management planning process (see Skydt, 1979: U.S.D.I., 1978; Eidisvik, 1977). Cultural history resources may be subdivided into two distinct classes: archeological and historical resources. The archeological resource class includes all remaining physical evidence of former occupation by now extinct cultural groups[1] including skeletons, settlement remains, implements, artifacts, monuments and inscriptions. The historical resources class is distinguished from the latter because it deals with a period in time beginning with the movement of settlers into an area (Schwarz *et al.*, 1976).

The goal of cultural resource management is to restore and to preserve historical and archeological sites or objects found in Provincial Parks. These sites or objects are of significant value because they enhance

---

[1]This resource class does not include any of the more recent physical products of contemporary native cultural groups such as may exist on Indian reservations.

the recreational experience of park lands. In Manitoba, cultural history resources are protected under Section 12(1) and 12(2) of The Park Lands Act, The Planning Act S.M. 1975, c. 29 ss.12(1) and 27(4) and The Historic Sites and Objects Act S.M., 1966-67, c. 22.

Any effort to establish a realistic historic and/or archeological resources program must recognize that, while the objectives may be admirable, the task will probably not be an easy one. A number of cultural and planning problems must be faced and resolved.

The cultural problem involves identification of the particular social values associated with the historical and archeological sites to be preserved. The planning problem revolves around the identification and evaluation of the objects, structures, sites and areas which reflect or incorporate such values. Sentimentalism and emotion on the part of the manager do not offer tangible evidence that it is in the public interest to preserve a given structure or the character of a given area. The historic and aesthetic value to society must be determined by persons with the special knowledge and technical competence to make such an evaluation.

2.3.2.1 Components of a Comprehensive Cultural Resource Management Program

Preliminary Survey

There can be no realistic program for cultural resources unless there has been a comprehensive inventory of the parks archeological and historic resources. The objects, sites and areas which are of importance to society must be identified and evaluated. The first step is to assemble a preliminary list of all resources of possible significance or interest.

The purpose of the preliminary survey is simply the identification of physical resources which may, after more intensive analysis, prove to be of historic or archeological significance. No evaluation is needed at this stage; it is adequate to list potentially valuable resources by location. The historic or archeological objects, sites or areas may be geo-referenced to the land ecosystem management units within which they occur. Later, the impact of the visitor on these land ecosystems can be more effectively monitored and controlled.

Several techniques can be used to gather data for the preliminary survey. The more obvious include:

1. contacting government personnel with the Historic Resources Branch, Manitoba Department of Cultural Affairs and Historical Resources;
2. contacting 'informed' residents of the region (e.g. the 'Old-timers');
3. contacting local historical societies and Manitoba university departments; and
4. reviewing published or unpublished materials dealing with the history and archeology of the region.

Extensive Inventory and Evaluation

In this stage the preliminary list of objects, sites and areas is refined, and detailed information is collected on all significant structures. Records should be established which would include descriptive materials and photographs.

The comprehensive inventory is an indispensible foundation for the program. It will be necessary to know what will be worth preserving before the details of a realistic preservation program can be developed. Therefore,

the extensive inventory should contain both factual data and evaluative materials. Objective information may be derived by inspecting objects, sites or areas, and by photographing and mapping. The evaluation of significance however will require professional competence and should be assigned to persons with the necessary education and experience.

Intensive Inventory

In most cases many of the historical and archeological objects or sites may not be known. Because of the economic impracticalities associated with an intensive survey of park lands for cultural resources, these should only be conducted when:

1. there is reasonably conclusive evidence to believe cultural resources may be located in a specific areas within the park;
2. when site developments may preclude the use of the cultural resources for educational, interpretational or scientific purposes.

In the event that site developments are planned for specific areas of a park where there is evidence to indicate the presence of cultural resources it may be necessary to conduct intensive field surveys. Should the site contain significant cultural resources there are two avenues open to the resource manager:

a) remove the resource if it is possible to do so without reducing its inherent values; and

b) redesign the site development so that impacts to the resource are minimized.

Preservation Measures

If properly applied, conventional land use zoning can offer protection

to historical and archeological resources in the face of human impact. However, it will be necessary to examine the probabilities associated with naturally induced impacts (e.g. flooding) as well. Where probabilities of impact by natural hazards are high[1], appropriate steps should be taken to protect historical and archeological resources.

2.2.3 Other Land Use Management

The *Other Land Use Management* program involves the preparation of management strategies to minimize the adverse impact of incompatible or inconsistent land use in Provincial Parks. Because parks in Manitoba accommodate commercial practices such as timber and mineral extraction and agriculture to assist in the generation of revenue for regional economies, it is a resource management responsibility to ensure that such activities do not interfere with the protection of the natural resources or the conveyance of recreational opportunities.

Dasmann *et al.* (1973) recognized the inherent difficulty in dealing with the multiple use of the land resource, especially when conservation and resource development were in direct competition:

> If by bad fortune, high economic development values and high values for ecological protection should coincide on the same tract of ground, all of the skills of both economics and ecology may be required to find ways to maximize the total gains to the community and minimize the losses.

A number of park agencies have attempted to deal with inconsistent park resource uses through zoning. The Alberta Parks Division in a

---

[1] A probability of 0.5 or greater would constitute a high risk.

recently completed Master Plan for Cypress Hills Provincial Park[1] contained a land use zone called the *Restricted Resource Use Zone*. The zone was used to deal with extractive activities such as oil and gas development, forestry, agriculture and mining. The identification of inconsistent land use zones in parks was considered beneficial because:

1. it provided for future recreation and conservation;
2. helped to consolidate boundaries to achieve manageable land units; and
3. could be complimentary to resource management objectives.

The U.S. National Park Service uses a *Special Use Zone* to indicate the probable future use of land and waters within the park boundary that are controlled by other agencies and interests (U.S.D.I., 1978).

Since the multiple-use of park resources on an incremental basis can seriously impact on the effectiveness of other park management programs, it is crucial that inconsistent uses be identified, zoned and the impact on the park resource base be evaluated to ensure that future outdoor recreation options are not pre-empted. Campbell (1976:iii) argued that resource development will continue on park lands "...until we can argue much more effectively and rationally about the recreational and preservational benefits we are providing through single use, and specifically, the role and function of one designated park versus another".

---

[1] Cypress Hills Provincial Park, classified as a *Natural Environment Park*, is one of the larger parks in the Alberta Park System. It contains 20,080 hectares (77.5 sq.mi.) of land situated in the southeast portion of the province, 30 km east and 34 km south of the City of Medicine Hat.

2.2.3.1 Management Alternatives of Compatible - Incompatible Uses

Unfortunately no panacea can be provided to resolve the potential impacts associated with inconsistent land uses. When two park land uses are completely incompatible the management alternatives are fairly simple, though the decision may be difficult to reach -- all of one, none of the other.[1] The same area cannot be used for commercial forestry and for 'pristine' wilderness recreation. One management objective must be chosen, and others excluded. When two uses are completely compatible, so that management for one purpose completely achieves management objectives for the other, there is equally no problem -- manage for either, and the other follows naturally.[2]

In Table 2.9 many of the pairs of uses are moderately to reasonably compatible, but often require some special management steps or programs to make them so. For example, timber harvesting may have to be modified or structured to protect the watershed or wildlife in the park. The management possibilities here are very great, and will likely test the skills of the resource manager.

Whatever the relationship between pairs of uses, or among groups of uses, and whatever the objectives of management, certain facts or relationships must be borne in mind:

1. There will always exist some biological or physical consequence of management actions.

---

[1]Preservation of unique landscapes or ecosystems is incompatible with commercial resource extraction activities.

[2]For example, it is important to consider 'time sequences' associated with commercial operations such as forestry. Given periods during a harvest rotation may be compatible with outdoor recreation pursuits, e.g. increased ungulate viewing.

Table 2.9 *Degree of compatibility among various forest users in Provincial Parks*

Primary Use	Maintain attractive environment	Provide recreation opportunity	Wilderness	Wildlife	Natural watershed	General Conservation	Wood Production and harvest
Maintain attractive environment		Moderately compatible; may limit intensity of use	Not inimical to wilderness but does not insure	Compatible to most wildlife, less so to a few	Fully compatible	Fully compatible	Limited compatibility; often affects amount of harvest
Provide recreation opportunity	Moderately compatible unless use intensity excessive		Incompatible; would destroy wilderness character	Incompatible for some kinds; others can tolerate	Moderately compatible; depends on intensity of recreation use	Moderately compatible; incompatible if use too heavy	Limited compatibility depends on harvest timing and intensity; roads provide access
Wilderness	Fully compatible	Completely incompatible, can't tolerate heavy use		Highly compatible to much wildlife, less so to others	Fully compatible	Fully compatible	Completely incompatible; precludes all harvest
Wildlife	Generally compatible	Limited compatibility; use intensity must limited	Mostly compatible though some wildlife require vegetative manipulation		Generally fully compatible	Generally fully compatible	Generally limits volume or conditions of harvest
Natural watershed	Fully compatible	Moderate compatibility; may require limitation on intensity	Not inimical to wilderness but does not insure	Generally compatible		Fully compatible	Moderate compatibility; restricts harvest methods but does not prevent timber harvest
General Conservation	Fully compatible	Moderately compatible; if use not excessive	Not inimical to wilderness but does not ensure	Generally compatible	Fully compatible		Compatible but requires modifications in methods of timber harvest
Wood production and harvest	Compatible if harvest methods strictly controlled	Moderately compatible	Completely imcompatible; would destroy wilderness	Compatible if harvest method fully controlled	Compatible if harvest methods fully controlled	Compatible if harvest methods fully controlled	

Source: Clawson (1975).

2. There are always economic values and costs involved in every decision, even when the governing criteria for management decisions is not economics.

3. From every management decision some people are gainers and some people are losers -- it is impossible to conceive a management decision that will equally or proportionately benefit everyone.[1]

2.2.3.2 Other Land Use Management Policy

The United States Forest Service, Department of Agriculture, manages the National Forests on an integrated resource management basis successfully because as a single agency it has jurisdiction over all resources (Brown *et al.*, 1969). Theoretically, at least, all resources are given equal consideration and when conflicts arise regarding resource allocation decisions, these may be rationally resolved in accordance with a single administrative goal.

In Manitoba, Provincial Parks have a purpose or goal that is distinct from other Crown Lands as established in The Park Lands Act S.M. 1972, c. 67, s. 2(3). However, Provincial Parks are the jurisdiction of the Minister of Natural Resources[2] who under Section 11(2) of the Act

---

[1] A park attitude survey conducted in the summer of 1979 in the Greater Winnipeg area (Wang, 1979) revealed that 86.3 per cent of the 1,379 respondents were in strong disagreement with resource extraction in Provincial Parks. The results were: 81.4 per cent against mining; 76.3 per cent against hunting; 75.8 per cent against commercial logging; 67.9 per cent against trapping; and 34.3 per cent against wild rice harvesting.

[2] Parks Branch was transferred from the Manitoba Department of Mines, Natural Resources and Environment to the new Department of Natural Resources after the terms of reference for the Practicum had been established.

is empowered to:

> ...prescribe conditions and restrictions in respect of the use or removal of the resources within provincial park lands that are in addition to the provisions of The Forest Act, The Wildlife Act, and The Mines Act, and those Acts, and the provisions thereof...

Therefore, the Manitoba Provincial Park situation is somewhat analogous to that of the U.S. Forest Service.

To allocate National Forest resources to various uses the U.S. Forest Service prepares Land Management Plans (Wingle, 1979: pers. comm.). The "White Mountain National Forest Plan" revealed that all resource allocation decisions were guided by resource management objective statements and subsequent policy formation. This procedure has merit in that the allocation of Provincial Park resources to inconsistent uses can be regulated to meet certain obligations associated with their use. For example, timber harvesting practices may have to be modified to meet with the criteria of aesthetics and high environmental quality.

The following objectives and policy examples may be modified to establish overall guidelines for the *Other Land Use Management* Program.

1. Minerals

   Objective: To integrate the development and use of mineral resources, giving full consideration to other resource values and objectives.

   Policy Statement Examples:

   - co-operate with other government agencies in the administration of mining and mineral leasing laws on Provincial Park lands.
   - regulate exploration and use to minimize other resource and environmental impacts.

2. Forests

Objective: To provide a sustained yield of forest products consistent with the capability of the land and other resource values.

Policy Statement Examples:

- the size, spacing and scheduling of individual cutting units will be subjected to interdisciplinary review and approved by line officers responsible for the project.
- the design of sale areas and applications of silvacultural techniques should:

  a. be appropriate with other resource values in the project area
  b. not adversely affect soil and watershed conditions
  c. meet aesthetic objectives in the project area
  d. be required to meet silvacultural objectives.

3. Fish - Wildlife

Objective: To maintain a reasonable balance of indigenous species through habitat management.

To protect rare and endangered species.

Policy Statement Examples:

- habitat requirements critical to species survival should be identified and managed.
- commercial trapping and fishing must be conducted in a manner which does not reduce the values of those resources.
- the sport fishery must be maintained in a manner which does not reduce the values of that resource.

4. Water - Soil

Objective: To provide the optimum contribution of the soil and water resources in Provincial Park lands to the Parks' present and future needs.

To provide optimum flow of high-quality water.

To protect aquifer recharge areas from activities that would adversely affect quantity and quality of water.

Policy Statement Examples:

- proposals for increasing or decreasing water flows or levels should not be approved until the effects on other resource values have been evaluated.
- construction of impoundments for regional water supplies or other resource management purposes should be considered only after the effects on other resource values have been evaluated.
- use of Provincial Park lands for water storage associated with power generation should be discouraged.

5. Transportation

Objective: To develop and maintain a road and trail system that will provide for optimum accomplishment of resource and land management objectives.

Policy Statement Examples:

- road and trails should be designed to meet resource objectives outlined in a prescription for each resource use made.
- off road vehicles should be restricted to designated routes and areas to ensure protection of all resource values.

6. Special Land Uses

Objective: To permit only those special land uses that are compatible with and contribute to Provincial Park objectives.

Policy Statement Example:

- evaluate capabilities of the land resource and impact on other resource values associated with right-of-ways for power lines, pipelines, etc.

2.3.3 Site Management

A 'site' is defined here as an area of land within the park which is associated with development. Sites are visitor use facilities such as trails, backcountry campsites or other areas of land where concentrations of recreationists may be found.

The principle objective of Site Management is to protect the natural resources of the site so that their quality does not deteriorate. Site protection implies positive management action to reduce the effects of human use on the site.

Jubenville (1980) described site management by the following equation:

$$\text{Well-managed site} = f \begin{pmatrix} \text{Site location} \\ \text{Site design} \\ \text{Recreational use patterns} \\ \text{Environmental conditions} \\ \text{Management strategies} \end{pmatrix}$$

The well managed site is one that is properly selected through the master planning process to enhance the recreational experience and reduce possible environmental degradation. The well managed site is designed to observe differences in ecological carrying capacities of the land, yet provide for the 'normal' behavioral patterns of the visitor. Management strategies developed in accordance with the variables of site location, resource qualities, and expected use patterns protect the site after development while complementing the normal behavioral patterns of the user; they also must be contingent on uncontrollable environmental conditions, which may cause the manager to periodically adjust his strategies to seasonal conditions.

There are six principles that the resource manager must consider

in order to properly implement the site management program:

Proper Location. Proper location of site development is by far the most important principle. The site should be chosen so as to reduce the recreationists impact on the environment. This may be achieved via two routes. The site should fit the normal travel and behavioral patterns of the visitor, or it will not receive its expected levels of use. Secondly, the location of the site should be where soils are stable and vegetation is hardy; the area should be durable enough to sustain recreational use with minimal ecological impact.

Dispersal of Use. The design of an area may cause high densities of visitors at particular sites which in turn results in site deterioration. In the attempt to minimize the impact of heavy use the resource manager may adopt a quota system to regulate use of or he may develop information systems to help disperse use for the area or on a regional basis. Visitors tend to concentrate on particularly well known site developments. A good regional and area information program can help to voluntarily disperse use and to reduce the average impact. Dispersal of use is probably more desirable than other management action because it generates better public relations than does immediate rationing or hardening of the site.

Concentration of Use. Concentration of recreational use on a developed site to more stable locations designed to sustain that level of use can help control overall site deterioration. In addition, certain locations on the site will be more ecologically and economically appropriate for solid waste disposal and sewage treatment for example.

Cultural Treatments. In order to raise the ecological carrying capacity of the site to sustain certain levels of recreational use,

cultural treatments such as soil scarification, surfacing high use areas, irrigation, fertilization or revegetation may be used. The first step in the application of this management action is a thorough survey of site conditions indicating the presence of any limiting factors in the natural productivity of the area e.g. low soil nutrient levels. Once the limiting factors have been isolated, specific cultural treatments may be devised to reduce these limitations.

Ecological Carrying Capacity. Each site has a carrying capacity limit at a given point in time, which are the natural limitations of the level of use it can sustain with minimal environmental impact. The development of carrying capacities based on the ecological factors of soils, water, vegetation and wildlife can be useful in the determination of levels of use at which some form of management action will be necessary.

Naturalism and Aesthetics. Site management should strive to maintain the natural quality of the environment that existed prior to site development. This does not mean the site must be kept in a pristine condition; maintenance of the developed site should attempt to preserve the existing soil, water and vegetative conditions.

The Site Management program also calls for the monitoring of the effects of visitor use on the ecology of the site. Site monitoring should be done from a permanent point so that repeated measures can be obtained over time; control plots may be established as a source of reference to change.

2.3.4 Hazard Management

Hazard Management, the last program type in the Resource Management

subsystem, has only recently become of interest in outdoor recreation management (Jubenville, 1978:22). Hazard Management programs are prepared by the inventory and subsequent reduction of natural and man-made hazards associated with various recreational uses found in parks.

In general, all man-made and natural hazards found in parks should be identified. This does not mean that the resource manager must automatically reduce or eliminate the hazards; it should point out the need to develop a systematic approach to hazard management. The following steps are offered as just such an approach:

Establishment of Objectives. The management of any hazard must fit within the framework of the overall recreational management objectives for the area or the site in the park.

Identification of Hazards. The next step in the process is to identify all known or potential natural or man-made hazards and to locate them on a base map of the park.

Evaluation of Hazards. Each hazard should be evaluated within the framework of the objective and within established policy guidelines for the area or site in the park.

Development of Management Strategies. The adopted strategies should reflect the previous steps and be co-ordinated with other management programs in the area.

2.4 CONCLUSIONS

1. An integrated approach to resource inventory and evaluation has merit over thematic approaches in terms of logistical costs.
2. The Alberta Energy and Natural Resources approach could be

used by Parks Branch to assess recreational use capabilities and limitations through a land ecosystem framework.

3. The Ecological Land Classification hierarchy similar to that used by Parks Canada for resource inventories could be used to delimit land ecosystem resource management units.

4. The Canada Geographic Information System (CGIS) could be used to digitize Manitoba Provincial Park resource base data.

5. The 'Other Land Use Management' programs cannot be comprehensively formulated until ecologically, economically and socially sound policy guidelines are prepared, reflecting the primary purpose of Provincial Park lands.

CHAPTER 3

RESOURCE MANAGEMENT PLANNING STRATEGIES

3.0 INTRODUCTION

In this chapter the results of the park agency survey are discussed and some general conclusions are drawn. The highlights of four park agency resource management planning procedures are discussed, since these provided valuable insights to the preparation of the following chapter -- the Resource Management Plan framework.

3.1 PARK AGENCY SURVEY RESULTS

The park agency survey was conducted during the summer of 1979 and entailed contacting five Canadian provincial and 45 U.S. state park agencies, Parks Canada and the U.S. National Park Service.

Because Parks Canada and the U.S. National Park Service have decentralized their resource management planning effort to a number of administrative regions,[1] each regional office practices a resource management planning approach that was somewhat different. In recognition of this situation, attempts were made to obtain information from the resource management co-ordinating sections in Ottawa and Washington. Both Parks Canada and the U.S. National Park Service have a general framework with which regional planning processes must comply.

In general, the analysis of each agency's resource management planning process relied on a review of planning documents, published and

---

[1] Parks Canada has five administrative regions which include the Atlantic Region, Quebec Region, Ontario Region, Prairie Region and Western Region. The U.S. National Park Service has nine administrative regions which include the Mid-Atlantic Region, Mid-west Region, National Capital Region, North Atlantic Region, Pacific Northwest Region, Rocky Mountain Region, Southwest Region, Southeast Region and Western Region.

unpublished papers, correspondence and personal interviews. Of the 52 agencies contacted, 23 failed to reply to the survey letter (Appendix 1c) and six replied with insufficient information. Therefore, the conclusions drawn in this chapter are based on information from 23 park agencies or 44 per cent of all agencies contacted.

There are two major shortcomings in the analysis of resource management procedures that should be noted at this time. First, because the methodology was based on a literature review process for the most part, the views expressed by authors in one time frame may not be representative of their current notions. The second shortcoming involves the planning documents. A majority of planning documents were reviewed without an appreciation of the underlying planning process; that is, the document product was analyzed without a detailed review of the factors leading to its production. As a result, documents were sometimes difficult to evaluate and more importantly, absolute conclusions were arduous to state. The analysis was based on the assumption that authors had expressed their iedeas and procedures correctly in the documents and that these could be correctly interpreted.

Table 3.1, an information matrix, provides an overview of the direction taken by 23 park agencies with regard to resource management planning.

The resource inventory approaches at the master planning level[1]

---

[1] In discussing resource inventories it is important to note that there are at least three major levels at which inventories are prepared in park planning and management: 1) *Systems level* - generally physiographic resource inventories which isolate natural areas (see Illinois Dept. of Conservation, 1978a); 2) *Master Planning level* - based on the park purpose park-specific resource data is collected and used in the establishment of resource base use opportunities and limitations and preservation requirements; 3) *Resource Management Project level* - the most detailed and site-specific collection of data to facilitate informed management decisions.

Table 3.1 *Informational summary of the park agency survey*

CONSIDERATION / PARK AGENCY	RESOURCE INVENTORY			MASTER PLAN			RESOURCE MANAGEMENT PLAN			
	INTEGRATED	THEMATIC	PROCESS NOT DETERMINED	IN PROCESS OF PREPARATION OR REVISION	INTENGRATED	DEVELOPMENT AND VISITOR USE ORIENTED RESOURCE MANAGEMENT NOT CONSIDERED	IN PROCESS OF PREPARATION	INTEGRATED WITH MASTER PLAN	NOT INTEGRATED WITH MASTER PLAN	CURRENTLY NOT PREPARING
FEDERAL:										
PARKS CANADA	●				●		●			
US NATIONAL PARK SERVICE		●			●			●		
PROVINCIAL:										
ALBERTA PARKS DIVISION	●				●			●		
BRITISH COLUMBIA PARKS BRANCH			●						●	
ONTARIO PARKS BRANCH		●			●			●		
SASKATCHEWAN TOURISM AND RECREATION PLANNING BRANCH			●	●						●
STATE:										
ADIRONDACK PARK AGENCY		●			●			●		
ALABAMA DIVISION OF PARKS			●			●				●
ARKANSAS PARKS DIVISION			●	●						●
ALASKA DIVISION OF PARKS			●	●			●			
DELAWARE DIVISION OF PARKS AND REC.			●			●				●
IDAHO DIVISION OF PARKS AND RECREATION			●	●						●
ILLINOIS DEPARTMENT OF CONSERVATION		●			●			●		
INDIANA DIVISION OF STATE PARKS			●	●						●
IOWA STATE CONSERVATION COMMISSION		●			●			●		
KENTUCKY DEPARTMENT OF PARKS			●			●				●
MARYLAND PARK SERVICE			●		●			●		
MICHIGAN PARKS DIVISION			●		●			●		
MINNESOTA DIVISION OF PARKS			●		●			●		
MONTANA REC. AND PARKS DIVISION			●		●				●	
NEVADA DIVISION OF STATE PARKS		●					●			
OHIO DEPT. OF NATURAL RESOURCES		●			●			●		
TEXAS PARKS AND WILDLIFE DEPARTMENT	●				●			●		

were categorized into two classes, integrated and thematic (also known as sectorial). The integrated approach to natural resource inventory as opposed to the thematic, offered a global view of the park by presenting environment elements (e.g. geology, soils, hydrology, vegetation, climate) in a synthesized form through the application of land classification. Natural resource information for an area or site is collected in cognizance of ecological inter-relationships; for example, a certain soil *Great Group* is related to a given parent material, vegetation association and climate. This integrated view of natural resources facilitated a comprehensive framework for environmental impact assessment and the assessment of selected site-specific developments and visitor uses. Combined with existing resource information, the integrated resource survey serves to identify resource use limitations and opportunities in the overall park management process. The thematic approach involved the preparation of individual inventories for each environmental component. The thematic approach was task-specific in nature, providing detailed information directly related to a single purpose or user requirement.

