AN INTERPRETIVE PLAN FOR TALL GRASS PRAIRIE RESTORATION AT BEAUDRY PROVINCIAL HERITAGE PARK

© Brenda E. Carson

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In Partial Fulfillment of the
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Master of Natural Resources Management

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A practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of Master of Natural Resources Management.

ABSTRACT

Manitoba Parks Branch is currently undertaking restoration of tall grass prairie on 200 ha of agricultural land at Beaudry Provincial Heritage Park (PHP). Establishment of the prairie will take at least 10 to 12 years. This plan was designed for the interpretation during restoration.

Interpretation during restoration will focus primarily on the processes and purposes of tall grass prairie restoration and the ecology of tall grass prairie plants. Secondary interpretive messages are from the themes of ecology of tall grass prairie animals and the aspen parkland.

The cultural interpretive messages for restoration focus on the relationship of peoples with the tall grass prairie. Interpretation of the cultural history of Beaudry PHP will become predominant in the post-restoration period. During restoration, interpretation of cultural history will illustrate the changes in tall grass prairie land use over time. Emphasis on cultural history interpretation will increase into the post-restoration period, particularly the Metis of Grantown theme.

Interpretive media should develop from a series of trail systems to a multi-media interpretive centre and living his-

tory sites. Staffing levels should correlate to this development so that in early years interpretive staff conduct guided walks and in later years also provide programs in the interpretive centre and the other sites. Although it is difficult to determine the number of future visitors, visitation levels are expected to increase during restoration. Visitor surveys should be conducted to gauge future planning. Research should be conducted on biological and historical aspects of the park to increase interpretive opportunities.

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Chapter I

INTRODUCTION

1.1 PREAMBLE

Beaudry Provincial Heritage Park (PHP) is located 10 km west of Winnipeg (Figure 1). It was established by the Manitoba Parks Branch in 1975. The area was set aside due to recognition by the International Biological Program of the unique river bottomland forest and the remnant tall grass prairie. The Program was designed to ensure the preservation of rare or valuable terrestrial ecosystems (Levin and Keleher 1969). The provincial cabinet has recently designated the park as a Heritage Park that will represent one of twelve natural regions of Manitoba - the tall grass prairie (Parks Branch 1985).

The tall grass prairie is one of two grassland types that occurs in Manitoba. It previously covered an area of approximately 4,000 km^2 and "lay almost wholly west of the Red River, extended north to approximately the Assiniboine River, and west to the rising ground of the Manitoba escarpment" (Watts 1969).

Tall grass prairie is characterized by a covering of tall grasses to 3 m, forbs and a few shrubs. The dominant

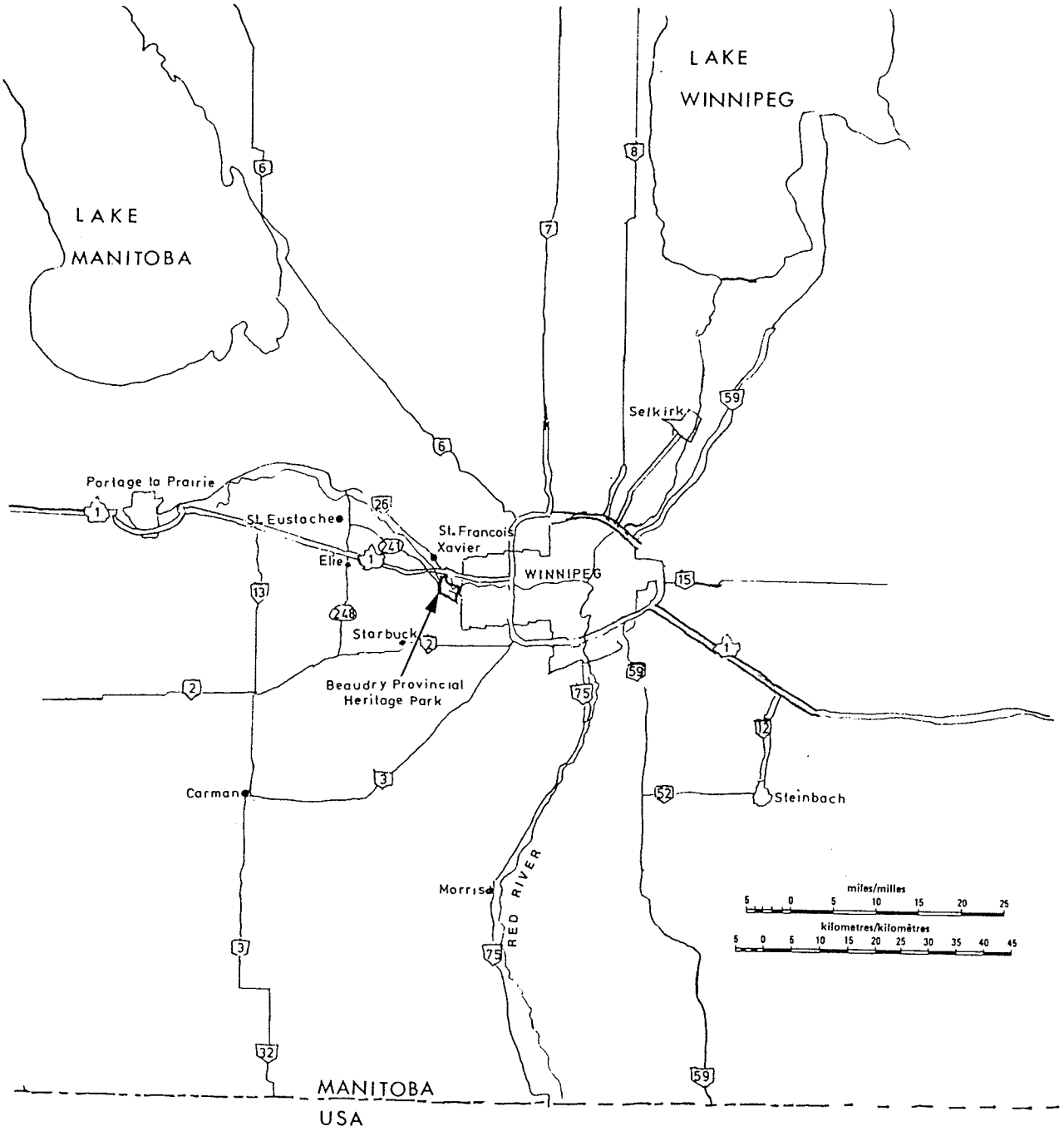

Figure 1: Location of Beaudry Provincial Heritage Park

grass species is big bluestem Andropogon geradi which grows to a height of 1 to 2m in our region.

Most of the former prairie within the park is currently under cultivation of cereal crops, but there are two small prairie remnants. These areas have been invaded by woody species due to discontinued burning (Levin and Keleher 1969). Thus groves of trembling aspen (Populus tremuloides) and bur oak (Quercus macrocarpa) are found amongst the prairie remnants. The Assiniboine River winds through the park and through flooding created river bottomland forest. Some of the oldest and largest American elm, (Ulnus americana), eastern cottonwood, (Populus deltoides), basswood (Tilia americana) and Manitoba maple (Acer negundo) trees in Manitoba are found in these forests. A series of trails have been established through the bottomland forest which are used for cross-country skiing and hiking. Figure 2 illustrates the vegetation cover in the park.

The productivity of the tall grass prairie allowed for exploitation of the plants, animals and soil by various cultural groups. Resources of the prairie and parkland were available on an annual cyclical basis. Prehistoric peoples followed the bison (Bison bison) onto the prairies in summer and back to the parkland in winter as this animal was the major food source. The Assiniboine and Cree followed the same cycles for many years till their way of life was dramatically changed. The Metis also hunted the bison but were

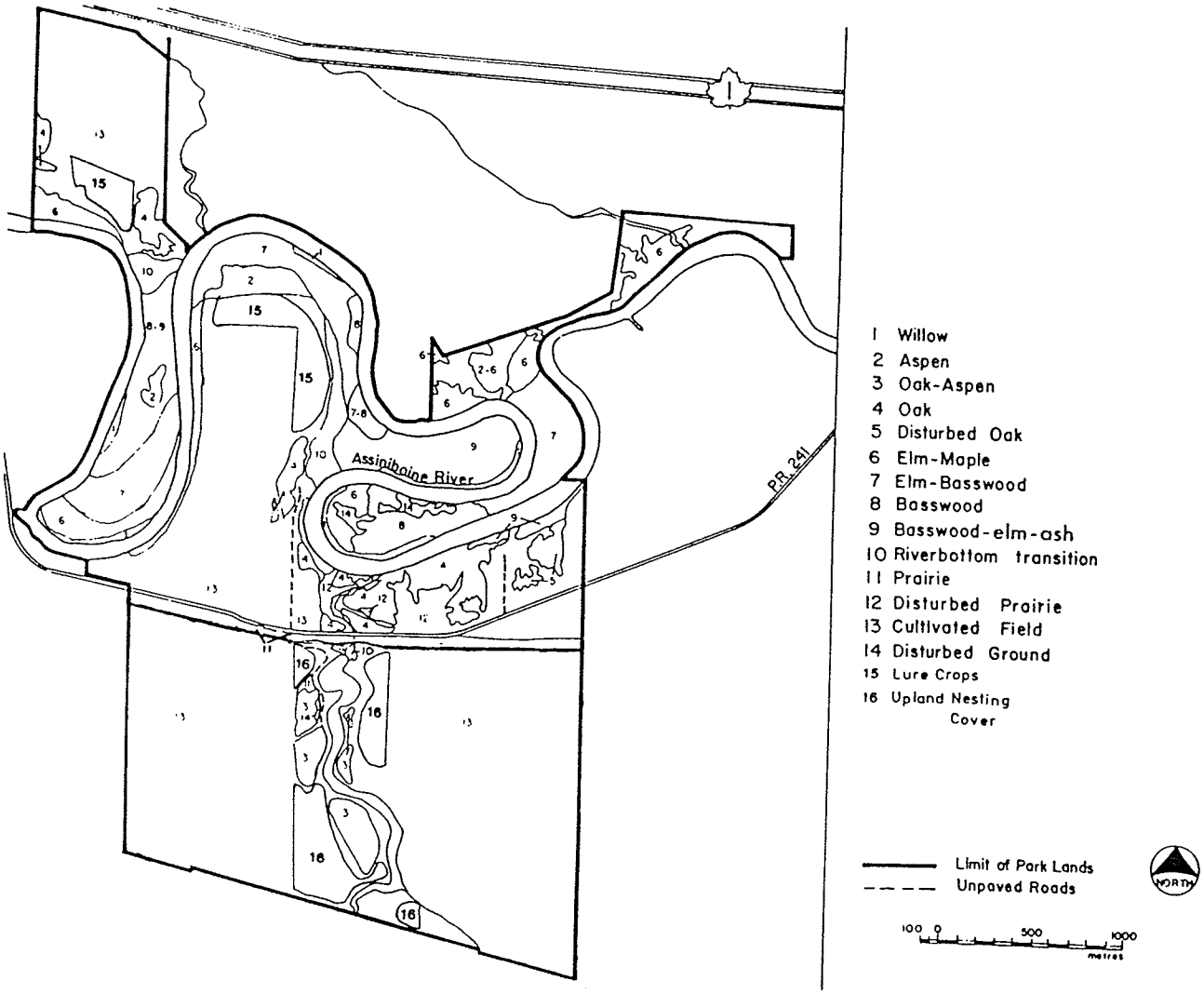

Figure 2: Vegetation of Beaudry Provincial Heritage Park (adapted from Dorber 1978).

part-time farmers as well. After many of the Metis left settlers from Canada, the United States and European began farming the lands. Wheat (Triticum aestivum) soon became the primary product of the agricultural community. After just over a century of permanent settlement, relatively little of the original prairie vegetation remains (Risser et al. 1981).

The primary goal of Beaudry Provincial Heritage Park is to:

> provide educational and interpretive opportunities for the people of Manitoba in general and residents of Winnipeg in particular through universal access which permits the discussion of the natural processes affecting the tallgrass prairie plant environment the role of man within the prairie biome as a culturally manifested manipulator, user and cohabitant of the prairie landscape in general and prairie plant life in particular (Anderson 1985).

An attempt is being made to restore tall grass prairie on 200 ha of the cultivated land, the first such restoration project in Canada. Because of the nature of prairie vegetation it will be at least 10 to 12 years before native grasses and some forbs become established.

Interpretive sub-themes have been written for Beaudry park for natural and cultural themes (Anderson 1985, Hilderman et al. 1984). The interpretation of these themes during the restoration period has not been addressed as they presuppose the presence of tall grass prairie. The park will be in operation during this period; therefore the park inter-

pretive plan must include interpretation of the restoration process with the ecological and cultural factors of tall grass prairie.

1.2 PROBLEM STATEMENT

Beaudry Provincial Park has been classed as a Provincial Heritage Park. The Parks Branch, Manitoba Department of Natural Resources is currently undertaking restoration of tall grass prairie within the park to increase its variety and add to the scope of interpretation. Establishment of the tall grass prairie will take at least 10 to 12 years. Operation of the park as a heritage centre in the interim entails not only interpretation of prairie ecology in relation to the impacts of various cultures, but also interpretation of the restoration process. Guidelines for interpretation have been written for the former theme, but the interpretation of the restoration process has not been addressed. A detailed interpretive plan for the interpretation of both themes is necessary.

1.3 OBJECTIVES

The overall purpose of this study was to design an interpretive plan for tall grass prairie restoration at Beaudry PHP for use by the client: Manitoba Parks Branch. Specific objectives for designing the plan were:

1. To determine objectives that the interpretive plan must meet.

2. To collect data on natural and cultural history of tall grass prairie relating to Beaudry Provincial Heritage Park.

3. To identify who the park visitors will likely be.

4. To identify the interpretive messages.

5. To identify the appropriate media for interpretation of the messages and to provide media alternatives.

6. To suggest the skills and numbers of personnel necessary for the interpretation program.

7. To recommend an implementation strategy for the interpretive plan.

8. To make further recommendations as necessary for the operation of the interpretive plan.

1.4 SUMMARY

Plans have been written to develop Beaudry Provincial Heritage Park. Interpretive planning guidelines outline the themes of cultures interacting with and impacting on the landscape processes. The major theme is human impacts on the ecology of tall grass prairie.

Prairie is to be restored but it will be at least 10 to 12 years before it is flourishing. The interpretive guidelines have not addressed the problem of interpreting the prairie during the restoration period. It is the objective of this study to develop a cultural-ecological interpretive plan for tall grass prairie at Beaudry Provincial Park. A literature review of cultural and ecological information, as

well as contact with interpretive and resource personnel will be the primary methods of research. The information gathered will be assessed for its potential use at Beaudry and the plan written from this.

Chapter II

INTERPRETATION AND INTERPRETIVE PLANNING

2.1 INTRODUCTION

This chapter is a review of literature concerning interpretation and interpretive planning. The terms will first be defined, followed by a review of the purpose and methods of interpretive planning. The role of interpretive planning in the provincial park system and related organizations will be examined.

2.2 INTERPRETATION DEFINED

Interpretation is a service provided to visitors to parks, forests, museums, wildlife management areas and other similar recreational and cultural areas (Sharpe 1976, Tilden 1967). Tilden (1967) provided the classic definition for the function of interpretation:

> An educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than to simply communicate factual information.

This statement was intended as a dictionary rather than an operating definition for interpreters. Tilden further wrote six principles upon which interpretation should be based:

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.

2. Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However, all interpretation includes information.

3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.

4. The chief aim of Interpretation is not instruction, but provocation.

5. Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase.

6. Interpretation addressed to children ... should not be a dilution of the presentation to adults but should follow a fundamentally different approach...

Sharpe's (1976) work is another classic in interpretive publications. Though he does not offer a definition of his own he steps beyond the definitions of others and considers interpretation as a management tool. Interpretation, in his view thus seeks to achieve three objectives.

> The first or primary objective of interpretation is to assist the visitor in developing a keener awareness, appreciation, and understanding of the area he or she is visiting. ... The second objective of interpretation is to accomplish management goals. (can encourage visitors to consider the special nature of the area and thus to use it thoughtfully, and it can be used to minimize human impact).... The third objective of interpretation is to promote public understanding of an agency and its programs. (Sharpe 1976)

There have been various other efforts to define interpretation in Canada. The classic work in Canadian interpretation is Edwards (1979), "Interpretation is communication about things that are right there helping to communicate." The subject being interpreted must be present. Edwards (1979) noted that the interpreter's skills results in "the communication of science - or of some other discipline - using rare skills that constitute an art." Edwards (1971) defined interpretation as the following five services:

1. Interpretation is partly an information service.
2. Interpretation is partly a guiding service. It guides minds into new ideas and it guides people into interesting places.
3. Interpretation is partly an entertainment service.
4. Interpretation is partly an education service. The central purpose of interpretation is to communicate knowledge.
5. Sometimes interpretation is quite properly a propaganda service, mainly in persuading people to behave less destructively toward their environment, and in encouraging new ethics in their care and use of the earth.

He added that interpretation aims at inspiring people to become involved with the knowledge of landscape processes. Helmsley (1971) defined park interpretation as "... the means of contact and communication between the park resource base ... and the visitor." He saw the broad purpose of park interpretation as gaining public awareness, understanding

and appreciating of parks and the need for their preservation, and serving educational and recreational functions.

Foley (1980) cited a number of public benefits and organizational values of interpretation that relate to Sharpe's (1976) objectives. The major points he mentioned were: 1) the opportunity to re-establish contact with our natural environment, 2) maintaining an emotional contact with our society's natural heritage, and 3) public support of the conservation organization, in his case, the Canadian Wildlife Service.

Peart (1976) surveyed the membership of the Association of Canadian Interpreters to establish a working definition of interpretation for this profession. He raised a concern that most definitions described only what interpretation does, not what it actually is. Common elements from the survey submissions were brought together and the resulting definition of interpretation is:

> A communication process designed to reveal meanings and relationships of our cultural and natural heritage to the public through first hand involvement with an object, artifact and landscape or site (Peart 1976).

This definition is used by the Canadian Wildlife Service in its National Plan (Foley & Barkley 1981), and its Grasslands Natural Region Plan (Peart 1977). In the latter plan, Peart emphasized that the most important aspect of the definition is the phrase "through first hand experience." Though various communication tools are used throughout the interpretive

process (pamphlets, displays, audio-visuals) first hand involvement, for nature interpretation, necessitates outdoor activities.

2.3 INTERPRETIVE PLANNING DEFINED

As interpretation is a communication process, the interpretive plan involves the planning of communication, not resources or development (MacFarlane 1975). In order to do this, the plan must include an inventory of the outstanding, important and characteristic features of the site's environment (Helmsley 1971). "Planning is the first stage in the development of good management for an interpretive program" (MacFarlane 1975). The interpretive plan sets the tone and direction of the interpretive program. Thus the plan predetermines these aspects for the interpreters for the life of the plan (MacFarlane 1975). The plan however is subject to revision. This systematic planning allows for more efficient interpretation through coordination and analysis of the various components of the program (Peart 1974a). "The plan will show the optimum interpretation required and the objectives through which this may be achieved." (Helmsley 1971).

The interpretive plan has three primary objectives according to Bradley (1976) which follow from the interpretive objectives listed by Sharpe (1976). These objectives are:

> The development of a successful program, the assurance of protection for areas of special interest and the delineation of guidelines for efficient management, operations, and maintenance programs... (Bradley 1976).

Interpretive planning answers the basic questions of why have a program, (what are the objectives), who is the program for, what is the message, how will the message be transmitted and how well is it being received? (Peart 1974a). Planning allows for sensibly ordered development, provides continuity in the program, simplifies financial forecasting and allows for the organized collection of information necessary for interpretation of the area (Howie et al. 1975). The plan can incorporate protective measures to minimize probable impacts on the environment. Interpretive plans must complement other management plans for the area (Bradley 1976).

2.4 INTERPRETIVE PLANNING PROCESSES

Early efforts in interpretive planning followed several different procedures (Howie et al. 1975, MacFarlane 1975). The first standard process used by Parks Canada was developed by Taylor (1971). In this process, park planners must consider "What are the significant and sensitive resource values? and, what kinds of experiences do we wish the people of Canada to enjoy in this park?" This is a crucial part of interpretation because:

> One of the key elements in this type of land-use planning is a very early determination of those areas in the park environment that best express

> the meaning of the park, that best allow the visitor to perceive this meaning and best present opportunities for some form of communication to enhance visitor experience and heighten visitor sensitivity (Taylor 1971, emphasis added).

In the mid-1970's interpretive planning in Canada generally began to follow the communication model developed by Peart and Woods (1976). Since interpretation is a communication process it is logical to use a communication theory for the planning process (Peart 1974b).