An integrated Master Plan contains information that serves to guide the preparation of 'operational' level plans for the development, visitor use, interpretation/education and resource management functions within a park. The integrated Master Plan reflects an understanding that all management decisions must be screened for their impact on the future management of the park; the social, environmental and economic implications of management action are carefully evaluated.

Master Plans that were compiled in the absence of resource management considerations, or which failed to integrate the four management

functions, were termed *Development-Visitor Use Oriented*. These Master Plans were generally prepared on a poor resource base evaluation, or lacked an evaluation all together,[1] and failed to address the social and economic implications of management actions.

A statistical summary of the data in Table 3.1 revealed that 57.0 percent of the park agencies contacted were preparing integrated Master Plans, 13.0 percent of the Master Plans were of the 'Development-Visitor Use' variety, and 22.0 percent of the agencies were either in the process of revising or preparing Master Plans.[2] An evaluation of Resource Management Plans revealed that 47.8 percent were the product of a master planning process, while only 8.7 percent were not and 30.4 percent of the agencies were currently not preparing Resource Management Plans.

3.1.1 Resource Management Plan - Master Plan Integration

The survey statistics tend to indicate that a large number of park agencies have chosen to produce integrated Master Plans. Also of interest is the fact that nearly one-fifth of the surveyed agencies were either in the process of preparing or revising Master Plans. Based on the *status quo* demonstrated in the survey, one could speculate that a growing number of park agencies will be adopting an integrated format in the future. The work of Theberge (1978) may help to establish integrated master planning.

---

[1] It is important to point out that resource management inventories and plans may be undertaken after the Master Plan is approved; this is a reflection of a lack of understanding at the *decision-making* level regarding necessary sequence.

[2] The percentages do not add up to 100 because the master planning procedures of two park agencies were not determined.

Professor Theberge at the University of Waterloo was contracted by Parks Canada in 1978 to compare the planning and management strategies used by the U.S. National Park Service with those of Parks Canada. A comparative evaluation of resource management planning and master planning of the two national park agencies lead Theberge to conclude that policy and administration to manage natural resources and ecosystems was considerably less developed in Parks Canada than in its U.S. counterpart. In fact, Theberge felt that as a result of the deficiencies in Canadian National Parks, the long-term protection of natural features was much less certain in Canada than in the United States despite the greater pressures of over-use in the U.S. National Parks. Even though both federal agencies had initiated master planning at the same time, Canadian National Parks lagged behind the U.S. in the production of park-specific Master Plans. Theberge cited three potential reasons for the disparity in achievement:

1. legal necessity of master plan -- N.E.P.A.[1] prevented any major federal spending for development in parks until an approved Master Plan was prepared;
2. manpower resources -- enough planners and resource trained people were hired to do the job; and
3. nationally accepted Master Plan guidelines were prepared.

---

[1] The National Environmental Policy Act was legislated by the United States federal government in 1969. Compliance with NEPA requires:
- A systematic, interdisciplinary approach to planning, and objective consideration of environmental values.
- Full involvement of other agencies and the public during the planning process.
- Procurement and use of relevant environmental information in analyzing alternative strategies.
- Recordkeeping of planning activities as a basis for decision making and preparation of documents.
- Preparation of an environmental statement when the plan as a whole constitutes a major federal action or entails significant or controversial impacts. (U.S. Dept. of the Interior, 1978).

Theberge (1978:46) in his visits to the National Park Service (NPS) Western Region Parks in 1978 was dismayed with the disparity in the number of Resource Management Plans and Environmental Impact Assessments in U.S. National Parks as compared to the Canadian National Parks. Following personal interviews with Canadian federal park managers, Theberge found universal agreement that the lack of Resource Management Plans was a serious problem and that the principal reason for the disparity was the lack of approved Master Plans for Canadian National Parks. Theberge concluded that the integration of the Resource Management Plan with the Master Plan would give Parks Canada a chance to move ahead in an area vital to the protection of national park resources.[1]

While Theberge's observations were clearly substantiated by the literature review process of this report, his conclusions regarding the disparity in the volume of approved Master Plans are open to questioning. Theberge failed to recognize the basic differences in total park planning procedures between the two national park agencies. Parks Canada's master planning process is centred on a very elaborate resource inventory program. The resource inventory program discussed in Section 2.2.2.2.(c) has taken nine years to evolve to its current operational status and has been a substantial factor in slowing down the master planning effort (Barlow, 1980, pers. comm.). The U.S. National Park Service's master planning process is also centred on the resource inventory. However, an examination of National Park Service planning documents and extensive personal interviews

---

[1] In the spring of 1979, Parks Canada released documents that demonstrated a full integration of resource management with master planning. This subject will be elaborated on in Section 3.2.4 of this chapter.

with Service research scientists and resource managers has lead to the conclusion that at best thematic resource inventories were prepared.[1] There is a considerable time factor difference to consider in the application of the two approaches: Comprehensiveness at the resource inventory stage requires considerable initial time outlays.

The importance of the integration of Master Plans and Resource Management Plans may be traced to the requirement of a common terms of reference for resource management and the other forms of management in parks. Governmentally approved Master Plans, as broad conceptual documents, reflect enabling legislation for the creation of parks and governmental policy and park agency policy in the establishment of a 'park purpose'. From the park purpose various park planning objectives are formulated based on an inventory of the natural and cultural history resource base which serves to identify the opportunities and limitations for use. In essence, approved Master Plans facilitate the implementation of resource management programs by ensuring that they are in concordance with park objectives. The absence of Master Plans, or their failure to integrate resource management considerations, may therefore jeopardize the effectiveness of resource management in parks.

3.1.2 Discussion of Findings

Absolute conclusions regarding the current status of resource

---

[1] Dr. Harvey Fleet, Chief of the Branch of Science at the Denver Service Centre, indicated that the "resource Basic Inventory(RBI) Handbook" produced in 1974 was the only guideline for inventories issued by the resource management co-ordination office in Washington. The handbook is nothing more than a checklist giving data requirements, the source of data and its use according to seven subject areas. The park offices were responsible for compiling this information in the following formats: lists, tables, maps, overlays, and accompanying narratives including bibliographies.

management planning are arduous to make. However, some general conclusions based on the review of agency documents, correspondences and personal interviews, may be made.

Resource management, as practiced by several park agencies, has no common definition. Each agency had developed a procedure that was unique to a given set of circumstances. While geographical and ecological differences shaped the kinds of resource management programs and projects that were required, the design and implementation of these still relied on three other factors:

1. The government's perception of the overall purpose of park lands;
2. The educational backgrounds of senior park agency bureaucrats, park planners and managers;
3. The level of government at which the park agency was found, i.e. federal and state/provincial.

Collectively these factors contributed to the multi-faceted character of park resource management which ranged from a strict resource preservation ethic with minimal site development, to extensive and intensive modification of the resource base in order to raise ecological carrying capacities.[1] The variability in resource management character was at times a product of the park classification system which because of a differing park purpose required a number of management approaches. In other cases, a uniform resource management approach was used because the parks had the same broad objectives (i.e. a classification system was not used).

---

[1] For example, fish stocking and trail surfacing projects increase the natural environment's tolerance to heavy use. Without resource management interaction the resource supporting the recreational activity may deteriorate or be destroyed.

The three factors listed above are not the only variables responsible for the different resource management practices, though they represent the principal ones. The first factor involves the government's perception of the overall purpose of park lands. During the review it became apparent that the purpose of park lands was determined in response to social wants and preferences, especially at the provincial level where the type of required opportunities could be more easily assessed. Once demand had been determined,[1] the park agency was charged with the responsibility:

a) to provide intensive recreational opportunities;

b) to provide extensive recreational opportunities;

c) to provide a mix of intensive and extensive recreational opportunities; or

d) to provide for the preservation of unique areas.

To meet the variety of recreational opportunities demanded, park classification systems and zoning schemes were sometimes established. Park classification was not as common as had been perceived earlier: In many cases, the zoning system was modified to accommodate the establishment of a variety of park types.

Because government perception of the future demand for outdoor recreation determined the purpose of parks, the character of resource management had to be flexible so as to ensure that park objectives were satisfied. This factor alone clearly demonstrates the importance of the integration of the resource management component with other components of the Master Plan.

---

[1] Refer to Clawson (1960a) for a thorough treatment of park demand.

The second factor contributing to the differences in resource management direction concerns the educational backgrounds of park agency personnel. Following an assessment of personal interviews, agency documents and correspondences it became very apparent that expertise was far from homogeneous. Senior park agency staff, planners and managers all had differing perceptions of what resource management was or should be. Campbell (1976:110), for example, reflecting upon the Canadian park movement stated: "Managers have not been trained in resource management, and most of the skills they demonstrate relate more to engineering, construction, and mechanical capabilities than to those associated with managing a dynamic ecological system".

Because governmental perception dictates the guidelines within which the park agency must formulate policies for the preparation and implementation of resource management programs and projects, it is not surprising that there is such heterogeneity in the planning and management of the park resource base.

The third factor cited for the variation found in the character of resource management was the level of government at which the park agency operated. Mandates for the creation of national and provincial/state level parks were significantly different on close inspection. The mandate for the creation of a national park system is to set aside ecologically representative or historically significant areas of land that are significant at the national level; to maintain in perpetuity those natural and cultural values; and to maintain a high degree of environmental quality associated with park development. As such, resource management in national parks is highly preservation oriented. Accessibility is not a primary consideration

in the establishment of a national park, the intrinsic values it fosters are. While provincial and state level park agencies may also manage park lands with similar mandates (e.g. Texas Parks and Wildlife Dept.), few actually did. In the majority of provincial and state parks there is a tendency towards the manipulation of the natural environment in an attempt to supply a range of recreational demands. Accessibility to provincial and state parks is an important consideration because these parks usually cater to shorter trips and units of leisure time.[1] Provincial and state park agencies in the development of park systems strive to produce a mix of park types often on the basis of accessibility and the significance of the natural and cultural history features at the provincial or state level.

To deal with multiple uses, a number of Canadian and American park agencies have turned to land use zoning for a solution. Two notable Canadian examples include the Ontario Parks Branch (1978) and the Alberta Parks Division (1979). In the United States, the National Park Services's concern over regional influences and 'within-park influences' of inconsistent land resource use, has resulted in the establishment of a special zoning category[2] (U.S.D.I., 1978). However, unlike provincial level parks, inconsistent uses in U.S. National Parks are suppressed; their inclusion is the result of specific legislative or administrative constraints. In general, inconsistent uses of provincial parks are allowed as long as

---

[1] In Manitoba, for example, residents of the region in which the Provincial Park is situated generally account for the greatest proportion of annual visitation (Wang, 1979, pers. comm.).

[2] The U.S. National Park Service use *Special Use Zones* to designate areas within the park, or adjacent to its boundary, which are managed by other government agencies or private interests (U.S.D.I., 1978). Under the Special Use Zone are listed 13 subzones, these include: commercial, exploration/mining, industrial, institutional, forest utilization, unmanaged non-federal lands, private residential, ranching, agriculture, reservoir, transportation, unused nonpark development and utilities.

safeguards are established to ensure that resource use practices are environmentally sound, and that the primary recreation and preservation objectives of park lands are not unduly compromised.

Following the park agency survey it became apparent that no one resource management planning process could be said to be superior to another. Each park agency had developed, or was developing, a procedure that was a response to perceived needs, and which could be supported by available financial and manpower resources.

3.1.2.1 General Conclusions

Following the review of the 23 park agencies,a number of ideas regarding the preparation of a Resource Management Plan framework for Provincial Parks were consolidated. Absolute conclusions could not be made because a supporting analysis would require a comprehensive information base for each agency. Considering that the mail survey was directed at obtaining general information dealing with resource management planning, such an analysis was far beyond the scope of the practicum. Therefore, a number of general conclusions were made and these are given below.

1. An Ecosystems Approach to Resource Management Planning

Only a few park agencies could be said to be using an ecosystems approach in their resource management planning procedure. However, it is important to note that the maintenance of the *status quo* is not necessarily beneficial. In general, those agencies using an integrated inventory procedure were practicing an ecosystems approach. While the U.S. National Park Service failed to follow the integrated approach, some work by Reid (1968), Houston (1971) and Stone (1965) had been carried out in individual parks in

the system. There has, however, been no concerted attempt to apply this management approach across the national park system. Benson (1978, pers. comm.) explained that the use of the ecosystem approach to natural resource management in national parks had not progressed much since the late 1960's and early 1970's. This, Benson indicated, was not a reflection on the approach "...but rather due to the time lag necessary for public relations among staff and management for complete understanding and acceptance and further time loss in programming".

Parks Canada's approach to resource planning and management was by far the most comprehensive attempt to implement the ecosystems approach. The utilization of the Ecological Land Classification land survey approach aided in isolating land ecosystems based on climate, vegetation, parent material and topography. The wildlife component was geo-referened to these land ecosystems. Parks Canada, however, followed the ecosystems approach in a purely descriptive sense. The functional aspects of ecosystems, including energy flows for example, were for the most part ignored. Although, the Ecological Land Classification could be used as a framework for the study of the functional relationships, especially at the large scales of generalization, should such a need in the resource management decision-making process occur.[1]

2. Resource Management Plan - Master Plan Integration

Master Plans and Resource Management Plans should be integrated in a process similar to that used by the U.S. National Park Service.[2]

---

[1]Kilgore(1976) demonstrated the importance of the functional aspects of ecosystems, for example, in a discussion on the requirements for fire management in the U.S. National Parks.

[2]Refer to Appendix 3 for a description of the master planning process.

This integration is crucial for two reasons:

a) resource management planning receives public recognition; and

b) public support of resource management planning helps to ensure that resource management programs are implemented.

3. Land Use Zoning in Resource-Based Parks

a) Master Plan land use zoning schemes should be prepared following an intensive resource base analysis for use capability.

b) Land use zones should be established so that complete ecosystems at the Ecosite (i.e. community) level are within zonal boundaries. This adjustment at the master planning level would make land use zoning consistent with resource management planning objectives and could minimize development impact.

c) Land use zoning in conjunction with the parks classification system should be used as a delimitor of resource management options within a park.

4. Resource Management Planning Considerations

a) The park manager and senior field staff must identify with the Resource Management Plan if it is to be effective. Field staff must recognize that the plan represents a proposed course of action. Therefore, they should have a high degree of involvement in the preparation and implementation.

b) The Resource Management Plan should be relevant to the needs of the park. They should be addressed to programs underway or those that must be implemented in the near future to meet specific objectives of the park.

c) The objectives and methods used in the Resource Management Plan must be consistent with the park purpose.

d) The Resource Management Plan projects must be co-ordinated with other park activities. Communication with other park planners and managers must be maintained to ensure that future conflicts do not arise -- projects should follow a logical order.

e) Resource Management Plans must be flexible. As new information becomes available through the continual monitoring of program actions adjustments may have to be made in management practices that are either not achieving the desired results or that are doing so at the expense of the integrity of the environment or natural resources.

f) Objectives of Resource Management Plans must be obtainable and stated in quantitative terms. The project statements in the Resource Management Plan should contain a description of what can be reasonably achieved within the constraints of technological know-how, funds, manpower, and a given time-frame.

g) Funds, manpower, and time must be programmed. It is imperative that the project statements contain a clear statement of needs (e.g. money, people, supplies, etc.) that will be required to complete a proposed task.

h) Resource Management Plans must be prepared with an understanding of ecological principles. In this regard, the U.S. National Park Service (U.S.D.I., 1974) suggested that corrective actions should be directed toward the elimination of the cause rather than treating the symptoms of ecological problems where it is feasible to do so without diminishing the value of the park for human use.

i) The Resource Management Plan should not be a 'one-man' job. Rather, it requires the input of an interdisciplinary

team consisting of a team leader[1] and scientists, park managers, planners and interpreters (also known as naturalists) who are most knowledgeable of park resources.

3.2 RESOURCE MANAGEMENT PLANNING HIGHLIGHTS

The highlights of four park agencies are discussed in this section of the practicum. The four agencies are the Illinois Department of Conservation, Nevada Division of State Parks, U.S. National Park Service and Parks Canada.

The two federal agencies played a significant role due to their long history of experience with resource management planning. Many provincial and state level agencies, in fact, had designed planning frameworks using the federal procedures as guides.[2]

3.2.1 Illinois Department of Conservation

The Illinois Department of Conservation prepares and uses Master Management Plans (MMP) to guide the logical movement, use, development, and acquisition of its properties.[3] The MMP is the product of a systematic, comprehensive process carried out by a multi-disciplinary planning team. The MMP provides a method through which proposal for future actions can be formulated, reviewed, revised, and approved; an opportunity to predetermine

---

[1]The team leader does not necessarily have to be knowledgeable of park resources, since the position calls for the creation of a consciousness of the park environment as it relates to the park purpose.

[2]For example, Alberta Parks Division's resource management planning process benefited from the experience of both the U.S. Park Service and Parks Canada (Skydt, 1979, pers. comm.).

[3]The Department has jurisdiction over State Parks, State Natural Areas, State Nature Reserves, State Recreation Areas and State Wildlife Areas.

the ultimate level of facility and program development; and an official guideline to be followed in future years.

The Department's Division of Planning and Design is responsible for the preparation of the MMP document; however, all divisions within the Department and known expertise outside the Department are involved in the planning process.

The planning team functions to collect resource data, identify issues, study alternative solutions, review all proposals for the property, and formulate the plan to guide future action -- the MMP.

A MMP for a specific property is the product of a systematic and comprehensive process. The process strives to integrate the properties resources and the public's outdoor recreation needs into a comprehensive and functional plan, ready to be implemented. The process has four major elements (Illinois Dept. of Conservation, 1979).

1. An Inventory and Analysis of Property Resources

The first step in preparing the MMP is the collection of pertinent information related to the property's resources. Also involved in this phase of the planning process is the identification of major issues and concerns by Department staff and the general public. Once gathered the information is analyzed to identify major resource features, potential, limitations and site concerns.

Typically, the information collected for a site includes the following:

a) at the regional level -- regional location, population within fifty or one hundred miles, compatibility with local planning agencies, and major access routes to the property; and

b) at the site-specific level[1] -- adjacent land use; existing facilities and uses; geological features; land elevations; soil and slope conditions; vegetation types, locations and conditions; fish species and habitats; wildlife species and habitats; archeological and historical features, locations and information; architectural barriers survey; and major concerns or problems affecting the site.

2. A Statement of Objectives to be Achieved

Building upon information gained from the resource inventory and analysis, an interrelated system of objectives is formulated for the property as a whole and for zones established in the property.

First, a major property objective is stated that clearly identifies the primary purpose or dominant theme for the property. This objective addresses the particular elements of protection, preservation, restoration, resource enhancement development, and resource base characteristics that make the property different or unique from other properties. The major property objective is the basic policy statement that guides the formulation and implementation of all future actions and more detailed objectives described below.

Second, a conceptual land use plan is produced that states in broad terms and shows in general locations how the property will be

---

[1] Fraser (1980, pers. comm.) indicated that information generated through the Natural Area Inventory was extremely useful in the formulation of MMP's. The inventory was a systematic effort to find, evaluate, describe and classify natural areas for the Illinois Dept. of Conservation. Categories were: Ecological areas, endangered species habitats, relict species habitats, geologic areas, natural study areas, unique natural area and aquatic areas (Anon., 1978:398). For further information refer to Lewis (1961) and Illinois Dept. of Conservation (1978).

managed, used, or developed. To do this, the conceptual plan established several land use zones within the property,[1] each of which has a definite objective of its own to guide future actions. Individually, each land use zone objective satisfies a part of the major property objective; collectively, the land use zone objectives embody all of the elements of the major property objective at an intermediate level of detail.

3. A Proposed Program of all Resource Management, Visitor Use, Facility Development and Land Acquisition to Fulfill Objectives

The overall program for satisfying the major site objective is found in a further refinement of the land use zones. In order to express proposed actions in detailed terms and for specific locations of the property, the land use zones are subdivided into a number of smaller *units* on the basis of differing resources, management, use or geographical location. Each of these units is assigned specific, detailed recommendations for resource management visitor use, facility development and land acquisition. The recommended actions for the units must be consistent with the land use zones' objectives and with the major property objective. It is through the implementation of the units' detailed recommendations that

---

[1] In State Parks three zones are used, these are: General Recreation Zone - the objective of which is to *conserve* and *enhance* the naturally appearing land and water resources and existing fish and wildlife resources while providing an optimum diversity of outdoor recreation opportunities, consistence with the major park objective (i.e. park purpose), for an optimum number of recreationists; Natural Resource Zone - the objective is to *preserve* and *enhance* the existing naturally appearing land and water resources and existing fish and wildlife resources while providing a variety of basic intensive and extensive outdoor recreation opportunities that are closely tied to existing natural resources; Natural Area Zone - the objective is to *preserve* and *maintain* natural conditions of the resources and to allow these areas to exist without human interference.

the major property objective is realized (see Figure 3.1).

A review of the "Pere Marquette State Park Master Management Plan" revealed that the land use zone *units* were in fact defined on ecological criteria. The units were established to maintain land ecosystem integrity and use was determined by assessing ecological carrying capacities of differentiated land ecosystems, i.e. a determination of ecological carrying capacities established use opportunities and limitations (see Illinois Dept. of Conservation, 1978).

4. A Strategy for Implementing the Management, Use, Development, and Acquisition Actions in a Logical and Co-ordinated Sequence

Once the overall program is formulated and accepted, a logical strategy for implementing the numerous recommended actions is established. This involves sorting the recommendations into three levels of implementation:

a) *Sustenance Level* - satisfies the immediate needs of the public use and resource deterioration and achieves the minimum acceptable degree of the major property objective;

b) *Intermediate Level* - satisfies the general needs of public use, resource conservation, site concerns, and outdoor recreation and achieves the minimum preferred degree of major site objective;

c) *Maximum Level* - satisfies the total program for public use, resource conservation, site concerns, and outdoor recreation and achieves the fullest degree of the major property objective.

In order to establish a sequence for implementing the actions contained in each level, the management, development, and acquisition

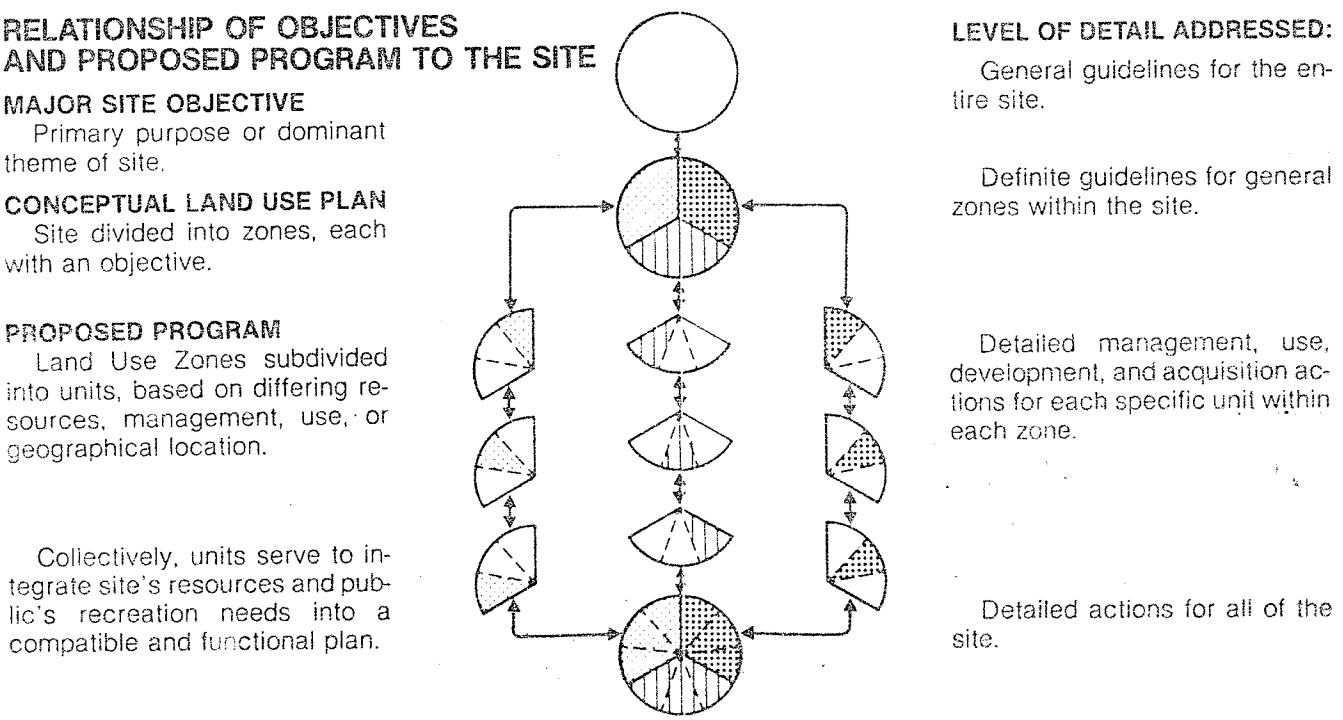


Figure 3.1 *Illinois Department of Conservation Master Management Planning approach illustrating the relationship between Phase 2 and 3.*

Source: Illinois Department of Conservation (undated).