The communication model developed by Peart and Woods (1976) is called the sender-message-receiver model (S-M-R) (Figure 3). This model shows the relationships between the major components of the interpretation process. The sender selects a message, encodes it and transmitts it by a particular approach to a receiver. The receiver decodes the message and returns feedback to the sender. The model is composed of five basic questions:

- Why give the program? What are the objectives and constraints? "The need and feasibility of the proposed interpretive plan must also be established" (Cherem 1979 in Capelle 1984).
- What is the message?
- Who is the target group?
- How When Where is the message to be communicated?
- So What? How can the plan be evaluated? (Capelle 1984, Peart 1974b, Peart & Woods 1976). Substituting these questions in the S-M-R model results in a framework for interpretive planning (Figure 4).

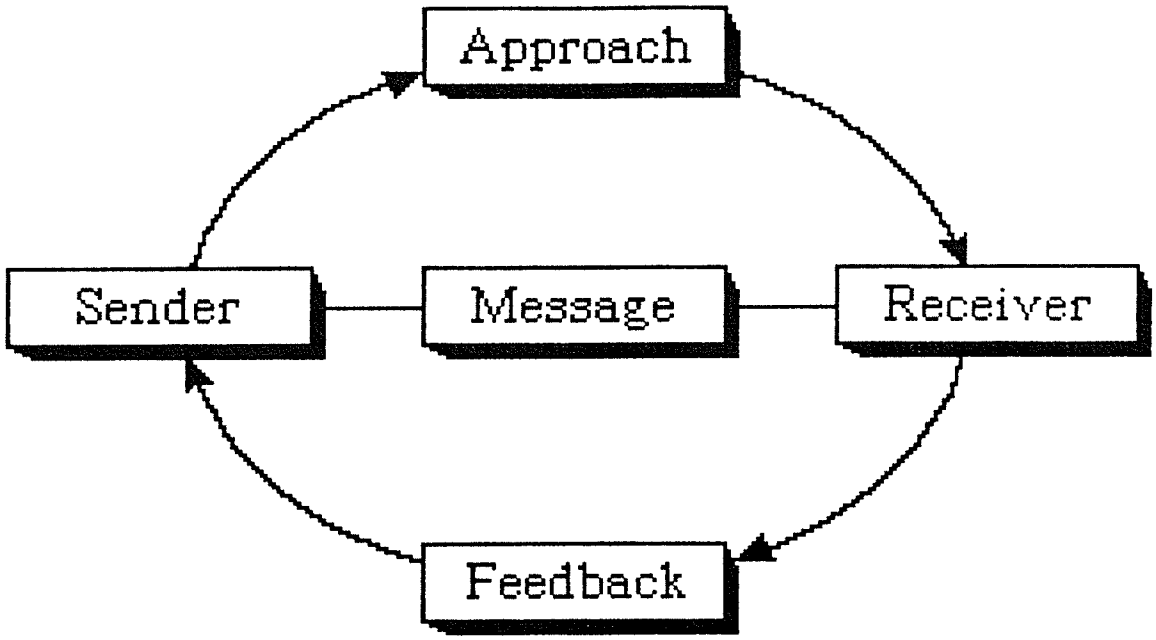

Figure 3: S-M-R Model (adapted from Peart & Woods 1976).

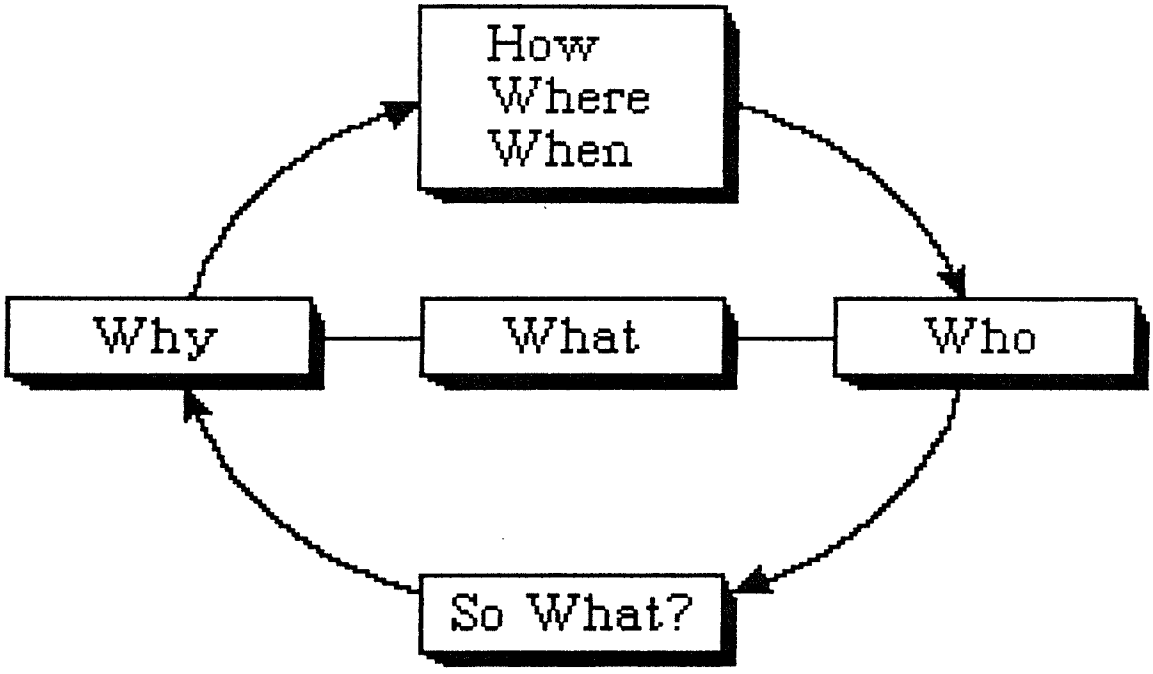

Figure 4: A Framework for Interpretive Planning (adapted from Peart & Woods 1976).

The basic premise of the model is "that in order to plan a total communications program one must consider all aspects of the communication process" (Peart 1974b). It steps beyond the traditional interpretive method of examining the message and the area's potential and leads to an examination and incorporation of the characteristics and objectives of the sender and receiver, the means of transmitting the message and receipt and review/evaluation of feedback (Peart 1974b). Peart and Woods (1976) list four reasons why the S-M-R model is invaluable as a framework for interpretive planning.

- It simplifies and illustrates the components of the communication process and assists in the planning projects and the logical development of ideas.
- The S-M-R Model is valuable as a planning framework at all levels of planning [from national plans to hikes to pamphlets].
- The S-M-R Model requires that an individual consider all aspects of the communication process simultaneously.
- The S-M-R Model illustrates to those individuals who aren't as familiar with your program as you are, the manner in which you developed your plans and the background behind your thinking (Peart & Woods 1976).

Both the Canadian Wildlife Service (CWS) and Parks Canada have adopted the S-M-R model as their planning framework (Foley & Barkley 1981, Peart & Woods 1976).

The process of interpretive planning is fairly standard. The emphasis and thoroughness of planning may differ depending on the model used. The following is a summary of various planning processes. Whichever model is chosen, it is imperative that the resulting plan be functional (MacFarlane 1975, Peart 1974a).

2.4.1 Objectives

Bradley (1976) stated that "Objectives are the guides to specific actions required in an interpretive plan." He outlines three levels of objectives which move from the general to the specific.

> The first level provides a purpose for the action. It is often an ideal that may be expressed in the abstract terms of values. It is essentially a policy statement that defines program direction and balance.
>
> The second level is more specific and further guides us in selecting opportunities available for interpretation. For each of our first level objectives it may be necessary to develop several second level objectives.
>
> The third level defines the desired outcome and permits measurement and evaluation pertinent to the first and second level. Several third level objectives may be needed for each second level objective. (Bradley 1976)

Howie et al. (1978) term these three levels policy level, opportunity selection level and evaluation level. They indicate that setting objectives should be the first thing done in the planning exercise. The objectives will reflect some of the constraints of the program. In terms of the

S-M-R model, Howie et al. (1978) stated that the objectives and constraints become attributes of the sender which in turn will affect the message. The planner should determine what can or should be said, rather than what she might want to say. As well, she should keep in mind evaluation and feedback mechanisms when formulating objectives.

2.4.2 Inventory: Data Collection

"The object of the inventory phase is to identify and locate the resources and amenities - both natural and humanly altered - that make up the physical, biological, and cultural environment" (Bradley 1976). During this process opportunities for interpretation and information that may shape the program should be identified (Bradley 1976). It is not necessary to collect detailed information (Howie et al. 1978). Rather, the area should be examined from a systemic point of view, working from the broad to the specific.

2.4.3 Analysis

The data collected are examined for the interpretive potential and assembled into interactive systems (Bradley 1976). This stage should identify potential interpretive themes and it is at this point that interpretive media should be considered. Once this phase is completed, "the raw data should be in manageable packages describing the resource, the interpretive opportunities, the users, potential

competing uses, and the agency and cultural constraints and preferences."

This is where the S-M-R model differs from the traditional model presented by Bradley (1976). The S-M-R model calls for message analysis preferably by charting the information (Howie et al. 1978, MacFarlane 1975, Peart 1974b). This system allows for a hierarchical order of messages and reduces the planners' biases. The analysis should demonstrate the logical relationships of the various messages to one another and to the overall story (MacFarlane 1975). The storyline is an account in layman's terms - an interpretive account of the message. Relationships not evident in the analysis will be revealed in the development of the storyline (Howie et al. 1975).

The next step in the S-M-R model is receiver analysis. Target groups must be identified for each proposed segment of the program (MacFarlane 1975) or to influence the choice of interpretive approaches (Howie et al. 1978). The groups, "should be analysed to determine their characteristics, requirements and movement patterns" to aid in selection of approaches and media (Parks Canada n.d.). For established areas, existing visitor surveys should be consulted and the target groups relationships determined. For unestablished areas an educated guess as to the receiver characteristics is necessary (Howie et al. 1978).

2.4.4 Synthesis of Planning Alternatives

It is at this stage that design and imaginative ideas become important (Bradley 1976). The alternatives are developed and the optimum alternatives are selected and presented to the decision makers. Howie et al. (1978) also referred to the necessity for imagination at this stage. Considerations at this point are the location (Where are the best areas to obtain experiences?), timing (When?), and media (How will the message be transmitted?) necessary for interpretation. Each of these aspects of the approach should be charted with the target groups and the message (Peart 1974b). Foley and Barkley (1981) emphasize that the selection of media must correlate with the definition of interpretation - the need for first hand experience. If this is not possible, there are other suitable, if not as effective mechanisms.