Note: The words 'site' and property are used interchangeably.

recommendations are arranged in priority order. Cost estimates are prepared for every work item in order to arrive at the implementation cost of each level and the total cost of implementing all proposed actions for the entire property.

The implementation strategy, with its priority sequence, provides a guideline for annual budget submitals and for seasonal work schedules.

5. Implementing the MMP

After the MMP has been approved, it provides the basis for the following plan implementation activities:

a) yearly budget requests for land acquisition, development, and resource management;

b) purchase of needed lands;

c) preparation of design plans and specifications for construction projects;

d) formulation of specific policies and administrative orders;

e) preparation of specific work projects and schedules.

In summary, the Illinois Department of Conservation has integrated the resource inventory and assessment and resource management programming into their Master Management Plan process. The MMP product is a result of a comprehensive and systematic effort to identify and evaluate all natural and cultural history resources of a property; to identify concerns or interests of the potential visitors; and to formulate recommendations for future land acquisition, development and resource management programs.[1]

---

[1] A 'Technical' Resource Management Plan is prepared by various Sections and Divisions within the Department of Conservation. These plans reflect and are consistent with the recommendations approved in the MMP. Since the MMP sets forth guidelines for management, the technical plans provide the detailed, sepcific actions required to implement the MMP's recommendations. (Illinois Dept. of Conservation, 1978:110).

The systematic design process used to develop MMP's assures that future decisions and policies for a given property are based on the property's resources and potentials as identified by professional designers, natural resource specialists, and concerned individuals.

The major significance of the Illinois Department of Conservation's approach is that it demonstrates that land use zoning is compatible with resource management programming.

3.2.2 Nevada Division of State Parks

The Nevada Division of State Parks has only recently become involved in resource management planning according to Humphreys (1979, pers. comm.). While the Resource Management Plan - Master Plan integration was not as clear cut as that shown with the Illinois Dept. of Conservation, Humphreys suggested that a procedure was being developed using the U.S. National Park Service's process as a guide.

At the time of writing the Nevada Division of State Parks was finalizing the preparation of its own Resoruce Management Plan framework. The first step in the planning process was the development of a resource inventory strategy. It had become very apparent that in-depth knowledge of the resources of a park was the basis for the preparation of the Master Plan and/or Resources Management Plan:

> To proceed without such data would be to risk making irreparable mistakes which could bring about destruction of priceless, perhaps irreplaceable, resources as well as to waste the limited funds available for park management and development. (Nevada Division of State Parks, 1978).

The resource inventory was to be completed in three phases: 1) collection of maps and aerial photographs; 2) completion of a

selective bibliography; and 3) the inventory. The bibliography represented a balance sheet of the present knowledge of a parks resources and assisted in the preparation of the inventory by avoiding duplication. The inventory was essentially a thematic approach of obtaining a quantitative and qualitative description of park resources containing the following considerations:[1]

A. Environmental Components

I. Physical Components

a. Climate - temperature
b. Geology
c. Water
d. Scenic Resources

II. Biotic Components

a. Vegetative
b. Wildlife

III. Cultural Components

a. Archeology
b. History

B. Other Agencies

Gave a narrative description of the purpose of the activities performed by other agencies in the park for the management of resources.

Upon the completion of the resource inventory, Resource Management Plans were developed for the management of selected resources (Nevada Division of State Parks, 1978). The objectives of the Resource Management

[1]A detailed description of environmental components is found in Appendix 3a.

Plan were two-fold:

1. to enhance the values of the park while regulating use to ensure continued availability of resources; and
2. to build a sound informational base for future management and to protect resources and ecosystems unique to the area in which the park was situated.

In outline form the Resource Management Plans contained the following features:

I. Introduction

A. - a brief, one paragraph characterization of the park, its location, its environment.

B. The Mission

This section contained a concise definition of the park's purpose.

C. Objectives and Policy

This section was used to establish the broad framework of policy, direction and control within which the Resource Management Plan was to operate. It included:

i. statement of significant resources;
ii. analysis of human benefits and values;
iii. statement of broad park policies and concepts to specific situations and problems in the park.

D. Statutory Guidelines and Restraints

This section includes a brief discussion of laws and regulations that might affect management practices applied in a park.

II. Resource Actions

A. Resource Inventory

This section contains a brief narrative of the status of the resource inventory, and a statement of research requirements needed to effectively implement the project.

B. Protective Activities

Projects or management action plans are developed on such subjects as forest insect control, wildlife control, and animal control. A brief narrative of the proposed actions are established in this section in the form of a 'Resource Project Statement'.

C. Interrelationship with other Projects

This final section contains a description of how the Resource Management Plan relates to other existing, proposed or ongoing plans of the park agency or other agencies.

The Nevada Division of State Parks (1978) has prepared Resource Project Statements based on those used by the U.S. National Park Service. In outline form these contain the following sections:

1. Park and Region. Includes a statement of the Park's name and the administrative region in which it occurs.

2. Project Name and Number. Includes a statement of the project's name and file reference number.

3. Statement of Problem. This section contains a concise statement of the problem concerning the resource base requiring mitigation.

4. What Has Been Done. This section indicates the status of any ongoing projects and outcomes of previous attempts to deal with the problem.

5. Description of Work to be Undertaken. This section contains a concise, although often too brief, a description of how the

problem can be resolved or prevented from becoming worse.

6. Length of Time Needed. Contains a statement of the period of time required to resolve the problem or to implement measures to maintain the status quo.

7. What Will Happen if not Undertaken. Contains a brief scenario on the outcome if the stated problem is not resolved or contained.

8. What are the Alternatives.

9. Personnel. Contains a list of agency staff that will be called upon to complete the tasks outlined in Section 5.

10. Administration and Logistics. This section contains a brief statement on the ongoing administration and monitoring of results. Agency personnel responsible for the maintenance of the project once it is on stream are cited. In addition, the project's financial commitments for both personnel services and equipment requirements are phased in a table form.[1]

11. References and Contacts. This section includes a bibliographic list of published and unpublished documents and other governmental agencies that were instrumental in developing the project.

12. Date of Submission.

In summary, Nevada's Division of State Parks had only recently recognized the value of Resource Management Plans in the achievement of overall park objectives. The procedure is closely tied to the inventory of resources, and an analysis of park objectives, policy and statutory guidelines and restraints.

---

[1] On this point, the Nevada Division of State Parks (1978:3) concluded that "the omission of capital programming in the planning process is simply the adult equivalent of writing letters to Santa Claus -- if cost is ignored, planning is just so much waste paper".

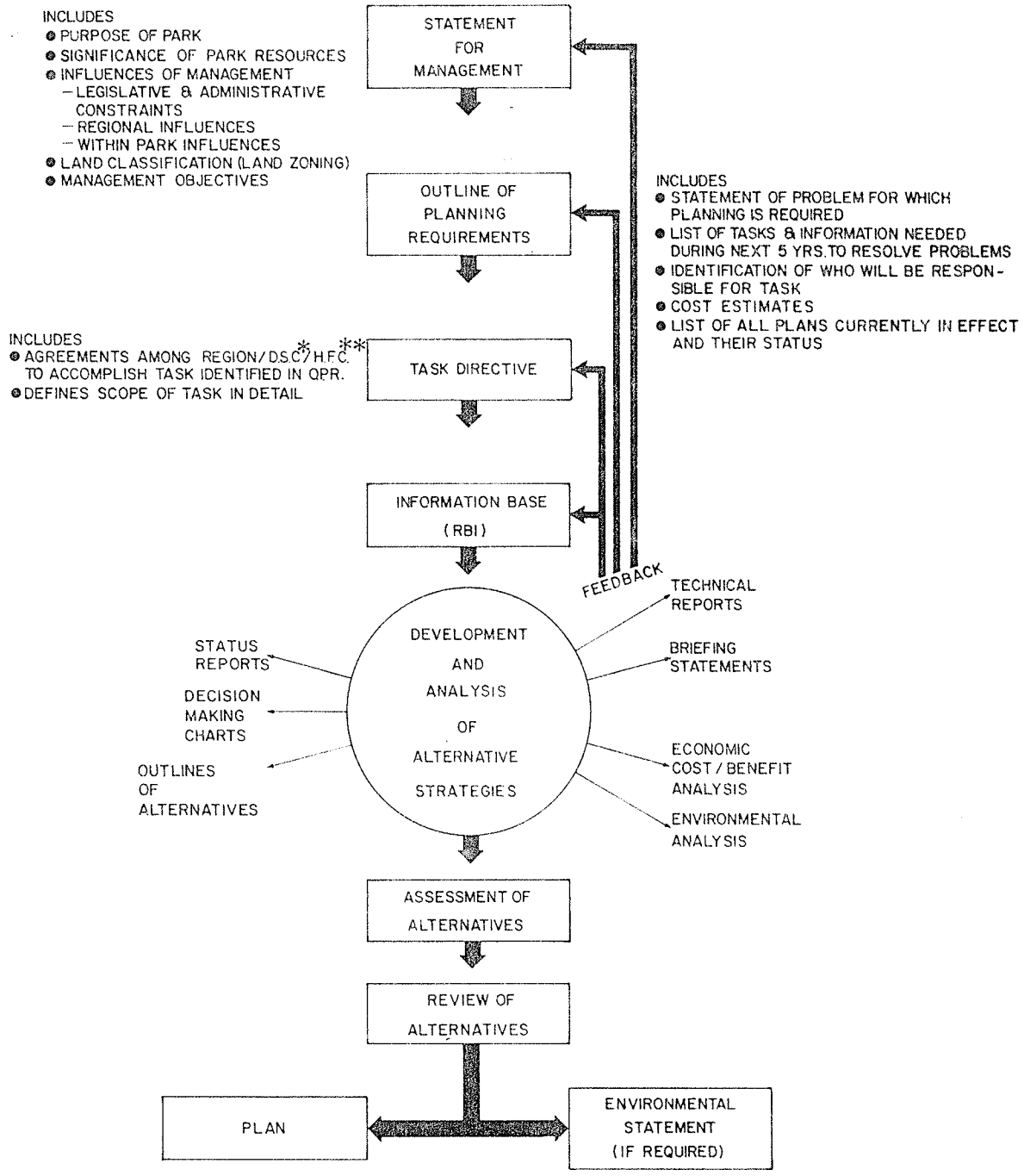
The significance of the approach, with respect to the formulation of a Resource Management Plan framework for Manitoba, is that it indicates a need to schedule resource management projects that is, resource management project statements were an integral part of the Resource Management Plan.

3.2.3 U.S. National Park Service

The U.S. National Park Service's General Management Plan and the Resource Management Plan are the products of an integrated planning process (see Figure 3.2).

The General Management Plan (GMP) is the park-wide plan that meets the management objectives established by the planning process. The GMP contains both short and long-term strategies for resource management, visitor use and development in compliance with National Park Service management policies and legislative and executive requirements, in accordance with resource use opportunities and limitations and in recognition of public concerns. The GMP establishes a framework for major programs, facilities and management actions, as well as, legislative and administrative requirements for implementing them.

GMP detail is variable depending on the size and complexity of the park and the nature of planning objectives. Axtall (1979, pers. comm.) explained that, in general, the 'Resource Management' component of the GMP met the planning requirements for small parks. However, in large, complex parks, the GMP's level of detail was typically inadequate to provide detailed guidance for all geographci areas, and for all facets of park management. Therefore, supplementary documents, usually prepared concurrently with the General Management Plans called 'Action Plan', were



I GENERAL MANAGEMENT PLAN

PARKWIDE PLAN FOR MEETING THE MGT OBJECTIVES OF THE PARK

- RECENTLY AUTHORIZED PARKS
- PARKS WITHOUT APPROVED MASTER PLANS
- PARKS WHERE EXISTING PLANS ARE OUTDATED

II ACTION PLANS

SITE OR SUBJECT – SPECIFIC PLANS

Figure 3.2 U.S. National Park Service planning process

* Denver Service Center (Master Planning and Resource Management Planning)
** Harper Ferry Center (Interpretative Planning)

formulated for large parks. The Resource Management Plan is one kind of Action Plan.[1]

The General Management Plan contains four sections: 1) Introduction, 2) The Environment, 3) The Plan, and 4) The Appendix. The purpose of these sections and minimal content requirements are discussed below.

1. Introduction

The Introduction facilitates a brief overview of the Park and the purpose of the GMP. It locates the park geographically, states its purpose in the system and its management objectives through a 'Statement for Management' and provides the minimal information needed for orientation of the park to its region. In addition, highlights of the GMP are identified. These could be the principle management issues, relationships to previous and future planning and the appropriate time frame for the implementation of GMP proposals.

2. The Environment

The organization and content of this section depends on the nature of the park's resources and planning concerns spelled out in the National Park System classification scheme. In most cases, the text is subdivided into sections dealing with existing park development and use, natural resources, cultural resources, and the socio-economic factors. The descriptive information on park resources and socio-economic factors is kept to an absolute minimum needed to promote an understanding of the park and the region.

---

[1]Others include Interpretive Plans, Development/Infrastructure Phasing Plans, etc.

3. The Plan

This section of the GMP consists of four 'components': 1) Management Zoning, 2) Resource Management, 3) Interpretation and Visitor Use, and 4) General Development. Because the GMP considers park planning and management as an integrated process, the organization and content of this section is structured to reflect the interactions between resource management, interpretation and visitor use and development. The specific management actions and subsequent programs for each component are prepared and the rationale behind each is furnished. In addition, each component contains strategy for compliance with legislation and policy and identify staffing, maintenance, equipment, technical assistance and other operational level requirements. The Management Zoning and Resource Management components are discussed below.

The broad framework for park management is established through Management Zoning (formerly known as Land Classification). According to *NPS - 2*, the U.S. Park Services planning process document, Management Zoning establishes the 'future' management emphasis for the park's land and shows graphically where different kinds of management strategies will be implemented. There are four major zones: Natural, Historic, Park Development and Special Use. The first three establish major differences in management emphasis for land where the Service has sole administrative jurisdiction or where jurisdiction is proposed. The Special Use Zone represents the probable use of land within park boundaries that would be controlled by other agencies and interests (U.S.D.I., 1978:2-5).

The Park Service (U.S.D.I., 1978) indicated that the geographical location of the first three management zones was based on a 'thorough'

knowledge of park resources and the uses which were consistent with the achievement of park management objectives. Thorough knowledge was defined as the full understanding of the significance of the resources and their capability to support the desired uses. Following a review of many General Management Plans prepared for various administrative regions, it became apparent that this was not really the case. Management zone boundaries appeared to be defined more on the basis of convenience as opposed to a comprehensive evaluation of resource use capabilities.

However, in spite of this shortcoming found in the application of management zoning, the land use zoning concept had merit because it provided a broad framework for managing different portions of the park in a cost-effective manner by limiting the range of management options. This feature was demonstrated in the following citation from the "NPS-2" document:

> Refinement of zones is accomplished through [the] establishment of subzones, which define more specifically the management emphasis for lands and waters within the parent zones. (U.S.D.I., 1978).

Resource Management, the second component of the General Management Plan, outlines the management strategies used to maintain or alter park resources. The component is subdivided into two categories: natural resource and cultural resource management.

The natural resource management category is used to establish the principal strategies that are continued, phased out, modified or initiated for the purpose of perpetuating natural resources and processes. However, primary emphasis is on the future management of the Natural Management Zone and each of its subzones. In general, this category contains a description of all areas within the park where the manipulation of the resources and/or

processes, occurs.

The Park Service (U.S.D.I., 1978) developed a list of the major natural resource management problems and concerns that were commonly dealt with in this section. These included the following:

- consumption of renewable and non-renewable resources, (e.g. mining, timber cutting, grazing).
- control of exotic plant and animals.
- control of diseases and infestations.
- improvement of environmental quality (air, aesthetics, noise, water).
- management of back country and wilderness areas.
- management of fire in natural ecosystems.
- management of native vegetation or particular plant species.
- management of shoreline resources.
- management of wildlife or particular animal species.
- management of other particular resources, as appropriate.
- principal research requirements.
- reintroduction of native species.
- resource surveys and monitoring requirements.
- land or interests in lands needed to facilitate perpetuation of natural resources.

The cultural resources management category is used to establish the principal strategies for the treatment of historic, archeological, architectural, and paleontological resources. The primary emphasis being on the future management of the Historic Management Zone and each of its subzones. The major management actions that were prepared dealt with:

- adaptive use of structure and sites.
- furnishing of structures.
- lands or interests in lands required to facilitate preservation of cultural resources and their settings.
- management of historically authentic or historically representative setting.
- preservation of cultural resources.
- reconstruction of structures (where justified).
- rehabilitation of structures.
- restoration of structures and sites.
- research for identification, evaluation, and notation of cultural resources.

The U.S. National Park Service (U.S.D.I., 1978) gave the following

definition for their Resource Management Plans:

> This plan defines the course of action, based on Service policy and law, for the continuous protection, management, and maintenance to perpetuate the resources, to achieve park purpose and objectives, and to appropriately regulate the effect of park use on these resources. The plan defines the operating program related to all the natural resources and the Science program[1] necessary to address crucial aspects or refinements of those operations.

Because the Resource Management Plan is a product of the recommendations made in the Resource Management component of the General Management Plan, it should be in substantiative agreement with those proposals. Therefore, Resource Management Plans are designed in a manner that facilitates the preparation of refined work plans from these prescribed management actions. Potential Resource Management Plan work plans are given in Table 3.2.

Table 3.2 *Resource Management Plan Work Plans.*

Resource Management Plan	*Work Plan*
Natural Resources	Back Country Use*
	Bear Management*
	Collections Management*
	Fire Management*
	Grazing Management*
	Ground Maintenance*
	Shoreline Management*
	Vegetation Management*
	Wildlife Management*
Cultural Resources	Collections Management*
	Cultural Resources Maintenance*
	Historic Furnishings*
	Historic Structure Maintenance*
	Historic Studies*

*Each work plan can be a Resource Management Plan in itself.

[1]The Science Program is designed to provide accurate scientific data in both natural and social sciences upon which all aspects of planning, development, and management of parks is based.

A review of Resource Management Plans from a number of the U.S. National Park Service's regional offices revealed that the documents were the product of a regionally distinct planning process. Benson (1978, pers. comm.) and Wauer, 1979, pers. comm.) attributed the regional differences to decentralization of the resource management planning effort.

Wauer (1977) canvassed the nine regional offices and found that a total of 94 plans had been completed and approved. Although considerable progress has been made since the 1960's, still less than one-third of the U.S. National Parks had Resource Management Plans by 1977. Wauer concluded that the plans "ran the gamut from being exceptionally detailed, reading like natural history handbooks and natural scientific research plans to exceptionally short documents of a few pages and of minimal value...".

Focussing attention on the overall purpose of resource management in national parks, Wauer established the following compulsory guidelines:

1. The plan must be comprehensive, but brief, so that it can be reviewed and kept current readily;
2. The plan should include statements of the activity or problem recognition based upon area management objectives;
3. The plan should identify what management and/or research action is underway or contemplated for each activity;
4. The plan should provide programming guidelines and priorities;
5. The plan should satisfy NEPA requirements.

The U.S. National Park Service's General Management Plan and Resource

Management Plans must be consistent with the provisions of NEPA. Therefore, an environmental impact statement must be prepared "...when the plan as a whole constitutes a major federal action or entails significant or controversial impacts". (U.S.D.I., 1978).

The Park Service uses the term 'environmental statement' in reference to two documents, the Draft Environmental Statement (DES) and Final Environmental Statement (FES). The DES is prepared to document the environmental effects of a proposed action entailing 'significant'[1] environmental impacts and to indicate the impacts of reasonable alternatives to the proposed action. The DES is prepared by an interdisciplinary team which determines the impacts of the proposed action(s) and the alternative action(s). In most cases the draft statement is prepared concurrently with the General Management Plan and Resource Management Plans. The content of the DES is limited to detailed considerations of the effects of the plans on the physical, ecological, socio-economic and cultural components of the park environment (U.S.D.I., 1978).

---

[1] In an attempt to determine the significance of an impact, the following factors were used:

1. the amount of land area involved;
2. the time over which the proposal had an impact;
3. the nature and magnitude of changes in human activity, land use, resource utilization, energy consumption, and management practices; the socio-economic well being of the park visitors, regional residents, and others affected;
4. the nature and magnitude of the change in the quality of air, water, vegetation, wildlife, cultural resources, and other components of the environment;
5. the magnitude of reversibility or irreversibility of resource commitments; and
6. the ability of the resource to absorb the impact.

Following an evaluation of the DES, if one or more of the criteria listed below are satisfied, an Environmental Impact Statement[1] is prepared.

> The cumulative direct or indirect impact of the proposed action is significant.
>
> The impacts of the proposed action are highly controversial.
>
> The proposed action is a precedent for future decisions or commits the Service to future actions, the cumulative impact of which is significant.
>
> The cumulative impact of the proposed action and ongoing or contemplated other action is significant. (U.S.D.I., 1976).

In summary, the General Management Plan and Resource Management Plan are the products of an integrated planning process. The General Management Plan's 'Resource Management' component establishes management direction on the basis of land use zoning for all parks. However, a Resource Management Plan is prepared currently with General Management Plans for large complex parks. Finally, the General Management Plan and Resource Management Plan must be in compliance with NEPA which results in the formulation of environmental impact assessments and statements.

The significance of this approach, with respect to the formulation of a Resource Management Plan framework for Mantioba, is found in the following observations:

1. land use zoning used in the MMP correctly applied by surveying resource base capabilities for use can be used to limit the range of management options;
2. environmental impact assessments prepared concurrently

---

[1]Appendix 3b contains the format used in the preparation of an Environmental Impact Statement.

with Resource Management Plans could ensure that management actions were not associated with adverse impacts.

3.2.4 Parks Canada

Parks Canada's approach to resource management planning, resulting in the preparation of park-specific Resource Management Plans, is very closely tied to the overall park planning process.

> Management of natural resources in a manner consistent with objectives, policy and legislation represents merely one component in the overall process of planning and managing national parks. In order for successful resource management to be achieved, its planning and implementation must be integrated into a framework which represents that overall process. (Parks Canada, 1979:A-4).

Figure 2.3 illustrates the integrative nature of the overall planning process.[1] Component inputs of the Park Management Plan (i.e. Master Plan) and Resource Management Plan are shown and the interrelationship clearly demonstrates the sensitivity of the system to adjustment of components: When an adjustment is made to one component, the entire process must be similarly adjusted to compensate for the change. The need for constant communication and co-ordination is self-evident. Both the 'Resource Management Process' and the 'Planning Process for National Parks' function in a parallel fashion and are also inextricably linked through information flow and decision making.

The 'Sub-Activity Plans' are products of the master planning process

---

[1] For a general description of the components, refer to Parks Canada (1979) and (1979a).

and include: 1) Resource Management, 2) Visitor Services, 3) Interpretation and 4) Administration and General Services (East *et al.*, 1979: 213). For illustrative purposes, however, the Resource Management Plan or 'sub-activity' had to be included in resource management process for completeness. The arrow between the Resource Management Plan and the Sub-Activity Plans demonstrates that there is an interdependence between the Resource Management and other Sub-Activity Plans.