2.4.5 Programming

The final section of the interpretive plan is an outline of the stages necessary to implement the plan (Taylor 1971). Programming will determine development priorities, budget forecasts and estimates, and any necessary future studies.

2.4.6 Plan Evaluation

The S-M-R model necessitates the collection of feedback regardless of the difficulty of obtaining it (Foley & Barkley 1981, Howie et al. 1978). Feedback must be obtained from three different levels: program, approach effectiveness and individual events (Peart 1974b). Foley and Barkley (1981) outlined four general sources of feedback: statistics on visitor use, subjective client feedback, special studies and expert evaluation. They concluded that evaluation provides information on program effectiveness and assists in planning future programs. It measures the response against the overall objective (Peart 1974b).

2.5 INTERPRETIVE PLANNING IN MANITOBA PROVINCIAL PARKS

Interpretive planning in the Parks Branch, Manitoba Department of Natural Resources, has only occurred on a limited basis to date. The Provincial Parks Land Act identifies education as part of its mandate. Thus, visitor services are offered in provincial parks; these include amphitheatre shows and self-guided trails. The central document for the planning process was written by Anderson (1977). The plan format is similar to the S-M-R model but does not place emphasis on evaluation and feedback as the S-M-R model requires.

Anderson (1977) suggested the use of a numerical weighting in terms of a number of criteria (e.g. accessibility, uniqueness, interpretive potential) for interpretive feature suitability. This system is, however, easily influenced by the planner's prejudices.

The process of interpretive planning for provincial parks was updated by Stetski (1980). He emphasized the need for a team approach to interpretive planning due to the variety of experience and knowledge necessary. Prior to writing the plan, the necessary background information (natural and cultural history) and the sources from which it can be obtained must be identified and then analysed. Following this, visitor information is gathered and analysed. Once these analyses are completed, the plan recommends the interpretive developments for the park.

There are few interpretive plans written for Manitoba's provincial parks at this time. One example of interpretive planning by the Parks Branch is Stetski (1978) for Alf Hole Goose Sanctuary. The overall objectives of an interpretive plan are listed as:

- to analyse the resource base for its significance to interpretation,
- to develop a system that will inform the public of the significance of the resource base; and
- to ensure that the educational experience set out by the interpretive plan meets the needs of both the resource and the visitor (Stetski 1978).

2.6 INTERPRETIVE PLANNING AT RELATED FACILITIES

2.6.1 Parks Canada

Parks Canada's policy for interpretation is stated as:

> Park[s] Canada will present accurate on-site interpretation programs which will promote understanding and appreciation of the park's natural, cultural and historical values and which will develop an awareness of man's relationship to and dependence on the natural environment (Parks Canada 1983).

Parks Canada has adopted the S-M-R model of interpretive planning. Interpretive documents for national parks break the areas into interpretive management units ["geographical segments of the park which, in very general terms, are defined by a particular combination of physical, biological and cultural attributes" (Cobus 1977)]. Manitoba's only national park, Riding Mountain, has some good examples of interpretive planning. The plan for this park outlines the character of the park and then proceeds with interpretive analysis. The analysis consists of four objectives:

- Visitor Analysis
- Designation of interpretive units
- Definition of major interpretive messages
- Combination of the above three to determine the locations for optimal presentation of the messages

General interpretation goals for the park were set (e.g. park users should become more aware of human influences on the park and the biological and earth science processes involved in ecosystem formation). Once these goals were de-

fined, then the approaches to reach the goals were set, followed by interpretive objectives and management guidelines for each unit.

One of the interpretive units for which an interpretive unit plan has been developed is the Mount Agassiz Ski Hill (Martz 1979). As a unit plan, this document includes interpretive objectives in relation to the other units in the park. Martz has developed interpretive methods and media and specific messages for the unit in terms of three phases of park visit. These phases are orientation, interpretive presentation and dialogue/extension.

A more recent example of interpretive planning by Parks Canada is the Prince Albert National Park Interpretation Plan (Cobus 1984). After outlining the interpretive themes for the park and detailing who the park visitors are, matrix analyses were conducted to determine the best ways of attaining program delivery objectives (awareness, orientation and message presentation). From thess analyses, gaps in theme presentations were determined and priority developments necessary to fill the theme gaps identified. Once this was completed Cobus (1984) outlined alternative ways of developing the priority program requirements as well as an optimum implementation strategy. The alternatives were defined in terms of operations and maintenance, and person-year funds.

2.6.2 Canadian Wildlife Service

The objective of the CWS Interpretation program is:

> To encourage and to provide opportunities for the development of awareness, enjoyment, understanding and appreciation of Canada's wildlife heritage and its environment (Foley 1980).

The CWS program has been based on the S-M-R communication model of Peart and Woods (1976). CWS interpretive centres have been designed to reflect a visitor flow pattern based on an Orientation-Experience-Reinforcement model (Foley & Barkley 1981). With this model a visitor is first given a brief orientation to what is available and what the visitor can expect to experience. She is then directed outdoors to experience the 'real thing'. The experience is later reinforced in an exhibit hall.

Foley and Barkley (1981) outlined in general terms the interpretive planning components (objectives, messages etc), for a national view for CWS. Regional and site specific plans are to be consistent in content (format), philosophy and policy to ensure a co-ordinated national interpretive program.

An example of a CWS regional plan for the Grassland Natural Region is Peart (1977). This plan follows the S-M-R model. It differs from other plans reviewed in its lengthy analysis of receiver groups. Once groups are identified a number of characteristics of each group are examined to determine what messages and methods of approach are necessary.

2.7 SUMMARY

This chapter reviewed literature regarding interpretation and interpretive planning. Interpretation is generally defined as a communication process and functions to organize, and determines the tone of, the interpretive program. A model of interpretive planning is the Sender-Message-Receiver model, (S-M-R), developed by Peart and Woods (1976). This model considers all aspects of communication - the sender, the message, the receiver, the means of transmitting the message (approach) and receiving feedback. Traditional methods of interpretive planning such as Bradley (1976) do not analyse the receiver group characteristics nor pursue feedback mechanisms. Interpretive planning methods for the Manitoba Parks Branch are not well established. Parks Canada and the Canadian Wildlife Service have developed national interpretive plans and generally follow the S-M-R model of planning.

Chapter III

METHODS

Several interpretive planning models have been developed over the years (Chapter II). No single model is used in developing an interpretive plan, but rather a combination of approaches, influenced by the researcher, is generally applied. Virtually all of the literature found on interpretive planning was written for, or about, existing programs. Much of this information was applicable in writing the plan for Beaudry PHP with a few exceptions. These exceptions was: the lack of site specific information on natural and cultural histories and visitors to the park. Projecting visitor use for a park in the planning stage only, is difficult. Visitor analyses from the literature (which were developed for existing programs) were applied to Beaudry PHP as best as possible.

The approach taken in developing the interpretive plan was to: a) first set the objectives, b) research the relevant natural and cultural histories and methods of restoring prairie, c) analyse potential visitors, d) determine the appropriate interpretive themes and media, e) analyse the interpretive messages, f) determine an implementation strategy, and g) outline the numbers and types of staff necessary.

Several research phases were used to fulfill the research objectives.

PHASE 1

Objectives for the interpretive plan were determined by the researcher based upon information gathered in Chapter I with assistance from literature reviewed for Chapter II.
Objectives were approved by the client and the academic committee prior to writing the interpretive plan.

PHASE 2

A literature review was conducted to obtain the following information:

- methods of general interpretation and interpretive planning
- natural history of aspen parkland and tall grass prairie
- restoration of prairie
- cultural group interaction and impact on tall grass prairie by native Indians, Metis and European settlers.

The University of Manitoba library system was used to locate and obtain references from Canadian and American universities and government agencies. The Provincial Archives of Manitoba, the Hudson Bay Archives and the Legislative Library were also used as sources.

PHASE 3

Staff at Parks Branch were consulted to determine the methods and timing of the restoration process to be used at Beaudry Provincial Heritage Park.
This helped determine the interpretive themes and media for the plan.

PHASE 4

Individuals at prairie centres, parks branches and heritage centres in Canada and the United States were contacted for their assistance and experience in interpretation and natural and cultural history.

Contact was by phone and letter. Information solicited included: interpretation plans and programs; prairie restoration methods; any required specific information on natural or cultural history of tall grass prairie.

PHASE 5

Visitor analysis was conducted by the researcher with reference to information gathered in Chapter II and Hilderman et al. (1984).

PHASE 6

A brief storyline was written for the selected themes drawing upon information from previous phases.

PHASE 7

Interpretive messages were drawn from the literature review based on the interpretive objectives.

Messages were ranked in order of importance, then analysed. Message analysis charts were used to subdivide the messages to determine experiences/stories based on the interpretive objectives and the park environment. The analysis charts included the possible means, locations and timing of the message presentation.

PHASE 8

Suitable media were determined and alternatives suggested.

PHASE 9

Message analysis, based on Cobus (1984), was done to illustrate the relationships between themes and media, and themes and location.

PHASE 10

A staffing plan has been suggested based on the interpretive themes and media.

PHASE 11

An Implementation Strategy was written to facilitate development and funding.

PHASE 12

Future research to enhance the interpretive plan was suggested based upon findings of the researcher.

Chapter IV

REVIEW OF NATURAL HISTORY LITERATURE

4.1 INTRODUCTION

This chapter is a review of literature on the natural history of Beaudry Provincial Heritage Park. First, the post-glacial vegetation history of Manitoba will be outlined. This will be followed by a brief description of the vegetation boundaries of Manitoba and the location of the park within them identified. The aspen parkland transition zone will be examined and then, more specifically, its tall grass prairie component. The natural history of Beaudry Provincial Heritage Park itself will then be examined.

Scientific names are in accordance with the following authors: Banfield (1974) for mammals, Preston (1982) for amphibians and reptiles, Scoggan (1978-1979) for plants and American Ornithological Union (1982) for birds.

4.2 POST-GLACIAL VEGETATION HISTORY

Manitoba was completely covered by glacial ice several kilometres thick for more than 10,000 years from approximately 23,000 years before present (B.C.), a period known as the Wisconsin Ice Age (Shay 1984). Once the glacier began

to recede (about 12,000 B.P.) it deposited eroded debris that was readily colonized (Shay 1984). "The record of vegetation history for the grassland-aspen parkland region is sparse..." (Ritchie 1976). The following summary is from Ritchie (1976, 1983).