In 1979, Parks Canada's Natural Resources Division released "The Natural Resource Process Manual".[1] The manual was designed to provide broad conceptual and operational direction in resource management planning within the five Parks Canada administrative regions (Barlow, 1979, pers. comm.). The Resource Management Plan component illustrated in Figure 3.3 is for the most part the product three component 'phases':

1. Resource Inventory
2. Resource Description and Analysis
3. Park Conservation Plan

Each phase is sequential and collectively these represent the development of the Resource Management Plan. Because the Resource Inventory phase was examined in Chapter 2, only the two remaining phases will be discussed below.

---

[1]To date, three natural resource planning process manuals have been prepared. The first two were preliminary drafts formulated to enlist discussion. The first document completed in February 1978 was entitled, *The Natural Resource Management Process Manual*. The second, entitled, *Natural Resource Management Process for National Parks*, marked the revision of the first document, was released in January 1979. The third document entitled, *The Natural Resource Management Process Manual*, released in the spring of 1979, reflected several years work. The latter document is currently used in the regions and once operational shortcomings are identified, revisions will lead to the preparation of a fourth edition.

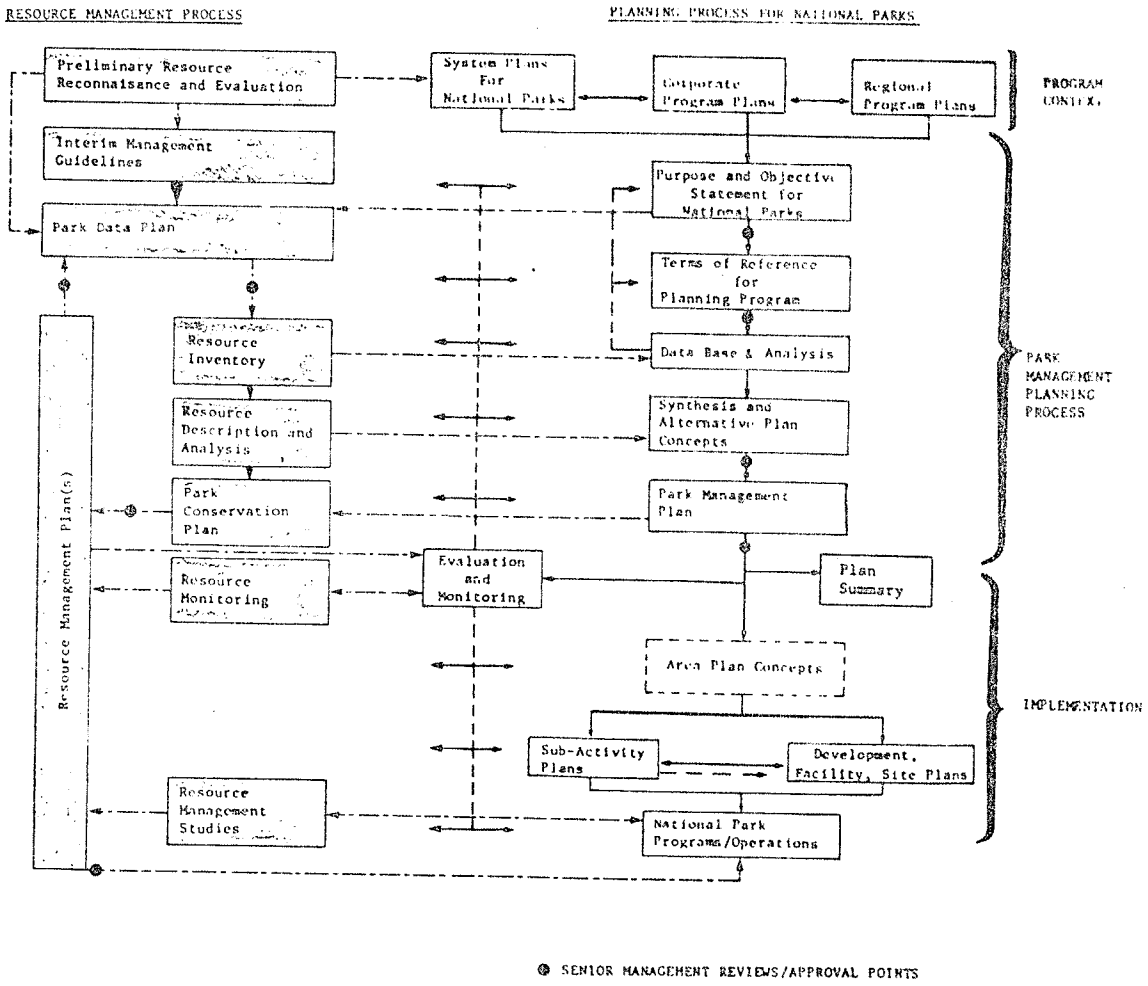


Figure 3.3 *Parks Canada overall national park planning process illustrating an integration of master planning and resource management planning.*

Source: Parks Canada (1979).

The Resource Description and Analysis plays an important function in the overall national park planning process. Parks Canada (1979:E-1) described the Resource Description and Analysis as:

> ...a digest of all pertinent natural resource information contained in the park data base upon completion of the Basic Resource Inventory. It will highlight major issues and concerns and reflect a strong bias toward past and ongoing process. The document should be largely graphical in nature relying on maps, charts, matrices and sketches to promote understanding of natural resource inter-relationships and actual and potential impacts. The Resource Description and Analysis will constitute the primary resource management contribution to the Park Management Planning process and will serve an ongoing reference tool for other management applications. It may also serve as a means of distributing information about the Park to the interested public.

The Parks Canada Prairie Region has completed the Resource Description and Analysis for Riding Mountain National Park. It was prepared in four stages:

1. Formation of the Natural Resource Management Planning Team;
2. Synthesis and Integration of the data base;
3. Description and Analysis of component natural resources; and
4. Evaluation of natural resource opportunities and limitations.

The Synthesis and Integration called for the collection of all resource information previously compiled and documented. Each document was classified according to subject area. For Riding Mountain National Park the component natural resource headings were climate, water, geology, pedology, geomorphology, vegetation, mammals, birds, fish, herptiles, butterflies and skippers, aquatic invertebrates, archeology and past and present land use.

In addition to a review of available literature and documents, a

list of map requirements was prepared by team members; the Park Master Plan was reviewed to identify resource management concerns; and the responsibilities of each team member for specific natural resource components were identified.

In the Description and Analysis, the Park's natural resources were described and analyzed using Ecological Land Classification data. The planning team members prepared descriptions on the specific natural resource components. Graphical aids such as maps, tables and figures were also prepared.

Because the combined natural resources and natural processes in a park form a complex ecosystem, detailed information of specific natural resource components and knowledge of interrelationships is a prerequisite to park planning. Therefore, Riding Mountain National Park natural resources were described and analyzed on the basis of land ecosystems and as separate environmental components. Using the ELC, the major resource inventory components of landform, soils and vegetation were integrated into conceptual ecosystem units based on the hierarchical classification system developed by Lacate (1969). For Riding Mountain National Park, Land Regions, Land District, Land Systems and Land Types were described according to criteria prescribed by Lacate. For example, Land Districts are characterized by a distinctive pattern of relief, geology and geomorphology. The Land Districts present in Riding Mountain National Park were the 'Upland Escarpment' and 'Lowlands'.

The Evaluation was the last stage in the Resource Description and Analysis and involved the determination of opportunities and limitations for Park resource uses and development. A five point classification system

was employed for this purpose and consisted of:

1. areas or resources which had a high capability for appropriate activities or developments;
2. sensitive features or resources which had limitations for suitable activities or developments;
3. features of scientific importance or interest;
4. culturally important features or areas; and
5. areas or resources requiring special management practices.

The Evaluation, as outlined in "The Natural Resource Management Process Manual", was "...not to be a detailed statement of natural resource opportunities or limitations associated with planned developments or activities. A detailed environmental impact statement or resource capability statement were to be conducted only for specific site development or activity proposals". The format for evaluation of natural resource components depended primarily on the nature of natural resource data vailable: A narrative format was used when natural resource data was qualitative; and a tabular and map format supported by a narrative were used when quantitative data was available.

In an attempt to identify the most obvious and pertinent natural resource issues on a Park-wide basis, map overlays were used. By stacking map overlays containing sites or areas of concern, those areas or sites of highest density were noted, and subsequently evaluated on the basis of long-range plans outlined in the Master Plan.

The final phase leading up to the preparation of the Resource Management Plan is the Park Conservation Plan. The objective of the Park Conservation Plan is to provide an integrated, reasoned course of action

whereby resource management problems, concerns and objectives are identified and ranked. With the completion of the Resource Description and Analysis phase, resource management objectives are stated and operational management priorities are established. The resource management objectives formulated in light of park objectives (i.e. park purpose) existing regulations, policy and political concerns provides the required resource management direction. The operational management priorities indicate the nature and extent of required resource management activities, including the need for Resource Management Plan development and/or the initiation of Resource Management Studies.[1]

Park Conservation Plan team members individually review the Description and Analysis, and Evaluation stages of the Resource Description and Analysis, and prepare lists of resource management objectives. The objectives are then categorized by natural resource component and ranked. Ranking of natural resource management objectives is dependent on the following criteria:

A. Issues and Resources of High Visibility or Controversy. These are issues and park resources which have a major impact on how visitors, neighbours, politicians and the general population perceive an individual park, and the Parks Canada organization. These may also be issues which have the potential to impact significantly beyond park boundaries or issues which have an immediate effect on the enjoyment by or safety of the public in the park. For example, beaver damming within park boundaries may result in flooding of neighbouring land.

---

[1] Ongoing planning and management of a park inevitably leads to the identification of problems requiring more information than is already available in order to affect a solution. Problems arizing with respect to specific resources, areas or activities will lead to demands for more detailed or different information requiring the initiation of Resource Management Studies.

B. Park Conservation and Preservation Needs.
These are needs relating to park resources regardless of their significance in A above. For example, monitoring vegetation change arizing from beaver activities.

C. Park Operation Needs.
These are topics/issues relating to the rehabilitation, maintenance and operation of the park but which do not fall into categories A or B. For example, determining appropriate measures for beaver-proofing culverts. (Parks Canada, 1979:F-2).

The Resource Management Plan is the product of the three component phases. Parks Canada (1979:G-1) defined the Resource Management Plan objective in the following statements:

> The objective of the Park Conservation Plan is to provide an integrated, reasoned course of action whereby resource management problems and management concerns and objectives are identified and priorized. Notwithstanding all the best global intentions of such a plan however, resource management remains the sum total of a varying number of discreet actions or activities each of which demands separate application of an organized thought process. The process is that of Resource Management Planning. The products are Resource Management Plan(s).
>
> .....
>
> The objective of each resource management plan is to detail a reasoned course of action including responsibilities and procedures whereby problems identified in the Park Conservation Plan are resolved.

The general format used for the Resource Management Plan is described below:

1. Introduction

The Introduction defines the problem and the objectives of the Resource Management Plan.

2. Background Information Review

This section is the product of the consolidation and evaluation of available information from the park data base, the Resource Description and Analysis, the Park Conservation Plan, park files, local knowledge,

libraries and personal contacts with known experts.

3. The Problem-Solving Model

A decision-making model is used to identify alternative courses of action to resolve resource management problems, concerns or issues.

4. Implementation of Selected Alternatives - Management Actions

The selected alternative was to provide the following information:

a) methodology/methologies to be used;
b) timing and frequency of action;
c) responsibility;
d) manpower requirements;
e) dollar requirements;
f) information lacking and a statement of priority for the acquisition of information, including the methodology, anticipated benefits and costs;
g) requirement for training, safety, enforcement, or public/staff information programs;
h) an identification of decision points in time contained in the Plan, the person having authority to make the decision, and guidelines for decision making; and
i) a statement of how the effectiveness of the Plan would be measured and monitored.

In summary, Parks Canada's resource management planning procedure is fully integrated with the overall park planning process. The resource inventory and evaluation is central to the development of Resource Management Plans and provides information at a scale valuable for the preparation of park-specific Master Plans.

The significance of Parks Canada's approach rests in the importance of a comprehensive and systematic resource inventory process. The comprehensiveness of Resource Management Plans could be said to be a function of the comprehensiveness of the resource inventory process.

CHAPTER 4

THE RESOURCE MANAGEMENT PLAN FRAMEWORK

4.0 INTRODUCTION

Chapter 4 presents the synthesis and consolidation of the preceding chapters and leads to the formulation of a Resource Management Plan framework for Manitoba's resource-based Provincial Parks.

In order to prepare a framework that will operate as an integral component of the Master Plan, it will first be necessary to consider: 1) existing and potential park land resources uses; and 2) the Manitoba Parks Branch Policy Directive.

Manitoba's resource-based Provincial Parks are subject to a broad spectrum of uses which range from the 'consumptive' category to the 'non-consumptive'. Consumptive uses are defined as those uses of the resource base that reduce the supply -- such as logging and mining. Consumptive use as a category does not make any distinction between resources whose supply will sooner or later build up again after an initial reduction (i.e. renewable resources) and resources whose supply will essentially never be renewed (i.e. non-renewable resources). Non-consumptive uses are defined as those uses that do not affect the supply and include such activities as swimming and sight-seeing. The major distinction between

the two major categories is that the former alters the resource base of the park.

Appendix 4a contains a list of potential and existing park resource base uses. The list contains only what are considered to be the major categories and types of uses and should not therefore, be considered to be all inclusive. The intention of the list is to demonstrate that parks are clearly subject to a broad spectrum of uses; uses that in some cases are incompatible with one another. The four major use categories include: 1) Outdoor Recreation, 2) Preservation, 3) Research and 4) Commercial Resource Use.

In the latter portion of 1979, the Department of Natural Resources released a policy directive[1] establishing two broad objectives for Provincial Parks:

A. to provide outdoor recreational opportunities for Manitobans; and

B. to preserve unique or representative natural and cultural resources.

To meet these objectives a variety of proposals were made. Those significant to the formulation of the framework included:

1. a park land classification system identifying the purpose of each park was to be used;

2. Master Plans were to be prepared for Cabinet (PLUC) approval;

---

[1] The Parks Branch Policy Directive is contained in the Manitoba Department of Natural Resources "Policy and Procedure Manual".

3. the Master Plans were to state the classification and purpose of the park and were to address present park use, recreational opportunities, resource allocation and zoning schemes;

4. all forms of outdoor recreation were said to be legitimate, none were intrinsically better than others or inherently more appropriate; and

5. the natural resources that were not presently required for outdoor recreational opportunities could be used commercially provided the utilization did not lessen future recreation use potential.

The significance of the policy directive is that parks are to provide two primary uses, outdoor recreation and preservation. All other park resource base uses were clearly established to be secondary. In addition, the Master Plan was to contain a statement of park purpose and park land use was to be determined through zoning. At this point it would also be important to indicate that policy directive 'B' is in conflict with policy proposal number 5: Commercial resource utilization is incompatible with the preservation use objective.

4.1 RESOURCE MANAGEMENT - MASTER PLANNING INTEGRATION

Figure 4.1 illustrates the points at which the resource management elements identified in Chapter Two could be used in conjunction with the Manitoba Parks Branch master planning process. At the resource inventory stage the *Ecosection* land ecosystem[1] unit found in the Ecological Land Classification hierarchy should be used for the collection

[1] See Rowe (1961) for additional information on land ecosystems.

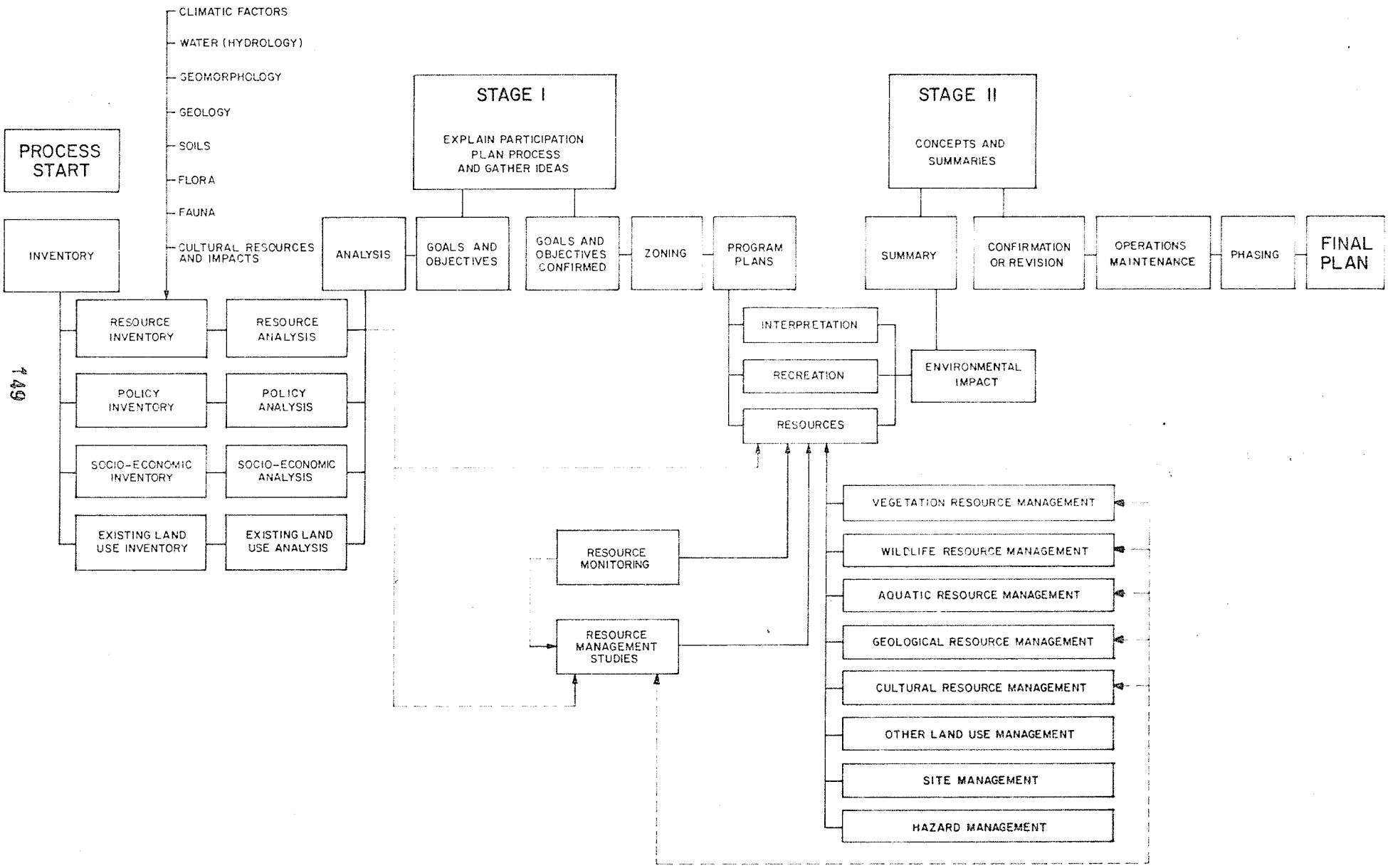


Figure 4.1 *Manitoba Parks Branch master planning procedure integrated with resource management.*

and digitization of natural resources element data. The cultural history resources element could also be geo-referenced to Ecosections. Following the collection and digitization of natural and cultural history resources data a 'resource analysis' should provide detailed information upon which resource use opportunities and limitations would be identified, therefore playing a critical role in the establishment of land use zones. The dashed line feeding into the 'Resources' program plan indicates that the resource inventory and analysis would also provide information for the preparation of resource management programs. The resource monitoring component represents an input from the day-to-day surveillance of park natural and cultural history resources and indentification of potential or existing resource problems, concerns or issues.[1] In addition, in some cases it may be necessary to conduct resource management studies to determine what the parameters of an existing or potential resource problem are.

4.1.1 Ecosite - A Basic Resource Management Unit

The Ecosite level of integration (*cf.* Rowe, 1961) in the Ecological Land Classification hierarchy may be used as the basic resource management unit in natural resource planning and management due to the degree of detail it provides (Gimbarzevsky, 1980, pers. comm.). Ecosites, should play a significant role in the planning and management of Provincial Parks because it can be readily used to identify specific[2] limitations

---

[1] Resource monitoring should be the responsibility of park managers and conservation officers and other Departmental, resource specialized officers who are familiar with the park.

[2] Ecosections, proposed for use in master planning resource inventory, due to smaller scale application would provide more general information.

and opportunities for park land use on the basis of ecosystem sensitivity. Ecosites are inventoried at large scales and therefore can be used in the specific determination of site development location or the allocation of natural resources to commercial use.

Ecosite Management Units, as real ecological land units, provide information for a variety of park resource planning and management purposes. The remainder of this section will outline the basic applications of the Ecosite Management Units.

Land Use Zoning. The establishment of land use zones in the Master Plan must be conducted in a manner that ensures the integrity of land ecosystems is preserved. Ecosite Management Units, defined by the more obvious natural environmental components (i.e. geomorphology, vegetation, and climate), should be delineated graphically before land use zones are to be established. By using the boundaries of the Units as a guide, land use boundaries should be drawn so as to include or exclude complete Ecosite Management Units.

Environmental Impact Assessment. Environmental impact assessments require detailed ecological information in order to evaluate man-induced impacts, holistically. Therefore, Ecosite Management Units should be used for impact assessments associated with park development and resource management programs. For example, impact assessments may be required for intensive use sites such as cottage subdivisions, campgrounds and bathing beaches; and for resource management action evaluations for such things as forest insect control measures.

Management of Flora and Fauna. Ecosite Management Units should also be used to aid the resource management decision-making process

regarding the management of key floral and faunal species in the park. Working within an ecological framework, inventory data, upon which management decisons are commonly based, can be obtained much more comprehensively and cheaply.

Resource Base Monitoring. Ecosite Management Units may also be used to monitor the resource base for impacts associated with visitor use. Areas or sites receiving heavy use may become ecologically unstable and could deteriorate, diminishing recreational opportunities. By establishing detailed ecological information at the onset of the park development, the resource manager establishes a yardstick with which changes may be measured.

4.2 RESOURCE MANAGEMENT PROGRAMS

Eight basic resource management program categories were identified in Chapter Two. These included:

1. Vegetation Resource Management
2. Wildlife Resource Management
3. Aquatic Resource Management
4. Geological Resource Management
5. Cultural Resource Management
6. Other Land Use Management
7. Site Management
8. Hazard Management

This section of the Practicum will focus upon the formulation of guidelines within which each of the programs must operate. To do this however, it will first be necessary to discuss the park land classification and zoning system in more detail.

4.2.1 Park Land Classification and Zoning System

Park classification, as briefly introduced in Chapter One, is an

approach to park planning now in use in many countries. The approach recognizes that a well organized, balanced park system provides a variety of experiences in a wide variety of landscapes. Classification helps to ensure the maintenance of the diversity intended in a parks system which includes everything from strictly protected natural areas to highly developed recreational facilities.

Because all park environments are distincitve, no individual park can be all things to all people. The park classification organizes parks into broad categories so that the park visitor approaching a classified park has some ideas of what to expect; each park shares with others in its class certain immediately recognizable characteristics. The recreational opportunities available to the visitor are those which best make use of the park's environment and which have the least adverse impact on the park's resource base. There are three major objectives that must be satisfied in the park classification:

1. The park classification should clearly express the role of the individual park in achieving the objectives for the park system as a whole.
2. The park classification should enable managers to ensure that each individual who participates in the diverse opportunities provided in Provincial Parks can best satisfy and most reward his or her individual desires.
3. The park classification should promote the best management of the diverse resources of the Provincial Park system through the encouragement of public understanding and appreciation of the characteristics of individual Provincial Parks and of the parks system as a whole.

At the time of writing, the 164 Provincial Parks in Manitoba

represent a total area of over one million hectares, or two percent of the total land and water area of the Province. Of this total area *Provincial Natural Parks* accounted for 98 percent and only a very small percentage was held by *Provincial Recreational Parks*. This disproportionately large share of the former, however, does not reflect the current management emphasis: management practices in many Provincial Natural Parks parallel those of Provincial Recreational Parks (Chekay, 1979, pers. comm.). This situation creates many resource management problems because management practices are clearly different for the two classes of parks (see Manitoba, 1974). In effect, resource management activities become self-defeating since the park purpose is inconsistent with overall management emphasis. For example, it would be impossible to preserve rare floral communities when park management plans call for weekly grass mowing or when development is planned for the same location.