- 13,000 - 10,000 B.P. - a cool climate, with mean summer temperatures in the northern Lake Agassiz basin between 5 to 10°C.Spruce forest grew on mesic sites with abundant poplar and willow stands on alluvial and hydric sites and open shrub (juniper, willow) and wormwood (Artemisia spp.) communities on xeric sites.
- 10,000 - 6,500 B.P. - an abrupt warming at 10,000 B.P. resulted in a warm dry climate with summer temperature 15 to 17°C and precipitation 10 to 20% less than modern values. The boreal forest disappeared entirely. It was replaced in the southwest by prairie, and in the southeast by deciduous forest. During this time bur oak migrated in from the southeast.
- 6,500 - 2,500 B.P. - a warm climate with summer temperatures similar to the preceding interval, but greater precipitation, with a marked cooling at 3,500 B.P. The grassland was gradually replaced by deciduous forest (poplar, oak, birch, ash).
- 2,500 B.P. - the establishment of the modern climate and vegetation.

4.3 VEGETATION BOUNDARIES

There are a number of different vegetation maps for Manitoba that illustrate the 'natural' vegetation regions (Anderson 1982, Bird 1961, Looman 1979, Rowe 1972, Shay 1984, Weir 1983, Watts 1969). Variations are the result of lack of adequate vegetation surveys prior to European settlement, changes in vegetation resulting from settlement, and use of different criteria (soil, climate, different vegetation sur-

veys) for determining the boundaries of the region. Figures 5 and 6 illustrate two of these maps.

The aspen parkland is a transition zone between the Great Plains grasslands to the southwest and the boreal coniferous forests to the north and east. It consists of a mosaic of grassland and groves of deciduous trees. In the south the parkland is predominantly grassland, but the percentage of tree cover increases as one moves northward (Bird 1961, Looman 1979, Watts 1969). The dominant tree throughout the parkland is trembling aspen (Populus tremuloides) with bur oak (Quercus macrocarpa) becoming important in the south (Bird 1930, Watts 1969).

The tall grass, or true, prairie in Manitoba, is a northern extension of this prairie community from western Minnesota and eastern North Dakota and is bordered by aspen parkland on the west, north and east (Shay 1984, Watts 1969). It is characterized by a covering of tall grasses (predominantly big bluestem, (Andropogon gerardii), a variety of forbs, few shrubs and no trees, except along river banks (Shay 1984, Watts 1969, Weaver 1954).

4.3.1 Location of Beaudry PHP

Though vegetation boundaries differ between maps, and the scales of these maps make it difficult to accurately locate Beaudry PHP, it can be concluded that the park lies on the

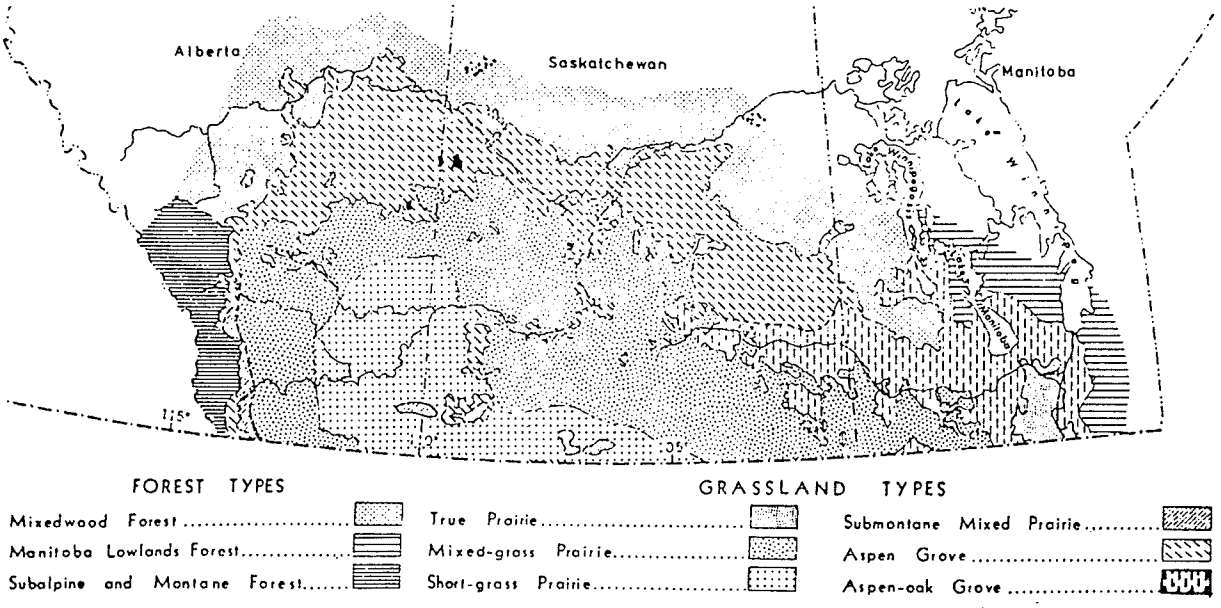

Figure 5: Vegetation of Western Canada (adapted from Watts 1969)

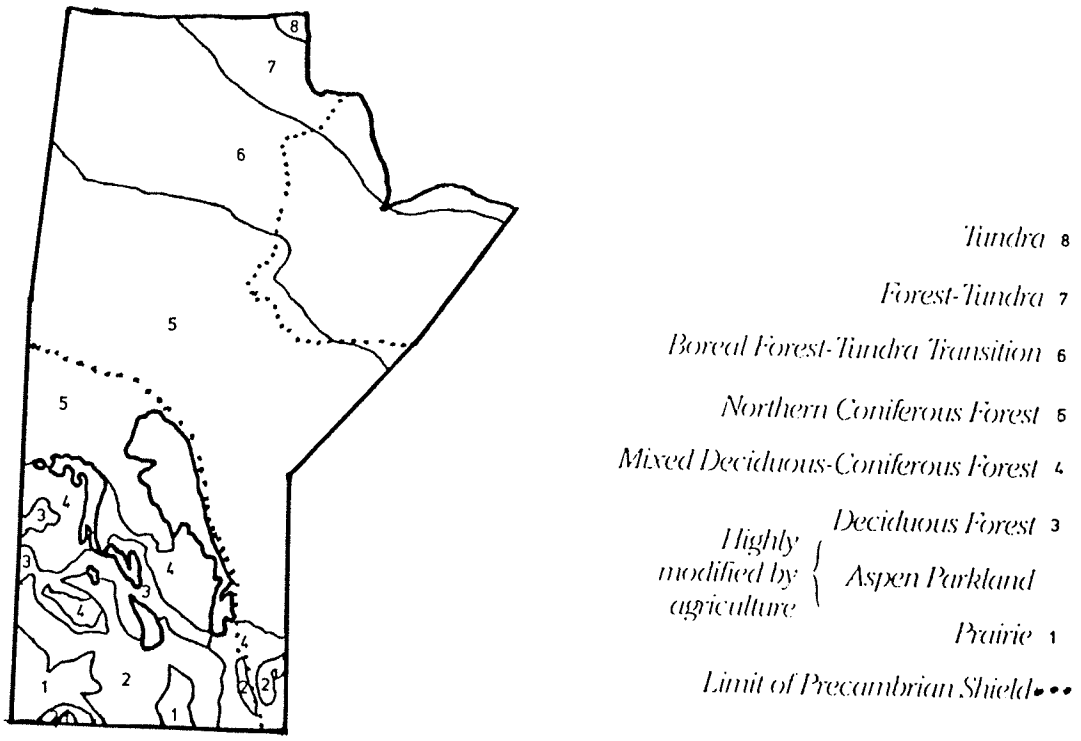

Figure 6: Vegetation of Manitoba (adapted from Shay 1984)

southern edge of the aspen parkland. The natural history of the tall grass prairie and the southern aspen parkland is intricately linked. Thus the natural history of the aspen parkland will be examined first, followed by a more detailed review of literature regarding tall grass prairie.

4.4 ASPEN PARKLAND

"The aspen parkland contains two major plant communities, forest and grassland, which are intermingled in a mosaic of irregular isolated patches and more or less solid stands, as well as numerous aquatic communities" (Bird 1961). Depending on pressures of weather, people, and fire, the grassland may advance on the forest when the trees are damaged by drought, fire or animals, or, it may recede when conditions for tree growth are more favourable (Bird 1961). Since the arrival of Europeans, the occurrence of fires has been reduced and the area of forest has increased (Bird 1961, Rowe 1972). The parkland has been considered an ecotone, or area of stress (Bird 1930, 1961). "Within this transitional zone, boundaries separating grassland from forest may be gradual or abrupt depending upon local environmental conditions related to topography and soil" (Anderson 1982).

4.4.1 Grassland Communities

4.4.1.1 Plants

The grassland portion of the aspen parkland is similar in composition to the grassland community to the south. In Alberta, Saskatchewan and western Manitoba, the grassland community found in the parklands is classed as mixed prairie. The drier communities in sections of the northern mixed prairie of Alberta and Saskatchewan are known as fescue prairie. In central Manitoba tall grass prairie is the grassland community found in the parkland (Bird 1961, Watts 1969). Looman (1981) indicated that all grasslands in the parklands are mesic. Precipitation is at least 375 mm with relatively low evaporation. He distinguished between two types of mesic grasslands. "The dry-mesic grasslands cover more that 50% of the area in the parkland landscapes of the southern parklands, and the lower elevations in the [Rocky Mountain] Foothills." The dominant species of this type are needle grass (Stipa spp.) or wild oat grass (Danthonia spp.) on dark brown soils. The second form is eu-mesic grasslands which "cover less than 50% of the parkland landscapes, with tree groves predominating." Here, either bluestem or fescue grasses (Festuca spp.) are dominant and the soils are black chernozem.

Looman (1981) divided the mesic grasslands into two classes: Stipo - Festucetea (more commonly refered to as mixed and fescue prairie) and Stipo - Andropogonetea (more

commonly refered to as tall grass prairie). A trend from dry-mesic to wet-mesic is evident in both classes. Both Looman (1981) and Bird (1930,1961) described specific grassland communities of the parklands.

4.4.1.2 Animals

Animals of the grassland portions of the aspen parkland are primarily the same species as those of the related prairie and are examined under that section. Animals typical of forest communities of the aspen parkland can be assumed to overlap and extend onto the adjacent grasslands.

4.4.2 Forest Communities

4.4.2.1 Plants

Rowe (1972) divided the parkland into two sections. The western portion of the parkland is termed the aspen grove. The dominant tree species in natural stands is trembling aspen. Towards the prairie, aspen are usually about only 7 cm in diameter and up to 4 m in height. "Towards the boreal forest the percentage of the total cover represented by aspen increases greatly" (Watts 1969). Balsam poplar (Populus balsamifera) occurs on moister sites. White birch (Betula papyrifera) is occasional and is found only on rough broken land (Bird 1961, Rowe 1972).

The topography of the aspen grove is generally rolling. It occurs primarily on the black and dark gray chernozem soils of Saskatchewan and Alberta (Rowe 1972). The meadow and prairie patches that occurred in the aspen grove have nearly all been broken for agriculture.

Rowe (1972) designated the eastern section of the parkland as the aspen-oak grove. Bur oak reaches the limit of its northern and western distributions in this zone (Bird 1961). It occurs primarily along rivers and on shallow dry soils and south or west slopes (Rowe 1972). It occurs in greatest abundance along the Red River and in the vicinity of Winnipeg and Portage la Prairie (Bird 1961). In the aspen-oak grove, sites that favour tree growth are wet soils, snowtraps and sandy areas with moist soil (Watts 1969).

The topography of this zone varies from flat or undulating in the east to rolling or rough on the west. Soils are black chernozem under grass and meadow sections. Well drained sites with trees have dark gray chernozem while humic gleysols are found on poorly drained sites (Rowe 1972).

Throughout the parkland a similar shrub and herbaceous layer is found under tree groves. The shrub stratum may primarily be composed of American hazelnut (Corylus americana), snowberry (Symphoricarpos albus), chokecherry (Prunus virginiana), saskatoon (Amelanchier alnifolia), wild rose (Rosa spp.), red-osier dogwood (Cornus stolonifera) and oc-

casionally raspberry (Rubus idaeus). Poison ivy (Rhus radicans) is found on sandy soils (Bird 1961, Watts 1969). The upper herb stratum may include wild sarsaparilla (Aralia nudicaulis), sweet-scented bedstraw (Galium triflorum), baneberry (Actaea rubra) and asters (Aster spp.) (Bird 1930, 1961). The lower herb stratum consists of pink wintergreen (Pyrola asarifolia), bunch berry (Cornus canadensis), lily of the valley (Maianthemum canadense), strawberry (Fragaria spp.), dewberry (Rubus pubescens) and Canada anemone (Anemone canadensis) (Bird 1930, 1961).

4.4.2.2 Flood-Plain Community

Along the river valleys of the parkland occur forests of Manitoba maple (Acer negundo), American elm (Ulmus americana), green ash (Fraxinus pennsylvanica), and Eastern cottonwood (Populus deltoides). Basswood (Tilia americana) is common only along the Red River and up the Assiniboine to Portage la Prairie (Bird 1961, Looman 1979, Rowe 1972). The undergrowth of the flood plain forest is sparse. It may contain ostrich fern (Matteucia struthiopteris), wood nettle (Laportea canadensis), silverweed Potentilla anserina), asters and poison ivy.

4.4.2.3 Animals

The dominant mammal of the aspen parkland forest communities of Manitoba was the snowshoe hare (Lepus americanus) (Bird 1930,1961). It prefers to reside in aspen groves and thickets of willow and hazel. The snowshoe hare has many predators which are found in the parkland: great horned owl (Bubo virginianus), great gray owl (Strix nebulosa), barred owl (S. varia), lynx (Lynx lynx), bobcat (L. rufus), red fox (Vulpes vulpes), coyote (Canis latrans), wolf (C. lupus) and mink (Mustela vison) (Banfield 1974). In winters snowshoe hares will eat twigs and bark. In years of high population they kill many young saplings and shrubs.

In pre-contact times American beaver (Castor canadensis) was a major influence in the parkland due to its dam building and consumption of its prefered food, trembling aspen (Bird 1961). He also notes that "It was the principal fur bearer and the chief factor in the early exploration of the parkland." The activities of beaver would have promoted "the ponds, willows, and other marsh growth so attractive to the moose" (Alces alces) (Nelson 1976).

Other mammals common to the forest edges of the parkland are: Gapper's red-backed vole (Clethrionomys gapperi), least chipmunk (Eutamias minimus), Franklin's ground squirrel (Spermophilus franklinii), and the striped skunk (Mephitis mephitis) (Bird 1961).

Resident birds that are found at the forest edge include, the American goldfinch (Carduelis tristis), yellow warbler (Dendroica petechia), brown thrasher (Toxostoma rufum), gray catbird (Dumetella carolinensis), eastern kingbird (Tyrannus tyrannus), common flicker (Colaptes auratus), mourning dove (Zenaida macroura), and the American robin (Turdus migratorius) (Bird 1961). Raptor species included the red-tailed hawk (Buteo jamaicensis), Swainson's hawk (B. swainsoni), and the northern goshawk (Accipiter gentilis). The former two hunt at the forest edge and over the prairie (Bird 1961). Bird species typical of the dense aspen forest are the red-eyed vireo (Vireo olivaceus), warbling vireo (V. gilvus), least flycatcher (Empidonax minimus), northern oriole (Icterus galbula), downy woodpecker (Picoides pubescens), hairy woodpecker (P. villosus), black-capped chickadee (Parus atricapillus), and the veery (Catharus fuscescens). Bird (1961) also lists numerous invertebrate species common to the aspen parkland. These include gall insects, snails and various beetles. "In the mature aspen, the invertebrate population may reach 4.5 million per acre, being highest among the leaf mold" (Bird 1961).

The increase in aspen parkland in historical times has resulted in the movement of various animals into Manitoba (Wrigley 1979). The most notable species is the white-tailed deer (Odocoileus virginianus). This species is mainly a browser of buds, twigs, leaves and fruit of many

plants. It prefers to inhabit the forest edges (Wrigley et al. 1974). Another successful newcomer is the eastern cottontail (Sylvilagus floridanus). This species is also a browser prefering the forest edges and brushy fields (Banfield 1974).

4.4.3 Aquatic Communities

Bodies of water in the parkland are mostly small and shallow (Bird 1961). Water accumulates from spring melt and rain runoff and forms various types of small water bodies (sloughs, potholes, marshes). The types of emergent vegetation found in these waterbodies include, cattail (Typha spp.), bulrush, (Scirpus spp.), sedges (Carex spp.), and grasses. The animals common to these aquatic communities include muskrat (Ondatra zibethicus), Canada goose (Branta canadensis), mallard (Anas platyrhynchos platyrhynchos), pintail (Anas acuta), blue-winged teal (Anas discors), killdeer (Charadrius vociferus), northern leopard frog (Rana pipiens), mosquitoes, dragonflies and damselflies.

A number of lakes are found in the parkland which are usually fed by small streams, springs and runoff water (Bird 1961). Where water levels are high enough, fish will occur. These include northern pike, or jackfish (Esox lucius), pickerel (Stizostedion vitreum), white sucker (Catostomus commersonii), and various minnow species. Fish eating birds attracted to these lakes include the white pelican (Peleca-

nus erythrorhynchos) and the double-crested cormorant (Phalacrocorax auritus) (Bird 1961).

The eastern part of the parkland is drained by three major rivers; the Assiniboine, the Qu'Appelle, the Red and their associated tributaries (Bird 1961). The lower portions of the Red and the Assiniboine often flooded in past years, before flood control mechanisms were built, and thereby created and maintained the flood-plain communities discussed previously. Common mammals along the rivers are the muskrat, beaver, mink, and raccoon (Procyon lotor). Numerous species of birds inhabit the river banks such as the belted kingfisher (Ceryle alcyon), bank swallow (Riparia riparia), wood duck (Aix sponsa), and mallard (Bird 1961). The common fish of the lakes of the parkland also occur in the rivers. Invertebrate species noted by Bird (1961) include the black fly (Simuluim venustum) mayflies, stoneflies and molluscs. The insects provide food to the frogs and turtles occuring along the river: leopard frog, western painted turtle (Chrysemys picta belli) and the snapping turtle (Chelydra serpentina serpentina).

4.4.4 Retarding Factors

Prairie is replaced by forest under certain conditions, and vice versa. Factors encouraging the growth of trees are: sufficient moisture, lack of fires and no grazing animals (cattle, bison) (Bird 1930, 1961, Looman 1979, Roe

1951). Conversely, factors encouraging the growth of prairie species are drought, fire and grazing.

The reduction of fires is the primary cause of the increase of aspen parkland (Looman 1979). Occasional fires may kill aspen trees, but regeneration is quick as the roots are undamaged. Recurrent fires will eventually damage roots and prevent regeneration (Bird 1961). Grasses are adapted to fire and drought. Snowshoe hares may kill large numbers of aspen during the winter by chewing the bark (Bird 1961). He cited this as second to fire as a check on aspen growth. Roe (1951) cited a number of early travelers who stated that buffalo killed numerous trees by rubbing them, thereby reducing the area of forest cover.

4.5 PRAIRIE

4.5.1 Climate and Prairie Regions

There are three prairie regions in Canada. They are: short grass prairie, mixed prairie and tall grass prairie (Figure 3). Generally, the climate of the prairies is characterized by an arid cold season of approximately six months, with a two month hot season (July and August) divided into a wet and a dry portion (Carpenter 1940). The short grass prairie lies in the rainshadow of the Rocky Mountains resulting in only 25 to 38 cm of rainfall per year. The effect of this rainshadow lessens as one moves east. Rainfall increases to 75 to 100 cm on the eastern edge, "potential

evaporation decreases, numbers of days with rainfall increases and periodic drought and periods of low relative humidity during July and August decrease" (Anderson 1982).

In short grass prairie, the dominant species on shallow soils of eroded uplands is blue grama grass (Bouteloua gracilis). Common speargrass (Stipa comata) is the dominant species on the deeper upland soils with better moisture conditions. Other important grasses of this region are: western wheat grass (Agropyron smithii), northern wheat grass (Agropyron dasystachyum), June grass (Koeleria gracilis), and Sandberg's blue grass (Poa secunda) (Watts 1969). The short grass prairie community in Manitoba is found only on sandy soils in mixed prairie areas.

The mixed grass prairie occupies a region of less extreme climatic conditions than the short grass prairie, but does not receive as much precipitation as the tall grass prairie (Weaver 1954). As a result, it contains species from both of the other prairie formations. The boundaries of this region fluctuate depending on the fluctuation of climatic factors (Carpenter 1940). Thus, during dry periods, short grass species benefit at the expense of tall grass species.

Almost all grasses of the short grass prairie occur in the mixed grass zone (Watts 1969). The grasses characteristic of the tall grass prairie that occur in the mixed grass zone do not achieve the same height as they do in the former

zone. Most prairie in Manitoba is mixed grass prairie, while the remainder is of the tall grass prairie community.