The importance of park classification lies in the fact that subsequent land use zoning schemes must reflect the principal purpose of the park established by the classification. Zoning allocates a park's land on the basis of its significance for protection and is essential for the orderly development and effective management of a park's land on the basis of resource base capabilities to sustain use. In theory, the parks in each class should combine zones in a particular way so as to provide for the protection and use of the resource base distinctive to that class. Since each land use type in each class of park is associated with a specific set of uses, it is evident that different operational resource management activities will be required. Jubenville (1980, pers. comm.) indicated that zoning would have a significant impact on the establishment of resource management program goals.

4.2.2 Program Goals

Table 4.1 represents the proposed[1] land use zoning scheme and the eight resource management program categories. Each cell in the matrix demonstrates what the goal of resource management will be within a particular zoned area of the park.

In the *Nature Reserve Zone*, preservation, is the key management strategy for the management of natural resources. Hazard management is not considered because all active forms of management are excluded from the Nature Reserve Zone. In this zone the management of hazards would only entail an inventory of potential hazards associated with the use of the zone. Passive measures (e.g. visitor information) would be the only form of hazard management.

The primary goal for the cultural history resource management program centres around the preservation of cultural resources found in the *Historic Zone*.

The management goals for the natural resources in the *Wilderness Zone* should be preservational in nature due to the very low density use the zone will receive. Specific sites, such as hiking trails and back country campgrounds, will require management emphasis which complies with the characteristics of a wilderness landscape. Hazard Management, due to a relatively greater potential for visitor use in the Wilderness Zone, should be used to actively reduce potential and existing hazards. However, any resource manipulation must be conducted in a manner that is condusive

---

[1] Manitoba Parks Branch's zoning scheme tends to mask the purpose of the zone categories. Therefore, to ease future reference, changes in terminology were made. See Appendix 4b for an elaboration.

LAND USE ZONING SCHEME		BASIC RESOURCE MANAGEMENT PROGRAMS							
TITLE	CLASS	Vegetation Resource Management	Wildlife Resource Management	Aquatic Resource Management	Geological Resource Management	Cultural Resource Management	Other Land Use Management	Site Management	Hazard Management
NATURE RESERVE ZONE	1	P	P	P	P	-	-	-	-
HISTORIC ZONE	2	R	R	R	R	Preserve Cultural Resources	-	PR	-
WILDERNESS ZONE	3	P	P	P	P	-	-	R	R
NATURAL RECREATION ZONE	4	PR	PR	PR	PR	-	-	PR	M
NATURAL RECREATION RESOURCE USE ZONE	5	PR	PR	PR	PR	-	MM	PR	MM
PARK DEVELOPMENT ZONE	6	MM	MM	MM	MM	-	-	MM	MM

KEY: SYMBOL GOAL

P PRESERVATION - Preserve natural ecology; no active resource management.

R RETENTION - Retain primary wild character of the landscape; some resource manipulation allowable

PR PARTIAL RETENTION - Raise visitor carrying capacities by modifying and stabilizing the resource base.

M MODIFICATION - Greater modification of the resource base than for PR.

MM MAXIMUM MODIFICATION - Greater modification of the resource base than for M. Reduce negative impacts associated with recreational or commercial use. Modifications of the landscape that do not blend in regardless of viewing distance are unacceptable, e.g. strip mining and large symmetrical forest clear cuts.

\- NOT APPLICABLE

of the wilderness character of the zone.

The *Natural Recreation Zone* and the *Natural Recreation Resource* Utilization Zone both require management emphasis which will raise the carrying capacity of the resource base. It may be necessary to modify the resource base so as to support higher density and intensity use. For example, hiking trails may have to be surfaced to prevent erosion; fish stocking may be required to raise the angling success; and wildlife habitats may be created to increase public viewing potential. The Site Management and Hazard Management programs in the Natural Recreation Zone should comply with the general requirements of the zone. The degree of modification of ecosystems in the Natural Recreation-Resource Utilization Zone will be greater than in all previous zones due to the existence of commercial resource use. Attempts should be made, therefore, to ensure that existing and future recreational opportunities are not precluded. Hazard management will play a significant role in the Natural Recreation-Resource Utilization Zone because active management may be required to minimize hazards associated with commercial resource uses. For example, mining sites will require certain precautionary measures to ensure public safety.

The *Park Development Zone* will most alter the natural environment. Through the alteration of natural processes such as water drainage, creation of artificial environments, and the displacement of certain wildlife species, the Site Management and Hazard Management programs will play the most significant role.

4.2.3 Resource Management Program Guidelines

Each resource management program can be subdivided into three interdependent stages for practical purposes. Figure 4.2 demonstrates this breakdown.

STAGE 1	Resource Management Program Statement
STAGE 2	Program Categories
STAGE 3	Resource Management Projects

Figure 4.2 *Stages in the resource management program.*

It is important to note that each of the consecutive stages in the resource management program becomes increasingly more specific in addressing resource management problems, concerns or issues. A description of the three stages is provided in the following sections.

There are three areas that must be addressed in the resource management program statement:

Agency Policy and Guidelines. Specific policies must be developed for the management of the natural and cultural resources of the park. These policies are to serve as guidelines for the formulation of resource management actions seen at the resource management project level.

Statement of Conditions. The Statement of Condition is a key stage because it identifies critical areas of concern that will be addressed in the resource management program. A description of the condition of

the resource should be given, followed by an outline of all past management actions and the results of those actions, and all ongoing management actions and their proposed outcomes.

Discussion of Management Alternatives. Within the confines of each Ecosite Management Unit(s) and in line with the agency policy guidelines, alternative courses of action to deal with resource problems, concerns or issues should be identified. The pros and cons of each alternative should be discussed subject to the constraints of financial limitations, purpose of the park, and ecological considerations. The negative and positive impacts of management actions should be documented. In addition, if 'no action' is proposed, justification for this decision should be provided.

Research Requirements. Following a discussion of management alternatives, it will become evident if certain information is required before management projects can be implemented. Research, is a vital component in the management of natural resources; it is a diagnostic tool the resource manager often requires prior to determining the type of management project that is needed. However, additional reasearch may also be required at the project level when ongoing projects reveal there is a need for more background information.

Program categories are used to group resource management problems, concerns or issues according to a common subject being addressed. Figure 4.3 illustrates how various projects are grouped into program categories.

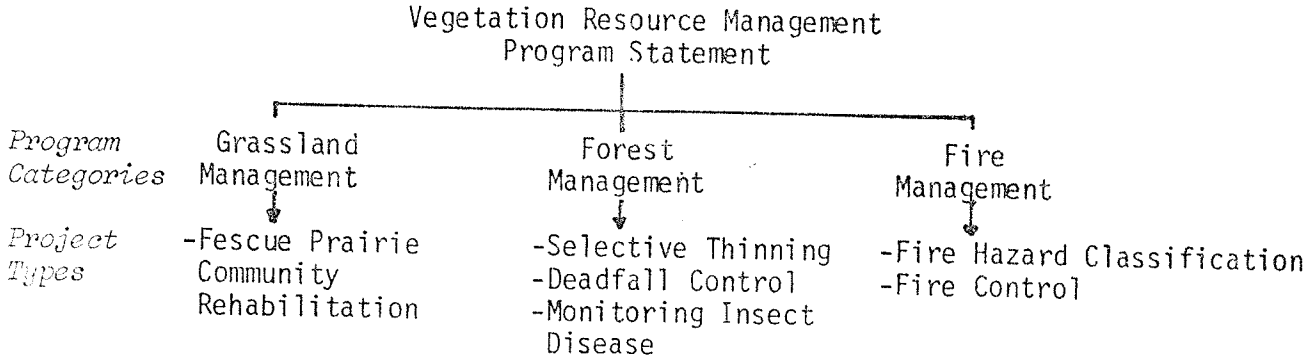


Figure 4.3 *An example of program categories and corresponding project types in the vegetation resource management program.*

The program categories and corresponding project types will of course vary from park to the next as a function of the characteristics of the resource base and resource management requirements.

For each resource management project under the program category the following 'project statement' should be developed:

FORMAT FOR THE PROJECT STATEMENT

1. DATE OF SUBMISSION
2. PROJECT NAME
3. STATEMENT OF THE PROBLEM
   The problem, concern or issue identified in the resource management program statement should be briefly and concisely restated.
4. STATEMENT OF OBJECTIVES
   In accordance with the policy guidelines regarding the resource a statement should be made indicating what the project is intended to accomplish.

5. METHODOLOGY

   A very brief description of the techniques being employed should be outlined.

6. LENGTH OF TIME REQUIRED

   The period of time required to operate the project should be indicated.

7. OTHER PARK MANAGEMENT PROJECTS

   Because other park management projects may be affected by the operation of the resource management project, an attempt should be made to identify the implications of management action.

8. CO-OPERATING AGENCIES

   The government agencies responsible for the co-operative management of Provincial Park resources should be identified. Consulting agencies or institutions (e.g. universities) should be identified.

9. CRITICAL PATH

   The project should be phased for manpower and equipment requirements and the financial costs in each stage of the project should be determined.

10. PROGRESS REPORT

    If the project extends over several years a progress report should be filed at the end of each fiscal year and appended to the project statement. The progress report may provide evidence suggesting the project is not meeting its objective or that there are unforeseen impacts.

11. RESEARCH REQUIREMENTS

    Unforseen impacts may require that research studies are carried out before the project can proceed. Therefore, additional research requirements should be documented and the critical path for the project should be adjusted to accommodate research needs.

12. REFERENCES AND CONTACTS

All published and unpublished references used in the preparation of the project statement should be cited. In addition, the names of contact persons, their addresses, phone numbers and input to the project should be given.

4.3 ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS

In 1976, the Manitoba Department of Mines, Resources and Environmental Management (1976) issued broad guidelines based on governmental policy regarding environmental management in the Province of Manitoba. These guidelines are currently used in the Provincial Environmental Assessment and Review Process (Brandson, 1979, pers. comm.).

The criteria and background for the submital of Project Descriptions and Environmental Impact Assessments is provided in Appendix 4c. The remainder of this section outlines a procedure for the preparation of these documents.

4.3.1 Project Description

The submission of a Project Description for Provincial Park resource management projects may be easily facilitated by providing MEARA[1] with a resource management project statement. This information submitted with relevant drawings, plans, photographs and charts should be suitable for an evaluation.

4.3.2 Environmental Impact Assessment (EIA)

The EIA serves to provide a detailed analysis of the environmental

---

[1] Manitoba Environmental Assessment and Review Agency.

impacts associated with a proposed project. The following format for an EIA was developed in conjunction with the guidelines outlined by MEARA (Manitoba, 1976).

FORMAT FOR ENVIRONMENTAL IMPACT ASSESSMENTS

I. INTRODUCTION

The Introduction should provide information on the location, purpose and magnitude of the proposed project.

II. ENVIRONMENTAL EVALUATION

The environmental evaluation should provide a detailed analysis of the impacts of the proposed project on the park and the park's regional environment.

A. Description of the Project or Site

a. Location, Size, Access
b. Current Land Use of the Area
c. Surrounding Environments
d. Existing Services
e. Time Frame in which Impacts are Anticipated
f. Other Related Information

B. Knowledge Gaps

a. Identification of Knowledge Gaps
b. Corrective Measures

C. Maps and Photographs

Maps or plans at scales of 1:125,000 or larger are useful for the identification of the project area or site, and for the presentation of environmental information.

D. References

a. Technical Methodologies
   - all technical or scientific methodologies used for the EIA should be described.
b. Sources of Information

- all sources of information should be referenced and annotated.

E. Project Alternatives

a. Types of Alternatives

b. Environmental Impact of Alternatives

- impacts of alternative actions should be qualified or described so that their associated impacts may be weighed against the original project proposal.

F. Environmental Categories Description

For each of the following environmental categories a detailed description of the associated elements will be required.

a. Climate

1. Temperature
2. Humidity
3. Winds
4. Precipitation
5. Insolation and Solar Radiation

b. Hydrology

1. Rivers and Streams
2. Lakes
3. Groundwater

c. Geology

1. Bedrock Geology
2. Surficial Geology

d. Soils

1. Soil Classification
2. Soil Susceptibility
   to: - wind erosion
       - water erosion
       - frost action
3. Soil Limitations
   for: - roads
        - trails

- permanent structures
- septic tanks and absorption fields
- sewage lagoons
- sanitary landfills
- recreational use (picnic grounds, campgrounds, etc.)
- vegetation rehabilitation

4. Soil Drainage Characteristics

- slope, aspect, topography
- depth to water table
- soil drainage class

5. Permafrost

- distribution
- occurrence
- surface conditions

e. Vegetation

1. Terrestrial
2. Aquatic

f. Wildlife

1. Terrestrial
2. Aquatic

g. Cultural Resources

1. Historical
2. Archeological

h. Natural Aesthetics

Projects may alter or destroy tangible and intangible values of extreme aesthetic significance. Therefore, attempts should be made to describe the aesthetic values of the area or site where the impact is to occur.

i. Human Interest Aspects

Human interest aspects of the environment are those that provide something beyond the absolute necessities for human life; they affect a person's emotional life by adding to the enjoyment of life. A site which provides an awe-inspiring view of a waterfall would qualify for inclusion to this category. Sites providing access to or views of educational or scientific interests should be identified.

1. Educational - Scientific Significance
   - geological significance
   - ecological significance
   - archeological significance
   - historical significance
   - cultural significance

G. Identification of Environmental Impacts

Based on the information provided in Section F all primary (i.e. direct) and secondary (i.e. indirect) impacts should be clearly identified. This includes both the positive and negative impacts associated with the project. In addition, the cumulative and long-term effects of the proposed action, which either significantly reduces or enhances the state of the environment, should be projected and described.

a. Impacts

1. Long-term impacts capable of enhancing, disrupting, impairing or destroying existing features, conditions, or processes in the natural environment of the area affected by the project.

2. Long-term impacts likely to cause enhancement of, or conflict with established, traditional or historical land use and ways of life within the study area affected.

3. Long-term impacts likely to affect the livelihood, or health of segments of the human inhabitants or visitors within the area affected.

4. Long-term impacts capable of significant reduction in the environmental options within the area affected.

5. Short-term and cumulative impacts as per 1 through 4 above.

6. Impacts arising directly from site manipulation by a proposed project.

7. Impacts arising indirectly from site manipulation by a proposed project.

H. Remedial, Protective and Corrective Measures

Proposals for the avoidance and minimization of adverse impact, as well as, for the mitigation and remediation should be outlined.

a. Measures Designed to Eliminate or Minimize Impacts

1. Location Changes
2. Design Changes
3. Changes in the scheduling of the project, development or associated activities.
4. Rehabilitation of Imparied Features
5. Other Mitigations

b. Project Surveillance and Monitoring

Statements should be provided on project surveillance and monitoring of:

1. Some or all aspects of the project and their associated activities so as to minimize cumulative effects on the natural environment.
2. All of the mitigative and ameliorative measures prescribed.

I. Potential Residual Impacts

Residual impacts are those impacts remaining after all practical mitigating measures have been incorporated. The nature, extent and duration of all such impacts in the environmental, economic and social sphere and in a national, regional, local and site-specific context should be documented. In addition, wherever it may be applicable, document the relationship between local short-term uses of the environment and the

maintenance and enhancement of long-term productivity, and irreversible and irretrievable commitments of resources.

a. Residual Impacts

1. Identify and describe the environmental impacts likely to remain after all mitigating measures proposed have been applied.
2. Apply legislative, regulatory and policy documents to further reduce all residual environmental impacts through the:
   - Provincial Park Lands Act and regulations, policies and directives;
   - national and provincial legislation, regulations and standards.
3. List the nature, extent and duration of residual impacts in the social, cultural and economic spheres.
4. State the environmental significance of the potential residual impacts.
5. Identify critical information gaps and propose terms of reference for the necessary studies to complete the environmental assessment.

J. Summary

The Summary should contain a concise restatement of the positive and negative environmental, social and economic impacts, within a national, regional, local and site-specific context; the means to control the adverse impacts; and the residual impacts.

K. Literature Cited

All references cited or consulted in the preparation of the EIA should be listed in this section.

L. Appendices

Maps, plans, aerial photographs, satellite imagery and field data used during the compilation and preparation of the EIA may be appended. The appended materials should be referred to in the text of the EIA and should be used to clarify specific subjects.

4.4 RESOURCE MANAGEMENT PLAN FORMAT

The Resource Management Plan document should be prepared in accordance with the following outline.

RESOURCE MANAGEMENT PLAN FORMAT

COVER SHEET

APPROVAL PAGE

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

The Introduction should contain a brief description of the purpose of the Resource Management Plan, its relationship to other park planning documents and a statement on its dynamic nature (i.e. requirements for annual revision and review).

II. RECORD OF ANNUAL REVISION

A concise statement indicating major revisions and additions, and the justification for such action, should be recorded on a yearly basis.

III. RESOURCE MANAGEMENT PROGRAMS

1. Vegetation Resource Management

2. Wildlife Resource Management
3. Aquatic Resource Management
4. Geological Resource Management
5. Cultural Resource Management
6. Other Land Use Management
7. Site Management
8. Hazard Management

For each of the above program types there should be:

A. Resource Management Program Statement

B. Program Categories

These are the classes or groupings of resource management requirements under a common resource management category.

C. Resource Management Projects

Under each class of resource management requirements include the appropriate Resource Management Project Statements.

D. Summary of Requirements

In order to avoid an overcommitment of available financial and manpower resources the requirements of all projects over the fiscal year should be determined. If project requirements exceed the budgetary and staffing compliment appropriate action should be taken.

IV. Environmental Impact Assessments

EIA's for proposed projects may be submitted with the Resource Management document. However, it may be more appropriate to annex the EIA, rather than to include it in the Resource Management Plan document.

4.4.1 Mode of Presentation

Because the Resource Management Plan is a dynamic document that will require annual review and revision in the face of changing circumstances, the mode of presentation should accommodate this characteristic. The three-ring binder system has gained wide acceptance by many park agencies and should be considered in lieu of permanent binding.

4.5 CO-ORDINATING GOVERNMENT AGENCIES

The objectives of this section of the practicum are to identify those Manitoba Government agencies that could contribute to the formulation and implementation of park-specific Resource Management Plans; and to analyze current agency objectives, mandates and personnel infrastructure since these could become potential constraints on the implementation of the Resource Management Plan. To meet the latter objective, personal interviews with senior agency officers were conducted and the interview information was supplemented with the most recent published or unpublished documents.

4.5.1 Department of Natural Resources Agencies

4.5.1.1 Current Natural Resource Management Emphasis

Parks Branch is currently one of nine Branches in the Department of Natural Resources. The eight other Branches include: Wildlife, Forest, Fisheries, Lands, Water Resources, Operations Surveys, Operations Regional Services and Operations Engineering and Construction.

Chekay, (1979, pers. comm.) indicated that the management of Provincial Park natural resources has been decentralized to the Branches

within the Department. The Park Lands Act, which under Section 2(3)a provided Parks Branch with jurisdiction over natural resources (flora and fauna), has been amended to reflect the decentralization of authority. Parks Branch, therefore, no longer has a mandate to manage the natural resources of parks directly; this function has been transferred to the specialized natural resource management branches.

Because the preparation of Resource Management Plans should be an interdisciplinary team effort, with members specialized in a variety of natural resource management disciplines, the decentralization may have benefits. It is imperative however, that team members be familiar with the parks policy, the park purpose and the resource base of a given park, to the extent that existing and potential natural resource management problems, issues and concerns can be addressed comprehensively. With this objective in mind, the resource management planning team members could be chosen from the administrative region in which parks are situated. The Department of Natural Resources has subdivided the Province into seven administrative regions, including: 1) Eastern, 2) Southeastern, 3) Southwestern, 4) Interlake, 5) Western, 6) Northwestern and 7) Northeastern. Each region has assigned to it a natural resource management specialist from the Wildlife, Forest and Fisheries Branches (Manitoba, 1980). Water Resources Branch has a regional manager in each region. Therefore, in theory, an interdisciplinary team could consist of these specialists.

In practice, however, it will be crucial that lines of communication between Parks Branch and the other resource management agencies be established and maintained if the resource management planning effort is to be successful. A potential constraint on the implementation of Resource

Management Plans in this decentralized management system regards the operational objectives and mandates of the co-operating agencies. For example, a first priority natural resource management problem, concern or issue in a park could become a low priority concern for the resource management agency if its mandate does not explicitly provide for the amelioration of these natural resource problems, concerns or issues in Provincial Parks. A possible solution could be found in the Resource Allocation Unit which has been established to settle resource allocation disputes using an interdisciplinary decison-making approach (Bossenmaier, 1980, pers. comm.). Members of the Advisory Committee reporting to the Unit are to be appointed by the Branch Directors within the Department and be senior officers in the Department of Energy and Mines and the Environment Division, Department of Corporate and Consumer Affairs and Environment (Doan, 1980, pers. comm.). The Advisory Committee could also be responsible for the resolution of implementary constraints on Resource Management Plans.

The following subsections deal with the current objectives, mandates and personnel infrastructure of the Wildlife, Forest, Fisheries, Water Resources and Operations Surveys Branches to determine if the Resource Management Plan could be prepared and implemented successfully as a co-operative effort.

4.5.1.2 Wildlife Branch

The Wildlife Branch is best equipped to handle the 'new' responsibility of managing the wildlife[1] resources in Provincial Parks. The Branch has

---

[1] The word, wildlife, was defined in Section 2(1) of The Wildlife Act S.M. 1970, c.89 as "...a vertebrate animal of any species or type excluding fishes that is wild by nature in the province".

a mandate to administer, manage and allocate wildlife so that viable populations are maintained, and numbers are not permitted to decline to levels where recovery is doubtful. The mandate was developed in concordance with the overall objective of the Branch which stated: "...that appropriate use is made of wildlife and that the resource is passed on to future Manitobans in at least as vigorous a state as it was received by our generation". (Colpitts, 1980, pers. comm.).

The mandate continued to state that the allocation of the wildlife resource should:

1. provide for economic uses where users are pursuing a return on their investment and time;
2. provide for recreational use where the users are spending their leisure time and seeking relaxation and enjoyment;
3. provide for the use of wildlife stocks by Treaty Indians consistent with their rights, and by remote-area residents in recognition of need; and
4. provide for the use of wildlife stocks for educational and scientific purposes. (Colpitts, 1980, pers. comm.).

Numbers 2 and 4 above apply to Provincial Parks and clearly demonstrate that the wildlife resource in Provincial Parks is a management responsibility of the Wildlife Branch. However, some concern can be raised about the omission of an explicit statement on importance of preservation as a valid use of wildlife. Preservation is only implicitly expressed in the overall Branch objective and mandate number 4.

Organizationally, the Wildlife Branch is composed of four sections: 1) Wildlife Management, 2) Wildlife Planning and Allocation, 3) Wildlife Habitat Management and 4) Biological Services (Manitoba, 1980). The latter two sections would play a major role in management of the

wildlife resource in Provincial Parks. The Habitat Management Section is staffed by officers with expertise in wetland and upland habitats management and the Biological Services Section has expertise in the areas of wildlife investigation and experimentation, surveys and inventories and ecological assessment. In addition, there are wildlife specialists in the seven administrative regions in the Province.

4.5.1.3 Forest Branch

The Forest Branch has a mandate that is predicated upon The Forest Act S.M. 1964 (1st Sess.), C.19, and its corresponding regulations (Rannard, 1980, pers. comm.). Section 3 of the Act enpowers the Minister to regulate and administer all matters relating to, or in any way connected with forestry. More specifically, Section 3(c) stated that the Minister, was to regulate and administer the management, utilization and conservation of Crown forest lands and timber. Sections 4 and 6 of the Act authorized the Forest Branch, under the direction of the Minister, to administer the Act.