4.5.2 Tall Grass Prairie

4.5.2.1 Species Composition

The height and species of grasses found in this prairie set it aside from other prairie communities (Watts 1969). The predominant grass species, big bluestem, can reach heights of over 2 m. in Manitoba. Along with little bluestem (Andropogon scoparius), big bluestem comprises approximately 75 percent of the cover of tall grass prairie (Weaver 1954). Big bluestem is dominant because of "its rapid growth, dense sod-forming habit, great stature, and tolerance of the plant and its seedlings to shade" (Weaver 1954). Big bluestem is best developed on lower moist slopes and well aerated lowlands while little bluestem does better on drier sites (Weaver 1954). Carpenter (1940) cited studies that examined east to west variations in prairie. Upland prairie species of the east generally became the lowland species of the west. Big and little bluestem, blue grama grass, side oats grama (Bouteloua curtipendula), Switch grass (Panicum virgatum) and porcupine grass (Stipa spartea) followed this pattern.

The tall grass prairie of Manitoba is an extension of this prairie community from western Minnesota and eastern North Dakota. It previously covered an area of approximate-

ly 4,000 km^2 and "lay almost wholly west of the Red River, extended north to approximately the Assiniboine River, and west to the rising ground of the Manitoba escarpment" (Watts 1969).

The lush growth of the dominant tall grasses was due to the heavy clay soil and poor drainage on the flat Lake Agassiz plain which retained spring runoff well into the growing season (Shay 1984). Canadian wild rye (Elymus canadensis), northern wheat grass, little bluestem, June grass and porcupine grass are associates of big bluestem (Watts 1969). "Forbs are always present and often abundant in prairie. They are an integral part of it. Often they are more conspicuous, although nearly always of less importance than the grasses. Some are rare; others occur only occasionally" (Weaver 1954). Watts (1969) listed the following as important components of the tall grass prairie: willow aster (Aster praealtus), tall goldenrod (Solidago canadensis), prairie lily (Lilium philadelphicum), prairie rose (Rosa arkansana), and Canada anemone. Other species typical of the tall grass prairie include the forbs black-eyed susan (Rudbeckia hirta), milk-vetches (Astragalus spp.), wild onion (Allium stellatum), and prairie crocus (Anemone patens). Shrubs include wolf willow (Elaeagnus commutata) and western snowberry (Symphoricarpos occidentalis) (Shay 1984). Major variations within a prairie community are due to differences in regional precipitation and the resulting humidity condi-

tions and evaporation rate as modified by wind and temperature. "Local variations are brought about by the nature of the soil, chiefly its water-retaining capacity but to some degree by its fertility as well. Only rarely is the soil so shallow that the presence of underlying rock modifies the character of the plant cover" (Weaver & Fitzpatrick 1934).

On the lower, poorer drained areas of the Lake Agassiz plain, the dominant grass species is prairie cord grass (Spartina pectinata), a tall marsh grass (Watts 1969). Grasses of lesser importance associated with this species are switch grass, Canada wild rye, alkali cord grass (Spartina gracilis) and northern reed grass (Calamagrostis inexpansa) (Watts 1969). Early European settlers of the Red River Valley cut large quantities of prairie cord grass for hay (though its quality is far lower than big bluestem). Weaver (1954) estimated that 20 to 30 percent of the Red River area was covered with a community, the dominant species of which were big bluestem and switch grass. The latter species was found on moderately wet sites of the Agassiz plain. On higher, coarse-textured soils, at the front edge of the Manitoba escarpment, where soil water is less abundant, upland communities develop. The dominant grass is porcupine grass. Associates include little bluestem, June grass, side oats grama and western wheat grass. Watts (1969) listed the important forbs in the Manitoba upland community as: lead plant (Amorpha canescens), stiff sunflow-

er (Helianthus laetiflorus), smooth goldenrod (Solidago missouriensis), silver-leaf psoralea (Psoralea argophylla), roses and prairie lily.

4.5.2.2 Characteristics of the Prairie

The prairie is constantly changing throughout the growing season. Species vary in growing and flowering periods, so that the colour, texture and height of the prairie are continually changing. The numerous species can only exist together by:

> sharing the soil at different levels, by obtaining light at different heights, by making maximum demands for the factors at different seasons of the year, by fitting into the niches unoccupied by other species, and by actually profiting by the incidental benefits afforded by the community of which they are a part. The legumes add nitrogen to the soil; the taller plants protect the lower ones from the heating and drying effects of full insolation; the mat formers and others prostrate on the soil further reduce water loss by covering its surface.... Light is absorbed at many levels, the more or less vertical leaves of the dominant grasses permitting some light to filter between them as the sun swings across the heavens (Weaver and Fitzpatrick 1934).

The vegetation may have a foliage cover of 100 percent or more so that, viewed from above, the soil is covered completely by the vegetation (Blake 1935). Weaver (1954) noted that the cover is usually 60 to 100 percent. Still, this cover is effective in absorbing radiant energy due to the different heights of plants and leaf patterns. "An acre of bluestem prairie may present 5 to 8 acres of leaf surface" (Weaver 1954). The extensive amount of vegetation results

in a layer of dead plant material at the surface which decomposes slowly because of the short arid summer.

As summer progresses and the species continue to grow, layers of vegetation form, thus further reducing the amount of light passing through to lower layers. According to Weaver and Fitzpatrick (1934), the light intensity at a height of 30 cm is reduced to 25 to 35 percent and near the soil surface to 3 to 8 percent.

Weaver (1954) noted the three height classes of grasses as:

tall grasses - a height of 1.5 to 3 m or more
e.g. big bluestem

medium grasses - 60 to 120 cm
e.g. little bluestem

short grasses - 15 to 45 cm
e.g. blue grama

These height classes reflect the three basic prairie formations and, as discussed above, may be intermingled. Weaver and Fitzpatrick (1934) provide height classes for the forbs of the Great Plains prairie.

- plants having little or no foliage exceeding a height of 30 cm on uplands and 45 cm on lowlands. e.g. wild strawberry, violets (Viola spp.)
- plants whose leafy stems function mostly at a height of about 60 cm e.g. roses, golden alexanders (Zizia aurea), daisy-fleabane (Erigeron strigosus).
- plants having many of the leaves carried far above 45 to 60 cm (the mid-summer level of the tall grasses) e.g. sunflowers.

In tall grass prairie, each of the height classes become the prevalent form as the growing season progresses.

Below the surface, the first 7 to 15 cm of soil "are occupied by roots and rhizomes, and occasionally by bulbs, corms, tubers, and their outgrowths. The dense network of roots extends much deeper" (Blake 1935). This vegetative network is the result of a plant community primarily composed of perennial species. Approximately 95 percent of prairie species are perennial (Blake 1935, Weaver 1954). This is an adaptation to a number of conditions, the primary one being an inadequate water supply. The development of extensive root systems and storage organs alleviates this problem (Blake 1935, Weaver & Fitzpatrick 1934). Reproduction is primarily vegetative (Weaver & Fitzpatrick 1934). According to Blake (1935), seeds face a hostile environment which reduces the possibility of germination. She stated that surface moisture is low, many seeds never reach the soil surface, and , if the seed does germinate, the rootlet may dry out before it is long enough.

Blake (1935) described the early life history of prairie plants from seeds. The following description is based upon her work. The seedlings that she studied were from seeds planted in a garden or greenhouse as it was difficult to determine whether young shoots in the prairie were from seeds or vegetative structures of established plants. If a seed does germinate, it must quickly develop a root and leaf sys-

tem to support it once the food stores in the seed or cotyledons are consumed. Root growth is rapid in order to reach available moisture deep in the soil. The root grows quite long before the shoot appears above ground, "sometimes even before it escapes from the seed coat." The secondary root system begins development soon after the primary root system has elongated, often at the time of tillering or shortly before. If conditions are favourable in the first year, organs of vegetative propagation develop extensively. Both forbs and grasses generally follow this growth pattern. "During all stages of development, growth of foliage is relatively slow and small compared to that of underground parts." (Blake 1935). By winter, the tops of prairie plants have died off leaving the roots in frozen soil. In spring new shoots replace the old ones in perennial plants. How long the root systems last is generally unknown, but prairie plants are long lived (Weaver 1954).

"The general characters of the root system of a species are often as marked and distinctive as those of the plant parts above ground" (Weaver 1954). Most perennial prairie plants have rhizomes which store food. It is from these structures that new plants develop. "Rhizomes may readily be distinguished from roots by the presence of nodes to which scale-like leaves are attached" (Weaver 1954). At the end of the rhizome is a terminal bud from which aerial shoots or new rhizomes develop (as from other buds on the

rhizome). Rhizomes are usually found within the top 10 cm of soil. Thus it is of interest to note some root and rhizome characteristics of tall grass prairie plants. The following descriptions are based on Weaver's (1954) work.

- Andropogon gerardii has roots that may reach a depth of 1.5 to 2 m or more. The roots grow vertically and obliquely downward with a few extending horizontally thus forming a dense sod. The main roots taper very gradually so that the diameter is the same at 1.2 m as at the surface. The root colour is reddish-brown. Rhizomes are usually short but closely matted in the top few centimetres of soil.

- Spartina pectinata has coarse, poorly branched but deep roots. The roots are thick and grow from the base of the clumps usually in groups of 2 to 5 or more. They spread very little but penetrate almost vertically downward to depths of 2.5 to 4 m. The roots are tan in colour. Rhizomes are usually in the upper 15 to 25 cm of soil and are very branched.

- Andropogon scoparius roots are finer than those of A. gerardii. Most of the roots extend vertically to a depth of 1.35 m to 1.65 m while some run laterally near the soil surface making a very dense sod.

- Stipa spartea has strong fibrous roots that grow vertically usually to a depth of 60 to 90 cm, sometimes 1.1 to 1.5 m. Other roots may extend horizontally but most run diagonally to a depth of 25 to 45 cm. The main roots often divide into many fine branches at greater depths.

- Helianthus laetiflorus has few or no roots. The rhizomes vary in length from a few centimetres to half a metre and are found no deeper than 15 to 20 cm in the soil. Roots may be fine or thick and woody.

- Solidago missouriensis primarily has short roots that form in clusters at the base of the clump and along the rhizomes. The main roots extend from 1.5 to 2.1 m in depth. Rhizomes are from 4 to 15 cm in length and are quite woody.