The Forest Branch mandate to regulate and administer all matters relating to, or in any way connected with forestry is vested in four sections: 1) Forest Management, 2) Forest Resource Inventory, 3) Forest Research and 4) Forest Protection (Manitoba, 1978a; 1980). The Forest Management Section co-ordinates all timber management and sivilcultural programs on a province-wide basis. The timber management component handles the administrative aspects of timber disposal and licensing of timber cutting authority, and the measurement and scaling of timber and forest products. Silvacultural programs involve growing and tending of forests,

which includes applied research to identify and produce trees of greater economic value, stand improvement projects to encourage greater productivity over shorter growing periods and reforestation of cutovers and poorly generating lands. The Forest Resource Inventory[1] is designed to maintain detailed information on the extent, location and availability of the forest resources in Manitoba. The data assembled for each forest management unit[2] provides information for forest management, operations, planning, economic analysis and decisions on forest allocation in the development and utilization of the total forest resource. Forest Research, is an operational form of research activity which is applied directly to operational programs: research is carried out to resolve problems that exist, or develop, as a result of programs. Research emphasis in 1978 was on forest genetics and tree improvement (Manitoba, 1978a). Finally, Forest Protection includes all aspects of fire control and the monitoring and control of forest insect pests and diseases.

In effect, the Forest Branch does not have a mandate to manage the forest resources of Provincial Parks for purely aesthetic, recreational and preservational reasons; rather, management emphasis is on the commercial aspects of forestry. Therefore, the implementation of Provincial Park forest management projects could be seriously constrained until the Forest Branch mandate is expanded to recognize park legislation and policy.

---

[1]The forest inventory maps essentially identify Ecophases. The inventory is prepared through air photo interpretation and extensive ground truthing (Best, 1979, pers. comm.).

[2]The Forest Branch has subdivided Manitoba into 10 different 'Forestry Sections' which in turn are subdivided into a total of 99 'Forest Management Units'.

Rannard (1980, pers. comm.) anticipated that forestry specialists in administrative regions would be responsible for the co-ordination of forest management projects in Provincial Parks. This responsibility was previously vested in Parks Branch forest technicians who acted as liaisons between Parks Branch and the Forest Branch.

In conclusion, some changes are warranted. Because current management emphasis is on the commercial aspects of forestry, the first consideration should address the modification of the Forest Branch mandate. The mandate should be broadened so that it is cognizant of vegetation resource management requirements in resource-based Provincial Parks. Secondly, some infrastructural changes will be required to facilitate the broadened mandate. The secondment of forestry specialists in the administrative regions may not be enough to successfully implement vegetation management projects. It would be more appropriate to designate 'Park Forester' positions within the Forest Branch.

4.5.1.4 Fisheries Branch

The Fisheries Branch overall objective is "...to ensure that the fishery resource in Manitoba is used to provide maximum benefits to Manitobans, and that the resource is protected from severe damage to be passed on to future Manitobans in at least as vigorous a state as it was received by our generation". (Hayden, 1980, pers. comm.). The Branch mandate is to manage, administer, and allocate the fishery resource. To meet this mandate, the following objectives have been established:

1. To develop and implement fisheries programs that are consistent with and designed to meet government policy objectives and to ensure adequate legislation exists to form a basis for sound fisheries management.

2. To allocate and administer the fisheries resource to maximize economic returns to the citizens of Manitoba.

3. To consult effectively with resource users regarding provincial fisheries management practices to ensure minimum infringement on user rights.

4. To monitor the effect of fishing and habitat alterations on fish stocks and to adjust fishing pressure and minimize habitat impacts in order to maintain or enhance the diversity and abundance of fish populations.

5. To enhance and diversify angling opportunities to meet recreational fishing demands in Manitoba.

6. To respect the special fishing rights of Treaty Indians through the allocation and management of the fishery resource. (Hayden, 1980, pers. comm.).

Objectives 1, 4 and 5 above are particularly germane to the management of the fishery resource in Provincial Parks. Objective 1 clearly states that the Fisheries Branch will develop and implement fisheries programs consistent with and designed to meet government policies. In this regard, the Branch does recognize the current Parks Policy objectives (Hayden, 1980, pers. comm.) to provide outdoor recreational opportunities and to preserve unique or representitive natural resources.

The Fisheries Branch is composed of four Sections: 1) Commercial Fisheries, 2) Fisheries Management, 3) Sport Fishing and 4) Biological Services (Manitoba, 1980). The latter three Sections are most important from a Provincial Park fishery resource standpoint. Biological Services contains personnel with expertise in habitat inventory and assessment, population dynamics, fish culture, and laboratory services. Fisheries Management is largely concerned with fisheries allocation. However, the regional biologists on staff in this Section could provide important input to the formulation and implementation of the Resource Management

Plans. The Sport Fisheries Section according to Hayden (1980, pers. comm.) is currently understaffed to provide a comprehensive sport fishery management program for Provincial Parks.

In conclusion, the Fisheries Branch has recognized the objectives of Parks Policy. However, this agency will require the designation of a 'Park Fisheries Officer' to ensure that fisheries management projects are successfully implemented. It will also be necessary, of course, to ensure that the Sport Fisheries Section be adequately staffed to provide a comprehensive sport fishing management program for Provincial Parks.

4.5.1.5 Water Resources Branch

The Water Resources Branch has a mandate which includes:

1. long and short-term planning and development of water resources;
2. design, construction and maintenance of provincial waterways, bridges and dams;
3. issuance of water rights licences;
4. approval of subdivision proposals;
5. flood forecasting and flood control;
6. provision of technical services to conservation districts; and
7. maintenance and operation of flood control works (Mudry, 1980, pers. comm.).

The management of Provincial Park water resources for recreational and preservational purposes will rely most significantly on the first mandate listed above. The preservation of aquatic ecosystems and the provision of recreational opportunities in parks must be considered in the long and short-range planning and development of water resources. The management of water resources in the Province by a single agency has

merit from a Provincial Park standpoint. Since the watersheds of many water courses and bodies of Provincial Parks lie beyond park boundaries, comprehensive planning in conservation districts (watershed districts) can be made to ensure that normal[1] conditions are perpetuated to maintain the integrity of unique or representative aquatic communities; or that recreational opportunities may be enhanced.[2]

The Water Resources Branch is subdivided into two Sections, these include: 1) Water Management and 2) Water Investigations (Manitoba, 1980). The Water Management Section contains officers with expertise in water development planning, which deal with water supply and conservation and drainage systems; watershed district, which on the basis of watersheds deal with flood control and planning; and control works, which involves preparation of construction standards and provision of technical and drafting services. The Water Investigations Section has expertise in groundwater and hydrological investigations.

In conclusion, the Water Resources Branch plays a significant role in park management since it has a legal mandate to manage the watersheds of many water courses and water bodies within and outside Provincial Parks. The preservation of aquatic communities and enhancement of water-based recreational opportunities is dependent on a comprehensive planning procedure and the Water Resources Branch has the technical expertise to facilitate this. To ensure that Provincial Park aquatic resource manage-

---

[1]Normal, in terms of naturally prevailing conditions that have been responsible for the existence of the aquatic community.

[2]For example, the creation of reservoirs for recreational use or the raising of water levels or maintenance of water levels during arid periods of the summer season.

ment program objectives are met will, however, require that lines of communication are open between Parks Branch and the Water Resources Branch. This does not warrant the creation of a new position within the Water Resources Branch, rather, it suggests the need for co-operation between Conservation District Officers and the appropriate Parks Branch personnel in the administrative regions and headquarters.

4.5.1.6 Operations Surveys Branch

The Operations Surveys Branch is composed of four Sections: 1) Legal Surveys, 2) Control Surveys and Mapping, 3) Geographical Mapping and 4) Map Distribution and Remote Sensing. The Map Distribution and Remote Sensing Section is the most significant of the four in terms of Provincial Park resource management planning.

The Remote Sensing Centre has the following mandate:

1. To provide assistance to government agencies in the acquisition, application, and analysis of remote sensing in the survey and management of the Manitoba environment.

2. To plan and co-ordinate airborne remote sensing data acquisition requests. (A Supplementary Aerial Photography (SAP) system provides relatively inexpensive means of collecting remote sensing data for resource information purposes).

3. To provide information on remote sensing coverage of Manitoba and to maintain a technical reference library to provide specific documentation related to a variety of disciplines.

4. To organize and co-ordinate lectures, seminars, and workshops on remote sensing.

5. To develop the use of remote sensing, the Centre provides assistance in the operation of interpretation equipment in the analysis of satellite and airborne data. (Dixon, 1980, pers. comm.).

The Remote Sensing Centre has assisted Parks Branch in a number of ecological terrain evaluations based on ELC methodology. Area studies in Grass River Provincial Park and Whiteshell Provincial Park are two of the most recent examples (Forrester, 1979, pers. comm.). A review of two studies prepared by Forrester (1977; 1978) indicated that the Centre has the expertise to conduct natural resource inventories in Provincial Parks. However, the Centre is not adequately staffed to conduct the natural resource inventories itself and could only co-ordinate such activities if contracted to the private sector. In addition, Dixon (1979, pers. comm.) indicated that the Centre could obtain access to a computerized land data base system for the storage, retrieval and manipulation of resource data at the request of a client agency.

In conclusion, the Remote Sensing Centre could co-ordinate resource inventories for resource-based Provincial Parks awarded on a contractual basis to the private sector. However, the Department of Natural Resources should be made to realize that expertise and familiarity with resources developed in conducting resource inventories is lost once the contract requirements have been met. Considering the very practical nature of the Ecological Land Classification approach to resource management decision-making in other parts of Canada, serious consideration should be given to expanding the responsibilities of the Remote Sensing Centre. The future benefits of such an expansion would in my opinion significantly outweigh the costs, since, this resource management decision-making tool could provide a valuable input for the management of all crown lands in the Province.

4.5.2 Other Manitoba Government Agencies

4.5.2.1 Environment Division, Department of Consumer and Corporate Affairs and Environment

The Environment Division according to Ward (1979, pers. comm.) has a broad mandate which covers the areas of ecosystem management and public health. The most significant aspects of the mandate from a Provincial Park resource management perspective include the following:

1. The protection and enhancement of the environment; to determine and anticipate environmental needs, to ensure the development and availability of necessary facilities and services to meet these needs, and to plan and effect programs relevant to the preservation, restoration and enhancement of the human, urban, rural and *recreational environment*.

2. The carrying out of a development and research function for the environmental monitoring of air, land and water and the maintenance of a program of investigation and research designed to provide continuing knowledge of the environmental status of the Province of Manitoba, the identification of conditions associated with pollution, and the implementation of the most effective technical techniques and administrative methods of pollution prevention.

Because the Environment Division is charged with the administration and enforcement of The Clean Environment Act S.M., 1968, c. 7 and its regulations, and the Clean Environment Commission Orders (Ward, 1979, pers. comm.), the management of the environment[1] has taken on a pollution[2] control emphasis. This may be seen to be implicitly reflected in the

---

[1] The word, environment, encompasses the human environment which includes all urban, rural, and recreational areas. (This definition was obtained from the Environment Division).

[2] The definition of pollution is dependent on the public' decision as to what use it wants to make of the environment: Human use defines what level of environmental quality is necessary for that particular use. Therefore, pollutants are those substances which interfere with the use of air, water, or soil for socially desired purposes.

mandate above.

The Environment Division is currently composed of three Sections: 1) Research and Development, 2) Program Development and Review, and 3) Environmental Control. Ward (1979, pers. comm.) indicated that the Environment Division could provide Parks Branch and the other Department of Natural Resources agencies managing the resource base of Provincial Parks with technical expertise on matters concerning environmental quality. The Environmental Control section contains officers with expertise in air, water, soil and noise pollution control.

4.5.2.2 Historic Resources Branch, Department of Cultural Affairs and Historical Resources

The Historic Resources Branch's mandate for the planning and management of historic and archeological resources in the Province of Manitoba is predicated on Sections 12(1) and 27(4) of The Planning Act. S.M., 1975, c. 29 and The Historic Sites and Objects Act. S.M., 1966-67, c. 22.

The mandate of the Historic Resources Branch is:

1. To enrich the fabric of life of the province by engendering in the people who live and visit here a respect and understanding for the groups, individuals, places that have shaped Manitoba.

2. To engender a new respect and attitude towards the accomplishments of our Native citizens.

3. To engender an attitude of respect towards and use of some of the more architecturally-sound and significant buildings in Manitoba.

4. To preserve, protect, restore, reconstruct, commemorate and interpret the significant themes in the history of the province in a balanced, well-co-ordinated manner.

5. To contribute to the quality and enjoyment of life in Manitoba. (Pettipas, 1979, pers. comm.)

The Historic Resources Branch is composed of three sections: 1) Restoration Architecture, 2) Historic Research and 3) Archaeology. In terms of cultural resources management in Provincial Parks, the Archaeology Section would play the most significant role.

Within the context of the overall Branch mandate given above, the goals of the Archaeology Section are: "to preserve, protect, restore, reconstruct and interpret the significant themes in the human history of Manitoba from the first evidences of man in this Province over 12,000 years ago through to and including the period of European contact; and to relate this story to residents and visitors alike". (Pettipas, 1979, pers. comm.).

The Provincial Park Lands Act under Sections 12(1) and 12(2) enpower the Minister responsible for Provincial Parks to establish regulations regarding preservation, management control or improvement of cultural resources. However, under Section 15 of The Historic Sites and Objects Act, the Historic Resources Branch is entitled to the right of investigation of sites for artifacts and paleontological objects[1] 'in, at, or under, any land'. In addition, Sections 12(1)f and 27(4)v of The Planning Act enable the Historic Resources Branch to identify and preserve, protect or enhance areas of land, buildings and structures, by reason of their historical and archeological significance. Therefore,

---

[1]The Historic Sites and Objects Act defines 'Artifact' as "(i) that is the product of human art or workmanship or both; (ii) that is of value primarily for its historic or archeological importance or interest; and (iii) that is or has been discovered above or beneath the surface of earth, whether by human activity or natural cause. 'Paleontological object' was defined as the remains, or fossil, or other object indicating the existence, of extinct or prehistoric animals or plants...".

one could conclude that the Historic Resources Branch has a vested interest in the preservation of cultural resources found in Provincial Parks.

4.5.3 Resource Management Co-ordination Shortcomings

Having reviewed the current management emphasis in Section 4.5.1.1 and the co-operating agencies' mandates and objectives, it will now be necessary to focus on a major shortcoming in the management of the Provincial Park resource base.

The major difficulty with the decentralized management approach will occur at the implementary stage of the Resource Management Plan. The implementation of certain management projects may be forestalled due to: 1) a lack of technical expertise or manpower within the Department of Natural Resources; or 2) because of an unclear understanding of management jurisdiction. What agency, for example, would have the technical expertise or responsibility for the implementation of a grassland management project designed to reintroduce extirpated species to a park?

The resolution of these implementary constraints on the Resource Management Plan will require some modification in government agency mandates and personnel infrastructure as noted above. This conclusion can be substantiated by examining other decentralized park resource management approaches. For example, the Illinois Department of Conservation, Division of Planning, is responsible for the planning requirements of a variety of State properties which includes State Parks. Resource Management is decentralized to divisions with appropriate expertise.

Fraser (1979, pers. comm.) indicated, however, that much better results could be achieved if there were specialists in the divisions with principal responsibilities of providing an input to the management planning process.

The Manitoba Parks Branch must also play a central role in the co-ordination of resource management activities in Provincial Parks. Central co-ordination will be required to ensure that other government agencies responsible for the management of park resources comply with park legislation and policy and that all management actions are consistent with the park purpose. A 'Resource Management Co-ordinator', as the title implies, could be designated the responsibility of co-ordinating resource management activities in Provincial Parks. Principal duties could include: 1) the co-ordination of an interdisciplinary resource management planning team consisting of resource management specialists from other government agencies; and 2) the presentation of unforeseen implementary constraints to the Advisory Committee in the Resource Allocation Unit for resolution.

In addition, to deal effectively with the unforeseen implementary constraints on resource management projects, the Department of Natural Resources may exercise one of two of the following options depending on the magnitude and duration of the project:

1. If the project is of small magnitude and short duration requiring little future supervision, the Department could enter into contractual agreement with appropriate private institutions and organizations.
2. If the project is of greater magnitude and long

duration requiring constant future supervision, the Department could create special term 'extension' units composed of officers with the needed expertise.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The objective of the practicum was to produce a framework for the preparation of a Resource Management Plan for Manitoba's resource-based provincial parks. Three sub-objectives provided overall guidance for the formulation of the framework, these were: 1) to use the ecosystems concept in the preparation of the framework where possible, 2) to identify approaches for the collection, storage, retrieval and evaluation of natural resource inventory data; and 3) to identify other Manitoba government agencies responsible for the co-operative management of park resources.

An extensive literature review, which provided a number of valuable resource management planning insights, was conducted to satisfy the principal objective. A significant finding was that the resource management planning process relied upon a comprehensive and systematic methodology for the collection of natural resource inventory data. The subsequent evaluation of these data served two important functions: it identified opportunities and limitations for park development based on resource sensitivity; and helped to isolate resource problems, issues or concerns. In effect, the *resource inventory and evaluation*, as an integral component of park resource management, demonstrated the integrated nature of the total park management decision-making procedure: Information from the resource inventory and evaluation provided criteria for the preparation of both the Master Plan and the Resource Management Plan.

Natural resource inventories may be categorized as thematic or integrated. The benefits and costs of applying either approach were

briefly identified and, over the short and long-term, the costs associated with the thematic inventory approach outweighed the benefits. While the integrated approach is initially more complex, it comes closest to implementing the ecosystems concept. The integrated resource inventory is a procedure in which ecological land units serve as a framework for the collection of natural resource data. The information collected is readily interrelated and provides an ecological view of park natural resources. The thematic approach, on the other hand, horizontally separates the components of the landscape into themes, such as soils and vegetation, and fails to provide an appreciation of interrelationship.

The Ecological Land Classification (ELC) approach to ecological land survey currently used by Parks Canada in its Inventory Program has demonstrated its practical nature. Use of the ELC in the resource management decision-making process across Canada affirms the usefulness of the technique. Therefore, Manitoba Parks Branch should consider adopting the ELC approach to resource inventory and evaluation for the following reasons:

1. The ELC approach is consistent with resource management planning requirements of Provincial Parks.
2. By presenting resource data in an integrated format, the ELC approach provides an ecological understanding of the natural environment, which in turn is crucial for the formulation of comprehensive environmental impact statements.
3. The ELC approach presents resource data at a common scale thereby facilitating an appreciation of interrelationships between environmental components.

4. The hierarchical structure of the ELC:
   a) allows the most effective use of remote sensing technology;
   b) reduces or eliminates unnecessary and costly duplications; and
   c) has a 'built-in' provision for subsequent more intensive investigations of selected areas in a park.

5. The ELC approach may be used to facilitate a variety of park management purposes (e.g. engineering, interpretation/education) in a comprehensive and effective manner.

6. The ELC approach has been proven to be cheaper than the thematic and readily facilitates the computerization of resource data. This latter feature makes the approach attractive since an informed, resource management decision-making process requires that resource data can be easily retrieved and manipulated.

Currently, the Manitoba Parks Branch is reviewing its master planning process for Provincial Parks. Due to the integrated nature of total park planning and management, three major recommendations should be made with respect to the resource inventory and evaluation stages in master planning:

1. The master planning process for resource-based Provincial Parks should be initiated by the classification and survey of primary natural resource elements based on the ELC methodology.

2. For practical purposes the ELC approach to an integrated resource inventory and evaluation should only be conducted at two levels of detail in master planning.

a) *Reconnaissance Level.* This level provides a quick overview of the broad landscape units and associated vegetation defined as Ecodistricts and Ecoregions and presented at scales smaller than 1:100,000.

b) *Detailed Reconnaissance Level.* At the general working level, the Ecosite Management Units of the park should be defined for resource management planning purposes. However, only the Ecosections, mapped as components of an Ecodistrict at intermediate scales, should be used in the preparation of Master Plans. Detailed resource base information provided at the Ecosite level for an entire park is impractical since the costs of obtaining the data exceed the benefits associated with its use: the level and degree of park management decision-making does not require an intensive resource inventory of the entire park.

3. The resource inventory and evaluation should play an integral role in the establishment of land use zones. Land use zone boundaries should be delineated to include or exclude complete Ecosite Management Units.

As mentioned in b above, *Ecosite Management Units* should be defined for resource management planning purposes. Modified to include wildlife, Ecosite Management Units isolated for an entire park could be employed for the:

1. establishment of Master Plan land use zones;
2. preparation of environmental impact assessments for sites or areas scheduled for park development or allocation of resources to consumptive uses such as right-of-ways, logging, mining, etc.
3. management of flora and fauna requiring detailed ecological information, e.g. wildlife population

management, fire management, forest insect management; and

4. monitoring of areas and sites for natural ecological changes or changes induced by human activity.

A survey of Canadian and American park agencies revealed that the Resource Management Plan (i.e. a sub-activity plan) was a complementary extension of a Master Plan. Based on the evaluation of information gathered in the survey, three reasons emerged suggesting that the Resource Management Plan be prepared concurrently and under the guidance of the Master Plan:

1. The Master Plan provides the legislative and policy background for resource management.

2. Master Plan land use zoning influences the character of resource management that will be required within a park.

3. The resource management planning process becomes visible to the public and demonstrates that active steps are being taken to preserve and conserve park resources. Public recognition and acceptance of resource management objectives are crucial for successful park management programs.

Secondly, the review of survey information revealed the Resource Management Plan was not a 'one-man' job; rather, it required the expertise of an interdisciplinary team whose members were familiar with park resources.

Current emphasis in the Department of Natural Resources is towards the complete decentralization of resource management in parks to the appropriate resource Branches. While decentralization may be compatible for resource management planning through the provision of expertise, a

major shortcoming should be noted. A major problem with the complete removal of resource management jurisdiction from Parks Branch is the failure on the part of the Department to recognize that planning is inextricably tied to management: planning provides management direction and scope, whereas, management implements planning recommendations.

The complete decentralization of resource management jurisdiction may seriously jeopardize the effective management of Provincial Park resources. While in theory other Branches should be best suited to develop interdisciplinary resource management programs, in practice, parks work is likely to get low priority consideration; the sections involved are likely unfamiliar with and unsympathetic to park policy, especially that related to preservation. Therefore, while decentralization is compatible with the requirements of the creation of an interdisciplinary resource management planning team, there will still be a need for central co-ordination to ensure that resource management programs are developed to meet the objectives of Provincial Parks, as established in park legislation, regulations and policy.

Ideally, the interdisciplinary team should be composed of a team leader and members from co-operating government agencies and Parks Branch. The team leader responsible for co-ordinating the preparation of the Resource Management Plan programs should be appointed on the basis of diversified resource management expertise; an appreciation of resource management requirements in light of park legislation, regulations and policy; and a thorough understanding of the purpose of resource-based Provincial Parks. The selection of team members from appropriate Branches within the Department of Natural Resources and the Historic Resources

Branch, Department of Cultural Affairs and Historic Resources, will also be required. Because resource management planning and the subsequent implementation of programs will require a great expenditure of time, the secondment of officers in the Wildlife, Forest, Fisheries and Historic Resources Branches may be inadequate for the preparation and implementation of comprehensive resource programs. Therefore, the Government of Manitoba should consider designating park resource officers in each of these Branches.

Park managers, senior park naturalists and park conservation officers should also be a part of the planning team since these persons are most familiar with the resources of a park; and secondly, their input to the planning process will ensure greater co-operation in the implementation of resource management programs.

Figure 5.1, an organizational flow chart, identifies the ideal resource management planning team. Parks Branch should provide the team leader (Resource Management Co-ordinator) with the authority to mobilize the manpower needed from the other Branches.

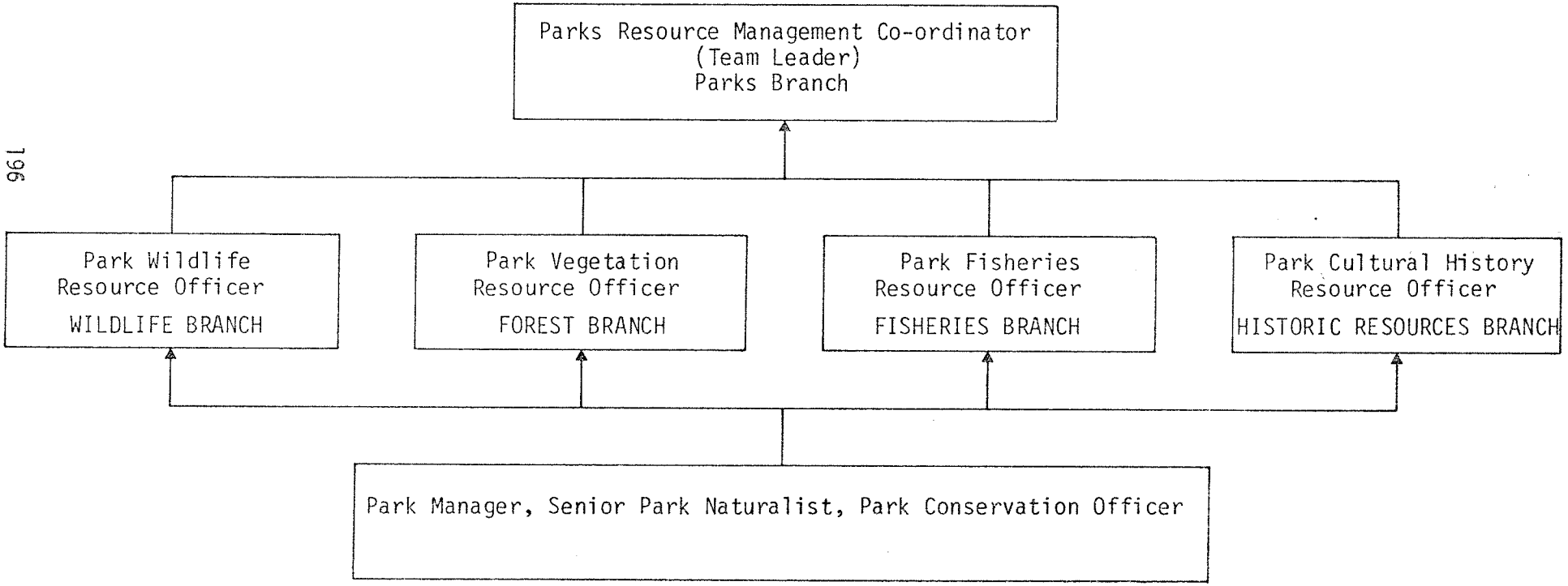


Figure 5.1 *Organization flow chart of the ideal resource management planning team.*

LITERATURE CITED

Anon.
1978 Illinois natural areas inventory. Landscape Architecture Magazine. 1SPS (304-620): 398-400.

Adirondack Park Agency.
1979 A citizen's guide to Adirondack Park Agency land use regulations. Essex Industries, Mineville, New York. 24 p.

1972 Private land resource capability; inventory rept. 1. Adirondack Park Agency, Ray Brook, New York. 16 p. and appendix.

Alberta Parks Division.
1979 Master Plan for Cypress Hills Provincial Park. Alberta Parks Division, Department of Recreation, Parks and Wildlife, Edmonton, Alberta.

Brockman, C.F. and L.C. Merriam, Jr.
1973 Recreational use of wild lands, 2nd. Edition. McGraw-Hill Book Company, New York.

Brown, C.S.
1969 Towards integrated resource management: Report of the Subcommittee on Multiple Use. National Committee on Forest Land, Quebec. 34 p.

Campbell, Colin K.
1976 Future symptoms, p. 74 - 132. In Canadian Outdoor Recreational Committee; Parks and recreation futures in Canada. Queen's Printer, Victoria, British Columbia.

Canada Committee on Ecological (Biophysical) Land Classification (CCELC).
1979 Applications of ecological (biophysical) level classification in Canada. Proc. 2nd. Meeting Canada Land Class., 1978. Ecol. Land Class. Ser. No. 7 Supply and Services, Canada, Ottawa. 396 p.

1979a Newsletter No. 6. Lands Directorate, Environment Canada, Ottawa, 6 p.

1976 Newsletter (ed. E. Wiken). No. 2 Lands Directorate, Fisheries and Environment Canada, Ottawa, 6 p.

1980 Land/Wildlife integration. Ecol. Land Class. Ser. No. 11 Lands Directorate, Environment Canada, Ottawa, 160 p.

Carbyn, Ludwig N.
1978 Is the concept of ecosystem management valid in the context of National Parks. (A preliminary draft) mimeo. Canadian Wildlife Service, Edmonton, Alberta. 99 p.

Christian, C.S. and G.A. Stewart.
1957 The concept of land units and land systems. Proc. Pacific Sci. Conf. 20: 74-80.

Clawson, Marion.
1975 Compatibilities and incompatibilities in multiple uses of forests. Trans. North Amer. Wildlife Nat. Res. Conf., 1975: 157-167.

Clawson, Marion, R. Burnell Held and Charles H. Stoddard.
1960 Land for the future. The John Hopkins Press, Baltimore, 570 p.

1960a The dynamics of park demand. Bulletin of the Regional Plan Association: 94(2): 39-58.

Conservation Foundation.
1972 National parks at the crossroads: drawing the line where protection ends and overuse begins. Conservation Foundation Letter, p. 1-12, (September).

Dasmann, William P.
1945 A method for estimating carrying capacity of range lands. Journal of Forestry 43(6): 400-402.

Daubenmire, Rexford.
1968 Plant communities: A textbook of plant synecology. Harper and Row, New York. 300 p.

Day, David.
1979 Ecological resource inventories in national parks: concepts and methods. Draft Report. Natural Resources Division, Parks Canada, Ottawa. n.p.

Dolan, Robert, Bruce P. Hayden and Gary Soucie.
1978 Environmental dynamics and resource management in U.S. National Parks. Environmental Management 2: 249 - 258.

Dumanski, J. (Ed.)
1978 The Canada soil information system (CanSIS): Manual for describing soils in the field. Lands Research Institute, Canada Department of Agriculture, Ottawa. 92 p. and appendix.

Edwards. B.
1973 The ecosystem concept in park management: How widely can it be applied? p. 60-64. In Some directions for the future of wildlife management in North America. Faculty of Environmental Design, University of Calgary, Calgary, Alberta.

Environment Canada, Lands Directorate.
1978 The Canada Land inventory: objectives, scope and organization. Rept. No. 1 Supply and Services Canada, Ottawa. 61 p.

Ford-Robertson, F.C. (ed.)
1971 Terminology of forest science, technology, practice and products. Society of American Foresters, Washington, D.C. 349 p.

Forrester, Don.
1978 Ecological terrain analysis: Whiteshell study 1978. Tech. Doc. 3. Lands and Surveys Division, Manitoba Department of Mines,Natural Resources and Environment, Winnipeg, Manitoba. 73 p.

1977 Terrain analysis and land suitability study: Sandy Bay-Cross Lake, Manitoba. Planning Branch, Department of Renewable Resources and Transportation Services, Winnipeg, Manitoba. 27 p.

Gantcheff, G., P. Glaude and P. Normandeau.
1979 The applications of the James Bay ecological inventory: A manager's appreciation, p. 239-249. In Proc. 2nd. Meeting Can. Comm. Ecological Land Class., 1978 Ecol. Land Class. Ser. No. 7. Supply and Services Canada, Ottawa. 396 p.

Gimbarzevsky, Philip.
1978 Land Classification as a base for integrated inventories on renewable resources, p. 169-177. In Integrated inventories of renewable natural resources: Proceedings of the workshop. General Tech. Rept. RM-55. Rocky Mountain Forest Range Exp. Stat., Forest Service, U.S.D.A.

Gimbarzevsky, P., N. Lopoukhine and P. Addison.
1978 Biophysical resources of Pukaskwa National Park. Inform. Rept. FMR-X-106. Forest Management Institute, Environment Canada. 129 p.

1977 L'Anse Aux Meadows National Historic Park integrated survey of biophysical resources. Inform. Rept. FMR-X-99. Forest Management Institute, Environment Canada, Ottawa. 113 p.

Hall, F.C.
1976 Classification, designation, identification=confusion. Regional Guide No. 4 Pacific Northwest Region, Forest Service, U.S.D.A. 11 p.

Hart, William J.
1966 Systems approach to park planning. International Union for the Conservation of Nature and Natural Resources, Morges, Switzerland. 118 p.

Hendee, John C. and Russ Koch.
1978 Wilderness management planning, p. 151-167. In J.C. Hendee, G.H. Stankey and R.C. Lucus (Ed.), Wilderness management. Misc. Publ. 1363. Forest Service, U.S. Department of Agriculture, Washington, D.C.

Hills, G. Angus
1976 An integrated iterative holistic approach to ecosystem classification, p. 73 - 97. Proc. 1st. Meeting Canada Land Class., 1976. Ecol. Land Class.Ser. No. 1 Land Directorate, Environment Canada.

1960 The classification of forest productivity systems. Paper presented at the Fifth World Forestry Congress, Seattle, Washington. 35 p.

Holling, C.S. (ed.)
1977 Adaptive environmental assessment and management. Rep. PR-6. Institute of Resource Ecology, University of British Columbia, Vancouver, B.C. 595 p. and appendices.

Holroyd, Geoffery L.
1979 The biophysical wildlife inventory of Banff and Jasper National Parks, p. 39-45. In Land/Wildlife integration. Draft Report. Ecol. Land. Class. Ser. No. 7 Lands Directorate, Environment Canada.

Houston, Douglas B.
1971 Ecosystems of National Parks. Science 172: 648-651.

Illinois Department of Conservation.
1979 Master management plans: The product and the process. Division of Planning and Design, Illinois Department of Conservation, Springfield, Illinois, 20 p.

1978 Pere Marquette State Park master management plan. Division of Planning and Design, Illinois. Department of Conservation, Springfield, Illinois. 111 p.

1978a Summary report: Illinois natural areas inventory. Contract #50-75-226. Natural Areas Section, Illinois Dept. Conserv., Springfield, Illinois, 27 p.

Kilgore, B.M.
1976 From fire control to fire management: an ecological basis for policies. Trans North Amer. Wildlife Nat. Res. Conf., 41: 477-493.

La Page, Wilbur F.
1963 Some sociological aspects of forest recreation. Journal of Forestry 61(1): 32-36.

Lacate, D.S.
1969 Guidelines for biophysical land classification. Canadian Forest Service Publ. No. 1204. Canadian Forestry Service, Ottawa, 61 p.

Leopold, Aldo.
1933 Game management. Charles Scribner's Sons, New York, 431 p.

Lewis, Philip H.
1961 Recreation and open space in Illinois. Bureau of Community Planning, University of Illinois, Urbana, Illinois. 162 p.

Linn, Robert M.
1976 Introduction to master planning. Parks Magazine 1(1): 5-8.

Mabbutt, J.A.
1968 Review of Concepts of land classification. In Land evaluation, Papers of a Commonwealth Scientific and Industrial Research Organization symposium, Canberra, 1968, p. 11-28. G.A. Stewart, ed. Macmilliam of Australia, South Melbourne.

Manitoba, Department of Natural Resources.
1980 Organizational charts. (mimeo). Winnipeg, Manitoba. 35 p.

Manitoba Department of Mines, Natural Resources and Environmental Management.
1978a Department of Mines, Natural Resources and Environment Annual Report. Manitoba Government Publ. 1699 Queen's Printer, Winnipeg, Manitoba, 114 p.

Manitoba, Department of Mines, Natural Resources and Environment.
1978b Lands and surveys, forestry, fisheries and wildlife annual report. Queen's Printer, Winnipeg, Manitoba. 72 p.

Manitoba, Department of Renewable Resources and Transportation Services.
1978 Wildlife protection in Manitoba. Information Ser. 78-2. Department of Renewable Resources and Transportation Services, Winnipeg, Manitoba. 4 p.

Manitoba, Department of Mines, Resources and Environmental Management.
1976 An environmental assessment and review process for proposed provincial projects. Department of Mines, Resources and Environmental Management, Winnipeg, Manitoba. 14 p.

Manitoba, Department of Tourism, Recreation and Cultural Affairs, Parks Branch.
1974 Criteria for provincial park lands classification. (mimeo). n.p.

Manitoba, Department of Tourism, Recreation and Cultural Affairs, Parks Branch.
1974a Master plan program. Queen's Printer, Winnipeg, Manitoba. 8 p. and appendices.

Nuxoll, Richard.
1975 Park systems planning in Manitoba. Parks Branch, Manitoba Department of Tourism, Recreation and Cultural Affairs, Winnipeg, Manitoba. 23 p. and appendices.

Ontario Parks Branch.
1978 Planning and management policies. Ontario Parks Branch, Ministry of Natural Resources, Toronto, Ontario. n.p.

Odum, Eugene P.
1971 Fundamentals of ecology, 3rd. edition. W.B. Saunders Co., New York. 574 p.

1959 Fundamentals of ecology, 2nd. ed. W.B. Saunders Co., Philadelphia and London. 546 p.

Ojamaa, Peter M.
1978 Biophysical analysis and evaluation of capability. Little Smoky Area. ENR Rept. No. 60 Alberta Department of Energy and Natural Resources, Edmonton, Alberts. 28 p.

Oswald, E.T. and J.P. Senyk.
1977 Ecoregions of the Yukon Territory. Canadian Forestry Service, Environment Canada, Victoria, British Columbia. 114 p.

Parks Canada
1979 The natural resource management process manual. Natural Resources Division, National Parks Branch, Ottawa. n.p.

1979a Planning process for national parks. National Parks Branch, Ottawa, n.p.

1978 Resource management analysis Point Pelee National Park: proposals and summary (unpublished document) Natural Resource Conservation, Parks Canada, Ontario Region, Cornwall, Ontario. n.p.

Peterson, Everet B. and Janet B. Wright (ed.)
1978 Northern transitions: Northern resource and land use policy. M.O.M. Printing, Ottawa. 319 p.

Reid, Neil J.
1968 Ecosystem management in National Parks. Trans North Americ. Wildlife Nat. Resources Conf. 33: 160-169.

Rees, William E.
1977 The Canada Land inventory in perspective; rept. No. 2. Lands Directorate, Fisheries and Environment, Canada, Ottawa. 40 p.

Rowe, S.J.
1961 Levels of integration in ecology. Ecology 42: 239-259.

Pettipas, Leo. Undated.
An introduction to the archeology section, Government of Manitoba. (mimeo). Department of Tourism, Recreation and Cultural Affairs. Winnipeg, Manitoba. 9 p.

Schwarz, Charles F., Edward C. Thor and Gary H. Elsner.
1976 Wildland planning glossary. Gen. Tech. Rept. PSW-13/1976. Forest Service, U.S.D.A. Berkeley, Californis. 252 p.

Skydt, Paul E.
1979 Resource conservation and management in Alberta Provincial Parks. (mimeo.) Resource Assessment and Management Section, Alberta Provincial Parks Division. 21 p. and appendices.

Smathers, Garrett A.
1975 Historical overview of resource management planning in the National Park Service. National Park Service Science Centre, Denver, Colorado. 18 p. and appendix.

Spurr, Stephen H.
1969 The natural resource ecosystem, p. 3-7. In G.M. Van Dyne (ed.). The ecosystem concept in natural resource management. Academic Press, New York.

Switzer, W.A.
1977 The Canada geographic information system CGIS: an overview. Draft report. Lands Directorate, Fisheries and Environment Canada, Ottawa, n.p.

Theberge, John B.
1978 An evaluation of natural resource planning and management in Canadian National Parks. University of Waterloo, Waterloo, Ontario. 65 p.

U.S.D.A., National Forest Service.
1974 Forest Plan White Mountain National Forest. National Forest Service Eastern Region, Laconia, New Hampshire. 77 p.

U.S.D.I., National Park Service.
1978 Planning process guidelines: NPS-2 National Park Service, Washington, D.C. n.p.

1978a Instructions for the preparation of the natural resources management plan. Unpublished document prepared by the Office of the Chief Scientist, Washington, D.C. 31 p.

1976 Environmental assessments and statements guideline: NPS-12. National Park Service, Washington, D.C. n.p.

1974 Resources basic inventory handbook. (A preliminary draft). mimeo. National Parks Service, Washington, D.C. 10 p. and appendix.

Van Camp, Jack.
1973 The ecosystem approach to national park management as evolved by several parks in the United States, p. 50-59. In Some directions for the future of wildlife management in North America. Faculty of Environmental Design, University of Calgary, Calgary, Alberta.

Van Dyne, G.M. (Ed.)
1969 The ecosystem concept in natural resource management. Academic Press, New York, 383 p.

Walker, B.C.
1978 Biophysical land classification of Banff National Park; progress rept. no. 4, 1977-78. Parks Canada Western Region, Calgary, Alberta.

Wang, Darsan.
1979 Manitoba's Provincial Parks attitude and perception study, 1979. (mimeo.) Parks Branch, Department of Natural Resources, Winnipeg, Manitoba. 42 p.

Wauer, Roland H.
1977 Resource Management Plans. (mimeo.). Paper presented at Great Smoky Mountains National Park. Southwest Region, U.S. National Park Service. 17 p.

Wiken, E. and D. Welch.
1979 An interdisciplinary basis for resource studies: The Ecological Land Survey. Paper presented at the Resource Inventory Workshop on October 1979 in Whitehorse, Yukon Territory. Lands Directorate, Environment Canada, Ottawa, n.p.

Wiken, E.G.
1978 The role of national and international co-ordination in ecological land classification, p. 183-191. In Integrated inventories of renewable natural resources: Proceedings of the Workshop. Gen. Tech. Rept. RM-55 Rocky Mountain Forest Range Exp. Stat. Forest Service, U.S.D.A.

1978a Ecological (biophysical) land classification. An evaluation of methodologies. Draft Rept. Lands Directorate, Ottawa. 79 p.

Wiken, E.B. and G. Ironside.
1977 The Development of ecological (biophysical) land classification in Canada. Landscape Plan. 4: 273-275.

PERSONAL COMMUNICATIONS

Axtall, Craig. Resource Manager, Everglades National Park, U.S. National Park Service. Homestead, Florida.

Barlow, Jim. Natural Resource Management Co-ordinator, Resource Conservation, Parks Canada, Prairie Region. Winnipeg, Manitoba.

Benson, Donald. Chief, Professional Support Division, U.S. National Park Service, Denver Service Centre. Denver, Colorado.

Bossenmaier, Eugene. Head, Planning and Allocation Section, Wildlife Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Colpitts, Lorne. Acting Chief, Wildlife Management Section, Wildlife Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Chekay, Douglas. Resource Management Specialist, Parks Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Dixon, Roy. Remote Sensing Technologist, Remote Sensing Centre, Operations Surveys Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Doan, Ken H. Head, Resource Allocation Unit, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Fraser, William E. Landscape Architect, Division of Planning, Illinois Department of Conservation. Springfield, Illinois.

Forrester, Don. Resource Planner, Remote Sensing Centre, Operations Surveys Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Humphreys, Marshall. Resource Manager, Nevada Division of State Parks. Carson City, Nevada.

Gimbarzevsky, Philip. Program Chief, Integrated Resource Surveys, Forest Management Institute, Canadian Forestry Service. Ottawa, Ontario.

Hayden, Worth. Director, Fisheries Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Jubenville, Alan. Associate Professor of Resource Management. School of Agriculture and Land Resource Management, Agricultural Experiment Station, University of Alaska. Fairbanks, Alaska.

Moore, Vincent J. Executive Director. State of New York Executive Department, Adirondack Park Agency. Ray Brooks, New York.

PERSONAL COMMUNICATIONS (Cont'd)

Mudry, Nestor. Director. Planning Section, Water Resources Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Pettipas, Leo. Head, Archeology Section, Historic Resources Branch, Manitoba Department of Cultural Affairs and Historic Resources. Winnipeg, Manitoba.

Rannard, Dave. Chief, Forest Management Section, Forest Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Seel, Kurt. Natural Resource Management Co-ordinater, Resource Conservation, Parks Canada Western Region. Calgary, Alberta.

Skydt, Paul E. Head, Resource Assessment and Management, Planning and Design Branch, Parks Division, Alberta Department of Recreation, Parks and Wildlife. Edmonton, Alberta.

Wang, Darsan. Systems Planning Section, Parks Branch, Manitoba Department of Natural Resources. Winnipeg, Manitoba.

Ward, William. Director, Program Development and Review, Environment Division, Manitoba Department of Corporate and Consumer Affairs and Environment. Winnipeg, Manitoba.

Wauer, Roland. Chief, Natural Resources Division, U.S. National Park Service. Washington, D.C.

APPENDIX 1a

Categorization of Provincial Parks
By Classification and Size

APPENDIX 1a

Provincial Park Classification	Park Name	Size (acres)	Number
Provincial Natural Parks	Assessippi	6,080	1
	Beaudry	2,176	2
	Birds Hill	8,704	3
	Clearwater Lake	147,200	4
	Duck Mountain	314,980	5
	Grand Beach	6,080	6
	Grass River	565,760	7
	Hecla	213,376	8
	Nopiming	355,200	9
	Spruce Woods	61,440	10
	Turtle Mnt.	46,720	11
	Whiteshell	675,840	12
	Total	2,403,556 acres 972,705.8 ha	
Provincial Recreation Parks	Amaranth Beach	4	1
	Bakers Narrows	450	2
	Beaver Creek	47	3
	Billy Boy	6	4
	Birch Point	31	5
	Burge Lake	20	6
	Camp Morton	658	7
	Cranberry Portage	94	8
	Crane River	10	9
	Grand Valley	72.7	10
	Grindstone	63,805	11
	Hnausa	27	12
	Lake St. Martin	16	13
	Lee River	60	14
	Lundar Beach	24.7	15
	Lynch Point	85	16
	Manipogo	127.5	17
	Margaret Bruce	16.5	18
	Methley Beach	119	19
	Moose Lake	2,364	20
	Norquay	107	21
	Oak Lake	25.4	22
	Overflowing River	33.5	23
	Paint Lake	55,950	24
	Patricia Beach	152	25
	Pelican Lake	13.5	26
	Pine Falls	31.5	27
	Poplar Bay	31	28
	Rainbow Beach	118	29
	Rivers	15.2	30
	Rock Lake	8	31
	Rocky Lake	60	32
	St. Ambroise Beach	41	33
	St. Malo	205.91	34
	St. Norbert	14	35
	Steeprock River	29	36

APPENDIX 1a

Provincial Park Classification	Park Name	Size (arces)	Number
Provincial Recreation Parks (cont'd)	Stephenfield	187.95	37
	Wallace Lake	52	38
	Wanipigow River	15	39
	Watchorn	21.8	40
	Waterhen Ferry	5	41
	William Lake	293	42
	Winnipeg Beach	95	43
	Zed Lake	30	44
	Total	125,572.16 acres 50,818.36 ha	
Provincial Heritage Parks	Elk Island	2,473	1
	Memorial	10	2
	Total	2,483	
Provincial Special Use Parks	Kirkella Information Plaza	5	1
	Kerr Lake	48.1	2
	Lac du Bonnet Trailer Village	40	3
	Spring Hill Winter Park	30	4
	Total	123.1 acres 49.82 ha	
Provincial Wayside Parks	Agassis	5	1
	Bakers Narrows	5	2
	Bell Lake	5	3
	Binscarth	15	4
	+ Birch Falls	5	5
	Birtle	5	6
	Black River	5	7
	Blueberry Hill	20	8
	Breezy Point	5	9
	Brokenpipe	5	10
	+ Buffalo Lake	5	11
	Camp Hughes	5	12
	Caribou Bog	5	13
	+ Clandeboye	5	14
	+ Comorant Lake	5	15
	Cowan	5	16
	Cross Lake	5	17
	Curries Landing	5	18
	Dawson Trail	10	19
	Devils Lake	5	20
	Devon	5	21
	+ Eden Lake	5	22
	Egg Lake	5	23
	Einerson	5	24

APPENDIX 1a

Provincial Park Classification	Park Name	Size (acres)	Number
Provincial Wayside Parks (cont'd)	Fairburn	2	25
	Goose Lake	5	26
	+ Government Landing	5	27
	Grand Rapids	5	28
	Grant Memorial	9	29
	Hargrave	5	30
	+ Hargrave River	5	31
	Harmon Lake	5	32
	+ Hughes Lake	5	33
	+ Hughes River	5	34
	Hyland	10	35
	Islandview	5	36
	Kerwenan	28.7	37
	Keyes	2.9	38
	Killarney	1.79	39
	Kirkella	1.77	40
	Lake St. Andrew	5	41
	Lake St. George	5	42
	+ Lake Winnipegosis	5	43
	La Verendrye	2	44
	+ Lee River Bridge	5	45
	Letellier	5	46
	Log Cabin	5	47
	Mafeking	5	48
	Manigotagan	10	49
	Manistikwan	5	50
	Mantagao	5	51
	Marchand	5	52
	McEwan Memorial	14	53
	Menisino Tower	5	54
	Mile 73 Tower	5	55
	Minago River	5	56
	Mistik Creek	5	57
	Neso Lake	5	58
	Netley Creek	5	59
	Norris Lake	5	60
	+ Ospwagan Lake	5	61
	Overflowing River	5	62
	Pinawa	5	63
	Pinegrove Halt	100	64
	Pine River	5	65
	Pipestone	4.7	66
	Pisew Falls	229	67
	Primrose	5	68
	Red Deer River No. 1	5	69
	Red Deer River No. 2	5	70
	Rosebud	5	71
	St. Adolphe	5	72
	Ste. Agathe	5	73
	Sasagui Rapids	382	74

APPENDIX 1a

Provincial Park Classification	Park Name	Size (acres)	Number
Provincial Wayside Parks (cont'd)	Scenic Site Tower	5	75
	Seton	5	76
	Setting Lake	5	77
	+ Silver Falls	5	78
	+ Sioux Benn	5	79
	Souris River	5	80
	+ South Twin Creek	5	81
	Springwater	47	82
	Steeprock Lake	5	83
	Stefanson Memorial	2	84
	+ Suwannee River	5	85
	Swan River	5.49	86
	Treherne	4.4	87
	Twin Lake	5	88
	+ Vanderkerckhove Lake	5	89
	Wawanesa	20	90
	Wekusko Falls	5	91
	Wekusko Lake	5	92
	Whitefish Lake	5	93
	+ Whitefish Lake	5	94
	Whitefish Falls	5	95
	+ Whitemouth Lake	5	96
	Whitemouth River	5	97
	Winnipeg River No. 1	5	98
	Winnipeg River No. 2	5	99
	Winnipeg River No. 3	5	100
	Woodridge	5	101
	+ Yellow Quill	7.4	102
	Total	1,324.15 acres 535.9 ha.	
	Total Parks	164	
	Grand Total	2,533,058.3 acres 1,033,208.5 ha	

+ 20 non-designated. Not yet in regulation under The Provincial Park Lands Act operating under order-in-council.

APPENDIX 1b

Park Systems Plan Component Definition
(Nuxoll, 1975: pp. 17-21)

Park Systems Plan Components Definition

1) Natural Regions of Manitoba: This factor consists of the development of a methodology that;
   a) will be utilized in the determination of provincially significant natural components of the province,
   b) will be incorporated into the interpretive and pre-historical components for consistency of analysis, and
   c) will be used as an instrument against which the existing park system can be applied to determine those natural components that are not included in the system but which should be.

2) Cultural Components of Manitoba: This factor is intended to permit:
   a) an understanding of the importance and applicability of both prehistorical and historical aspects of Manitoba, and
   b) an identification and analysis of both aspects with a view towards representing provincially significant cultures, events, persons and places through the Park System.

3) Needs Analysis: This analysis is designed to compare provincial park outdoor recreational demand with the current provincial park outdoor recreational supply, in order to determine the outdoor recreational needs for the province in terms of provincial parks. Only those activities that are measurable on a participation rate basis are included.

4) Interpretive Component: This factor is designed to identify the importance of the Interpretive Program in the Provincial Park System and the fashion in which this component is to be integrated into the other components of the plan.

5) Regional Analysis: This component is designed to clarify the nature of the existing park system and will provide the common basis for the analysis of all other components.

6) Research Component: This component is designed to identify information deficiencies in a priority fashion and to present a research program (both primary and secondary) that is directed

to alleviating these deficiencies.

7) Tourism Component: This component is designed to co-ordinate the efforts of Parks Branch and Tourist Branch, Department of Tourism and Cultural Affairs, taking into consideration the objectives of both Branches.

8) Institutional Factors: This component is intended to:

   a) explore the range and limitations of Parks Branch boundaries in the provision of provincial park outdoor recreational opportunities,
   b) identify the relative priority level at which provincial parks are situated within the Manitoba Government,
   c) detail Parks Branch policy, and
   d) ensure that the Park System is consistent with the institutional factors.

9) Co-ordination: The co-ordination component will be investigated with a view towards minimizing duplication of effort and resources, minimizing land use conflicts and maximizing leisure time services. This component will ensure that the Park Systems Planning Program is co-ordinated with other leisure service and land-use agencies, organizations and individuals.

10) User Groups: This component will permit an understanding of the various user groups that participate in a park-related experience. It will provide information on park users so the Provincial Park System can better meet their needs and desires.

11) Standards: The purpose of the standards component is to identify the possible range of design and development solutions within the policies of the classification scheme. In addition, standards are required for a Supply and Demand analysis. Since both the Supply and Demand analysis and the classification scheme are important tools in the realization of a Park Systems Plan, standards analysis are also important.

12) External Factors: In the exercise of establishing a Park Systems Plan, there are numerous aspects that, although do not conveniently fall under a broad 'component', are important to the final product.

The component "External Factors" therefore is a 'catch-all' component that will analyze factors such as the energy crisis, peaking phenomena, work vs., leisure ethic, recreational trends, recreational activities, the role of interpretation, group use of park areas and the like.

13) Public Participation: This component is intended to serve the dual function of a) a vehicle for the inclusion of public and agency opinion in the Park Systems Planning Program and b) education of the Program.

14) Evaluation Procedures: The purpose of developing Evaluation Procedures for various aspects of the Park Systems Planning Program (such as the assessment of economic impacts, social impacts, success of park programs, etc.) is to determine the extent to which the Program is acheiving its goals and objectives.

APPENDIX 1c

Standard Park Agency Survey Letter

Appendix 1c

MANITOBA
DEPARTMENT OF MINES, NATURAL RESOURCES AND ENVIRONMENT
Parks Division
200 Vaughan Street
Winnipeg, Manitoba
R3C 1T5

May 29, 1979

PARK AGENCY

Manitoba Parks Division is presently in the process of developing a framework to be used in the preparation of park-specific Resource Management Plans. The Resource Management Plan is the operational segment of the Park General Management Plan (Master Plan), as are Interpretive Plans, Visitor Services Plans and Development and/or Infrastructure Phazing Plans. In effort to devise a functional Resource Management Plan framework I am conducting a review of adopted strategies by various park management agencies in Canada and the United States. Through this literature review process I hope to learn from your experience. Therefore, I would appreciate receiving any pertinent documentation: This would ideally be a Resource Management Plan framework. In absence of such, a resource management plan, park master plan or planning process manual may prove helpful.

Thank you for your prompt assistance.

Sincerely,

John S. Marczyk,
Resource Management Section

JSM:cf

APPENDIX 2

CLI Summary of Land Capability Classification for Recreation

APPENDIX II

SUMMARY OF

LAND CAPABILITY CLASSIFICATION FOR RECREATION

Seven classes of land are differentiated on the basis of the intensity of outdoor recreational use, or the quantity of outdoor recreation which may be generated and sustained per unit area of land per annum under perfect market conditions.

"Quantity" may be measured by visitor days, a visitor day being any reasonable portion of a 24 hour period during which an individual person uses a unit of land for recreation.

"Perfect market conditions" implies uniform demand and accessibility for all areas, which means that location relative to population centres and to present access do not affect the classification.

"Intensive and dispersed activities" are recognized. "Intensive activities" are those in which relatively large numbers of people may be accommodated per unit area, while "dispersed activities" are those which normally require a relatively larger area per person.

Important factors affecting the classification are:

- The purpose of the inventory is to provide a reliable assessment of the quality, quantity and distribution of the natural recreation resources within settled parts of Canada.
- The inventory is essentially of a reconnaissance nature, based on interpretation of aerial photographs, field checks, and available records. The finished maps should be interpreted accordingly.

- The inventory classification is designed in accordance with present popular preferences in non-urban outdoor recreation. Urban areas (generally over 1,000 population with permanent urban character), as well as some non-urban industrial areas, are not classified.
- Land is ranked according to natural capability under existing conditions, whether in natural or modified state. But no assumptions are made concerning its capability if it is given further major artificial modifications.
- Sound recreation land management and development practices are assumed for all areas in practical relation to the natural capability of each area.
- Water bodies are not directly classified. Their recreational values accrue to the adjoining shoreland or land unit.
- Opportunities for recreation afforded by the presence in an area of wildlife and sports fish are indicated in instances where reliable information was available. But the ranking does not reflect the biological productivity of the area; wildlife capability is indicated in a companion series of maps.

CLASSES

1 - LANDS IN THIS CLASS HAVE VERY HIGH CAPABILITY FOR OUTDOOR RECREATION

Class 1 lands have natural capability to engender and sustain very high annual use based on one or more recreational activities of an intensive nature.

Class 1 land units should be able to generate and sustain a level of use comparable to that evident at an outstanding and large bathing beach or a nationally known ski slope.

2 - LANDS IN THIS CLASS HAVE A HIGH CAPABILITY FOR OUTDOOR RECREATION

Class 2 lands have natural capability to engender and sustain high annual use based on one or more recreational activities of an intensive nature.

3 - LANDS IN THIS CLASS HAVE A MODERATELY HIGH CAPABILITY FOR OUTDOOR RECREATION

Class 3 lands have natural capability to engender and sustain moderately high annual use based usually on intensive or moderately intensive activities.

4 - LANDS IN THIS CLASS HAVE MODERATE CAPABILITY FOR OUTDOOR RECREATION

Class 4 lands have natural capability to engender and sustain moderate annual use based usually on dispersed activities.

5 - LANDS IN THIS CLASS HAVE MODERATELY LOW CAPABILITY FOR OUTDOOR RECREATION

Class 5 lands have natural capability to engender and sustain a moderately low total annual use based on dispersed activities.

6 - LANDS IN THIS CLASS HAVE LOW CAPABILITY FOR OUTDOOR RECREATION

Class 6 lands lack the natural quality and significant features to rate higher, but have the natural capability to engender and sustain low annual use based on dispersed activities.

7 - LANDS IN THIS CLASS HAVE VERY LOW CAPABILITY FOR OUTDOOR RECREATION

Class 7 lands have practically no capability for any popular types of recreation activity, but there may be some capability for very specialized activities with recreation aspects, or they may simply provide open space.

SUBCLASSES

Subclasses indicate the kinds of features which provide opportunity for recreation. They are, therefore, positive aspects of land and do not indicate limitations to use. Features may be omitted from a unit, either because of the imposed three-feature limit, or because their presence was unknown or unconfirmed.

The degree to which these features are judged capable, collectively, of generating and sustaining use for recreation determines the

class. The sequence in which they are listed indicates the order of their significance. Subordinate features may be relatively insignificant and the class of a unit should not be interpreted to indicate the capability of a second or third use.

The subclasses are:

A - land providing access to water affording opportunity for angling or viewing of sports fish;

B - shoreland capable of supporting family beach activities. In high class units this includes family bathing. In Classes 4 and 5, the activities may preclude bathing due to water temperature or other limitations;

C - land fronting on and providing direct access to waterways with significant capability for canoe tripping;

D - shoreland with deeper inshore water suitable for swimming, or boat mooring, or launching;

E - land with vegetation possessing recreational value;

F - waterfall or rapids;

G - significant glacier view or similar experience;

H - historic or pre-historic site;

J - area offering particular opportunities for gathering and collecting items of popular interest;

K - shoreland or upland suited to organized camping. This subclass is usually associated with other features;

L - interesting landform features other than rock formations;

M - frequent small water bodies, or continuous streams occuring in upland areas;

N - land (usually shoreland) suited to family or other recreation lodging use;

O - land which affords an opportunity for viewing of upland wildlife;

P - areas exhibiting cultural landscape patterns of agricultural, industrial or social interest;

Q - areas exhibiting variety, in topography or land and water relationships, which enhances opportunities for general outdoor recreation such as hiking and nature study or for aesthetic appreciation of the area;

R - interesting rock formations;

S - a combination of slopes, snow conditions and climate providing downhill skiing opportunities;

T - thermal springs;

U - shoreland fronting water accommodating yachting or deep water boat tripping;

V - a vantage point or area which offers a superior view relative to the class of the unit(s) which contain it, or a corridor or other area which provides frequent viewing opportunities;

W - land affording opportunity for viewing of wetland wildlife;

X - miscellaneous features with recreational capability;

Y - shoreland providing access to water suitable for popular forms of family boating;

Z - areas exhibiting major, permanent, non-urban man-made structures of recreational interest.

APPENDIX 3a

An Elaboration of Environmental Components Used in the Nevada Division of State Parks Resource Inventory. (Cited from Nevada Division of State Parks, 1978:3)

A. Environmental Components

I. Physical Components

a. Climate

Temperature - maximum, minimum, seasonal and daily variation

Precipitation - amount, type, seasonal distribution

Wind - direction, velocity

Micro-climate - location, characteristics, etc.

b. Geology

Soils, subsoils, superficial deposits

Bedrock, landforms

Type and extent of erosion damage

c. Water

Location and type, uses, sources of drinking water

Physical, chemical, biologica characteristics

d. Scenic Resources

Location and type

II. Biotic Components

a. Vegetative

Floral and foliage displays

Plant communities, common and unique, wildlife habitat type

Endangered species

Exotic plants - noxious weeds

Native plant list - identify those which may be suitable for plantings

Plant and tree diseases

Aquatic plants

Grazing and browsing - describe type and extent of use, affected areas, controls.

b. Wildlife

Animal list, distribution, realtive abundance, special requirements, habitat types

Bird List

Endangered species

Aquatic animals

III. Cultural Components

a. Archeology

Location of important prehistoric or aboriginal remains, if possible describe chronological and cultural relationships

b. History

Locate historic features such as buildings, fortifications, trails, roads, etc.

Relate events associated with them

APPENDIX 3b

U.S. National Park Service

Environmental Impact Statement

Format

The Environmental Impact Statement documents contained the following features:

1. Cover Sheet
2. Table of Contents
3. Description of the Proposal. This section contains a clear and succinct description of the proposed action or recommendations, and the projected timeframe for the proposals implementation.
4. Description of the Environment. This section contains a general description of the total environment in which the proposed action will occur, and a succinct and specific description of those elements of the existing environment that affect or are affected by the proposal. In addition, a scenario is developed describing the environment as it would probably exist if the proposal was not implemented.
5. The Environmental Impact of the Proposed Action. The probable beneficial and adverse impacts imposed upon the human environment are described and analyzed in this section, presenting conclusions on their nature, magnitude, and significance. Primary emphasis is placed upon components of the environment most obviously affected by the proposed action.
6. Mitigating Measures Included in the Proposed Action. This section is used to discuss those specific actions, research projects, special studies, monitoring systems, future planning, and other recommended measures inherent in the proposal that are required, or may be required, in order to lessen negative environmental effects of the proposed action. Emphasis is placed upon significant measures taken to offset or lessen major negative effects.
7. Any Adverse Effects Which Cannot be Avoided Should the Proposal be Implemented. The adverse effects of the proposed action that re not mitigated, or are only partially mitigated,

by other measures included in the proposal are summarized. The relative importance and magnitude of the adverse effects as they pertain to the various components of the human environment are discussed.

8. Alternatives to Proposed Action. This section describes and analyzes the probable environmental impacts of those reasonable alternatives to the proposed action that involved alternative uses of available resources. This section is particularly important when conflicts concerning the possible uses of resources are unresolved.

9. Consulation and Co-ordination with Others. This section is subdivided into three components:

   a) Consulation and Co-ordination in the Development of the Proposal and in the Preparation of the Environmental Statement. This section contains a brief discussion of the important consultations that occurred during the evolution of the proposal and the Environmental Statement. All federal, state and local agencies, and other organizations and individuals consulted during the development of the proposal and Environmental Statement are indicated.

   b) Co-ordination in the Review of the Draft Environmental Statement. This section in the DES indicates the procedure that was followed in disseminating the Statement, and lists those agencies, organizations and individuals who are requested to officially review the document. On preparation of the FES, this section is expanded to indicate who commented on the draft.

   c) Bibliography. Each Environmental Statement contains a bibliography of relevant literature used in its preparation.

APPENDIX 4a

Existing and Potential Park Resource Uses

PROVINCIAL PARK LAND RESOURCE USES

I. OUTDOOR RECREATION

A. Extensive Recreation

a. Land Based

i. Interpretation/Education
ii. Climbing
iii. Hiking
iv. Horseback Riding
v. Picnicking
vi. Site-seeing
vii. Skiing
viii. Sport Hunting
ix. All Terrain Vehicle Use
x. Snowmobile Use

b. Water Based

i. Interpretation/ Education
ii. Canoeing
iii. Sailing
iv. Scuba Diving
v. Swimming
vi. Power Boating
vii. Fishing

B. Intensive Recreation

a. Site and Area Developments

i. Campgrounds
ii. Picnic Grounds
iii. Cottage Subdivisions
iv. Trailer Villages
v. Golf Courses
vi. Bathing Beaches

II. PRESERVATION

A. Geological Resources

a. Landforms

b. Geological Formations

i. Bedrock Exposures
ii. Paleontological Components

B. Land Resources

a. Wilderness ecosystems

b. Unique ecosystems

C. Vegetation Resources

a. Unique, Rare or Endangered Species

b. Indigenous Species

c. Extirpated Species

D. Faunal Resources

a. Unique, Rare or Endangered Species

b. Indigenous Species

c. Extirpated Species

E. Cultural Resources

a. Archeological Sites, Objects or Areas

b. Historical Sites, Objects or Areas

F. Aesthetic Resources

a. Open Space

b. Vistas

III. RESEARCH

A. Natural Resource Research

a. Fire Management

b. Insect and Disease Management

c. Ecological Studies

B. Cultural Resource Research

a. Historical Heritage

b. Archeology

IV. COMMERCIAL RESOURCE USE

A. Mineral Resource Use

a. Mining

i. Hard Rock
ii. Soft Rock
iii. Aggregate (sand and gravel)

b. Oil and Gas Extraction

c. Mineral Resource Exploration

B. Land Resource Use

a. Agriculture

i. Cultivation
ii. Grazing
iii. Haying

b. Rights-of-Way

i. Utility Lines
ii. Pipelines
iii. Provincial Transportation Corridors

C. Vegetation Resource Use

a. Forestry

i. Sawlogs
ii. Pulp
iii. Firewood
iv. Wild Rice

D. Faunal Resource Use

a. Wildlife

i. Trapping
ii. Guided Hunting Tours

b. Fish

i. Commercial Fisheries
ii. Trout Farming
iii. Guided Fishing Tours

E. Water Resource Use

a. Impoundments

i. Regional Water Supplies
ii. Regional Water Control
iii. Hydro-Electric Power Generation

b. Hydro-Electric Sites

APPENDIX 4b

Manitoba Parks Branch
Zoning Scheme Proposed
Changes

In 1974, the Manitoba Parks Branch developed a five category zoning scheme in conjunction with their park classification system (Manitoba, 1974). The five categories and their objectives are provided below:

1. *Special Areas*. The primary purpose is to ensure that unique features or situations are preserved. Special Areas are characterized as areas of unique provincial significance for history, geology, or scientific interest. The management emphasis is on the preservation of these features. Access is limited and no other land uses are permitted.

2. *Primitive Environment Areas*. The primary purpose is to maintain a primitive or isolated environment. Primitive Environment Areas are characterized by the exclusion of commercial resource uses and mechanized forms of transportation. Most extensive recreational opportunities are permitted and the management emphasis is aimed at the maintenance of a primitive environment.

3. *Natural Recreation Areas*. The primary purpose is to create areas of low density, nature-oriented recreation. Natural Recreation Areas contain all of the extensive recreational opportunities previously given in the two previous zones. They were proposed as buffer zones to protect the first two zones. Natural Recreation Areas are divided into two subzones:
   3a--which excludes all commercial resource uses, and
   3b--which allows commercial resource uses.

4. *General Outdoor Recreation Areas*. The primary purpose of which is to provide a wide range of outdoor recreational opportunities within a natural setting. The General Outdoor Recreation Areas provide for all forms of extensive and intensive recreational uses and are divided into two subzones:
   4a--which allow public use by public development or commercial lease, and
   4b--which allow public use for limited term, private cottage or seasonal trailer village lease.

5. *Intensive Use Areas*. The primary purpose is to provide a concentration of service facilities and recreational activities adjacent to visitor entry points or high density areas. Intensive Use Areas are subdivided into three subzones, all of which exclude commercial resource use due to the significance of the proposed facilities:

5a--which allow public uses only
5b--which allow public uses for limited private leases for cottages or seasonal trailer villages, and
5c--which allow administrative uses only.

EXISTING ZONING SCHEME	PROPOSED CHANGES
1. Special Areas	1. Nature Reserve Zone
2. Primitive Environment Areas	2. Historic Zone
3. Natural Recreation Areas 3a 3b	3. Wilderness Zone 4. Natural Recreation Zone
4. General Outdoor Recreation Areas 4a 4b	5. Natural Recreation-Resource Utilization Zone
5. Intensive Use Area 5a 5b 5c	6. Park Development Zone

APPENDIX 4c

Criteria for submittals of
Project Descriptions and
Environmental Impact Assessments

The Environmental Assessment and Review Process (EARP) was formulated on the following policy statements:

1. environmental assessments are carried out for all proposed provincial projects that may significantly alter or affect the environment, as a result of contamination of air, water and soil;

2. the results of environmental assessment, commonly referred to as an 'environmental impact statement' are subject to review by the Cabinet who may permit, modify or disallow the proposed action;

3. the results of environment assessment and all subsequent recommendations and conditions applicable thereto, will be used in the planning, implementation and operational phases of the project if approved. (Manitoba, 1976).

In an attempt to implement this policy the Manitoba Environmental Assessment and Review Agency (MEARA) was established. MEARA's responsibilities include:

1. reviewing proposals for new projects or proposals respecting major alterations of existing projects;

2. exempting those projects which would not require a thorough assessment;

3. recommending to the Minister responsible those projects which in the judgement of MEARA required an environmental assessment;

4. providing environmental impact assessment guidelines;

5. reviewing environmental impact statements;

6. recommending additional procedural guidelines to further identify and mitigate environmental impacts; and

7. submitting reviews and recommendations to Cabinet to permit, modify or disallow a proposed undertaking.

Figure 4b represents the current environmental assessment and review process. The first stage in the process involves screening of the

project by the proponent agency to determine whether or not impacts associated with the project are of the magnitude that would warrant the submission of a 'project description' to MEARA. The project description enables MEARA to understand the nature and scope of the project, as well as, to identify potential environmental impacts. In general, the project description should contain information and technical data on the proposed project and all relevant drawings, plans, photographs, maps, charts, etc; a description and a statement of the rationale for the undertaking, the alternative methods of carrying out the project and alternative projects.

MEARA suggested that the project proponent answers a series of 11 questions during the 'in-house' screening of projects. Affirmative responses to one or a combination of questions necessitates the submission of a Project Description to MEARA. The questions focus on projects that would:

1. result in a significant detrimental effect on air, water or soil quality, or on ambient noise levels for adjoining areas;
2. have significant effect on adjacent persons or property or persons or property not associated with the undertaking;
3. generate secondary effects (e.g. land development, population growth) likely to significantly affect the environment;
4. necessitate the irreversible commitment of any significant amount of non-renewable resources;
5. preempt the use or potential use of a significant natural resource for any other purpose;
6. cause significant interference with the movement of any resident or migratory fish or wildlife species;

7. have effects on an area of ten acres or greater;

8. block views or adversely affect the aesthetic image of the surrounding area;

9. have an effect on any unique, rare or endangered species, historical or archeological resources, habitat or physical feature of the environment;

10. establish a precedent or involve a new technology either of which is likely to have significant environmental effects now or in the future; and

11. be highly controversial (Manitoba, 1976).

In addition to these 11 questions, one additional question should be asked:

12. if the proposed project is a precedent for future decisions, is the proponent committed to other future actions, the cumulative impact of which may be significant?

When a project description is submitted to MEARA a decision is made whether the project is of significant impact to warrant its passage through the EARP procedure. If upon review there appear to be significant impacts the proponent is required to submit an Initial Environmental Evaluation (IEE). MEARA then determines whether the project should be changed to minimize the impact. If changes are not easily facilitated MEARA seeks Ministerial approval for the preparation of an Environmental Impact Assessment (EIA). The proponent must submit the EIA and MEARA then decides whether environmental concerns have been comprehensively addressed. If they have, MEARA drafts the project conditions subject to the approval of the Minister. If environmental concerns have not been sufficiently addressed MEARA has two avenues open to it. The first involves

the scheduling of public hearings under the aegis of the Clean Environment Commission. If public hearings are not held an Environmental Impact Statement (EIS) must be prepared by the proponent for review by MEARA.