Roots of prairie plants do not all occur in the same levels (Weaver 1954, Weaver and Fitzpatrick 1934). Various

species may be grouped according to the layers of soil their roots occupy. "The segregation of the root systems into several more or less distinct levels for absorption is one of the chief adaptations of plants of the prairie to their environment" (Weaver & Fitzpatrick 1934). Thus young shoots from seedlings have difficulty in obtaining water and this reduces the number of annuals that can exist in the prairie. The extensive root system of tall grass prairie species allows the plants to survive in times of drought (Weaver and Fitzpatrick 1934). Weaver (1954) has documented many of the effects of drought on prairie plants.

The amount of organic matter produced by the foliage and especially the roots of tall grass prairie plants creates extremely fertile soil. "The virgin grassland soils are rich in both organic matter and nitrogen" (Weaver 1954). Thus the use of prairie for agricultural crops has expanded to such an extent that unplowed prairie has become rare.

The accumulated organic matter not only makes seed germination difficult, but can also affect shoot growth from vegetative structures. Since the amount of moisture actually reaching the soil surface is hampered not only by the live vegetation, but by the accumulated debris (Knapp 1985, Peterson 1982). Burning prairie is therefore beneficial if it occurs before growth is renewed in spring (Weaver & Fitzpatrick 1934). "Shoots start to grow sooner and more vigorously when exposed to the light and warmth of the sun's rays

than when they must elongate through a tangle of dead parts" (Blake 1935). Fires increase the soil temperature, which favours shoot growth (Knapp 1985, Peterson 1982, Wright & Bailey 1982). Peterson's (1982) study supported a number of earlier studies and showed that fire was an "important environmental cue for increased flowering in Andropogon gerardi". Knapp (1985) noted numerous benefits to big bluestem after burning: "Following fire, increased net photosynthesis, leaf conductance and production, greater N [nitrogen] uptake, retention and use efficiency (N conservation) and more efficient utilization of available solar radiation... were evident." He also noted that while the dominant species of tall grass prairie, big bluestem was favoured by burning, there was no major change in species composition of the community.

Prairie plants are adapted to fire because of the reproductive vegetative parts underground (Knapp 1985). Fire is considered to be a means of maintaining prairie from invasion by woody species (Levin & Keleher 1969). Thus the reduction of fires since the arrival of Europeans has reduced the area of prairie (Bird 1961, Nelson 1976, Nelson & England 1976, Roe 1951, Rowe 1972, Weaver 1954). Fires in prehistoric times occurred from lightning strikes, combustion, or were set by native people (Nichols & Entine 1978, Nelson & England 1976, Thomsen 1982, Weaver 1954, Wright & Bailey 1982). They did so "to clear the land and promote early

grazing, make travelling easier, or for other reasons...." (Weaver & Fitzpatrick 1934). In historic times, the causes of fires increased due to careless settlers and sparks thrown from railroad engines (Nelson & England 1976, Wright & Bailey 1982). Settlement of the prairies led to a reduction in fires, not because people were any more careful, but because of containment of fire to protect land and other belongings (Nelson & England 1976, Weaver 1954).

4.5.2.3 Animals

The most important animal, in terms of its influence on the prairie plants and people, was the American bison (Bison bison). Journals of early explorers, missionaries and fur traders note the vast numbers of this species (Nelson 1976, Wrigley 1979). The distribution of bison was originally from northern Mexico to Great Slave Lake and from Washington to the Rocky Mountain states. Bison were migratory. All herds moved southward in winter a few hundred kilometres to more favourable pastures (Banfield 1974). Bison had numerous effects on the floral species composition, distribution and height, primarily due to their vast numbers and large size (Nelson 1976). Trampling of woodlands may have been influential in maintaining and extending prairie. Walking and wallowing resulted in well worn paths that were extended by rain, runoff and erosion. Nelson (1976) noted that the species was an important source of fertilizer as were bears

(Ursus americanus and Ursus arctos). The bison was overhunted to the point of near extinction. Today only domestic herds exist in Manitoba.

"The grazing, walking and wallowing of the bison also influenced the distribution of other fauna" (Nelson 1976). The grazing habits of bison possibly encouraged the growth of forbs and shrubs which were consumed by pronghorns (Antilocapra americana) (Nelson 1976). This species orginally roamed the prairies in numbers comparable to bison (Banfield 1974, Wrigley 1979). It too was wiped out in Manitoba by overhunting but small herds still exist in southern Alberta and Saskatchewan (Banfield 1974).

Another large animal that was numerous on the prairies was the wapiti, or American elk (Cervus elaphus) (Nelson 1976). This species is quite flexible in its choice of habitat but prefers open areas such as prairie and aspen parklands (Banfield 1974).

Primary predators of bison, elk, and pronghorn were the grizzly bear (Ursus arctos) and the gray wolf, (Canis lupus nIblis) - a plains population formerly called the buffalo wolf (Banfield 1974, Bird 1961). Both of the prairie populations of these species were hunted out of existence.

Smaller mammals of the tall grass prairie include the white-footed mouse (Peromyscus leucopus), meadow voles (Microtus pennsylvanicus), thirteen-lined ground squirrel

(Spermophilus tridecemlineatus), and the Richardson's ground squirrel (Spermophilus richardsonii). The latter formed extensive colonies (Bird 1961).

Typical birds of the grassland are the western meadowlark (Sturnella neglecta), the horned lark (Eremophilia alpestris), and the upland sandpiper (Bartramia longicauda) (Bird 1961). Closer to the aspen groves common birds are the vesper sparrow (Pooecetes gramineus), chipping sparrow (Spizella passerina), and the sharp-tailed grouse (Tympanuchus phasianellus) (Bird 1961). Birds of prey which nest in the woodland and hunt over the grassland are the red-tailed hawk and the rough-legged hawk (Buteo lagopus). The northern harrier (Circus cyaneus) nests and hunts on the grassland.

A number of snake species are found in the grassland (Bird 1961). The most common species is the western plains garter snake, (Thamnophis radix haydeni). More rare species are the smooth green snake (Opheodrys vernalis) and the northern red-bellied snake (Storeria occiptomaculata occipitomaculata).

Amphibians common to the prairie include the American toad (Bufo americanus) and the leopard frog. Bird (1961) writes that the insectivorous leopard frog can be so numerous that it exerts "a powerful influence on the community."

4.6 BEAUDRY NATURAL HISTORY

4.6.1 Riverbottom

Dorber (1978) inventoried the vegetation of the riverbottom forests in the park. The most important tree species (in terms of frequency) was green ash followed by basswood and American elm. Manitoba maple, trembling aspen and bur oak had low importance values. The presence of Dutch Elm Disease in southern Manitoba has resulted in the removal of many elm trees from Beaudry PHP. This removal will continue as no effective disease prevention is currently available. In the shrub layer, hazelnut had the highest relative density. Also common were riverbank grape (Vitis riparia), climbing bittersweet (Celastris scandens), yellow parilla (Menispermum canadense), virginia creeper (Parthenocissus quinquefolia), wood nettle, red-osier dogwood, wild sarsaparilla and ostrich fern. Animals found residing in the riverbottom forest were the striped skunk, white-tailed deer, raccoon, black-billed cuckoo, great gray owl and numerous songbirds.

4.6.2 Aspen-Oak Grove

The aspen-oak groves inventoried by Dorber (1978) included green ash, Manitoba maple and American elm. She concluded that some of the stands were advancing toward riverbottom forest. The common shrubs associated with these stands were downy arrowwood (Viburnum rafinesquianum), hawthorn (Cratae-

gus rotundifolia), high bush cranberry (Viburnum opulus), red-osier dogwood, chokecherry and saskatoon. The herb layer contained ostrich fern, poison ivy, wild sarsaparilla, western snowberry, lily of the valley, raspberry, northern bedstraw (Galium septentrionale), and star false Solomon's-seal (Smilacina stellata).

4.6.3 Tall Grass Prairie

Levin and Keleher (1969) inventoried the remnant along the railroad right-of-way. They concluded that fires set along the tracks as a management activity were responsible for maintaining this remnant. The railway was abandoned in 1965 which ended the annual fall burning. In the intervening four years woody species, including western snowberry and bur oak, had invaded the remnant as a result. They advised that burning be initiated in the spring.

Two prairie types were found at Beaudry. The more extensive type, big bluestem, was found on more mesic sites. On drier and slightly more elevated sites porcupine grass-big bluestem was found. The species composition of these types are listed in Table 1 and Table 2 respectively. Of the 108 species of flowering plants found on the remnant only 17 (15%) were non-native to the region.

Parts of the remnant along the railroad right-of-way were burned for Parks Branch management purposes in the spring of 1981 and again in spring of 1985.

TABLE 1

Species Composition in the Big Bluestem Type Prairie of Beaudry Provincial Heritage Park (adapted from Levin & Keleher 1969)

Species	Mean Foliage Cover	% Frequency
Andropogon gerardii	33	100
Galium septentrionale	35	100
Thalictrum venulosum	6	100
Spartina pectinata	6	86
Astragalus goniatus	6	43
Anemone canadensis	5	71
Symphoricarpos occidentalis	4	86
Amelanchier alnifolia	4	71
Rosa acicularis	3	100
Helianthus laetiflorus	3	71
Artemisia ludoviciana	3	71
Helianthus maximiliani	3	57
Solidago missouriensis	1	57
Panicum leibergii	1	57
Lathyrus palustris	1	43
Vicia americana	1	43
Glycyrrhiza lepidota	1	29
Steironema ciliatum	1	29
Fragaria virginiana	1	29
Zizia aptera	1	14
Lathyrus ochroleucus	1	14
Salix petiolaris	<1	43
Comandra umbellata	<1	29
Geranium bicknellii	<1	29
Heliopsis helianthoides var. scabra	<1	14
Cirsium flodmanii	<1	14
Heuchera richardsonii	<1	14
Anemone cylindrica	<1	14
Sisyrinchium montanum	<1	14
Crepis tectorum	<1	14
Sonchus uliginosus	<1	14
Spiraea alba	<1	14
Populus balsamifera X P.deltoides	<1	14

TABLE 2

Species Composition in the Porcupine Grass-Big Bluestem Type Prairie at Beaudry Provincial Park (adapted from Levin & Keleher 1969)

Species	Mean Foliage Cover	% Frequency
Stipa spartea	50	100
Andropogon gerardii	19	50
Galium septentrionale	19	100
Astragalus goniatus	11	100
Rosa acicularis	5	100
Artemisia ludoviciana	5	100
Amelanchier alnifolia	5	67
Helianthus laetiflorus	4	67
Symphoricarpos occidentalis	3	50
Spartina pectinata	2	83
Thalictrum venulosum	2	67
Panicum leibergii	2	50
Lithospermum canescens	1	50
Monarda fistulosa	1	34
Lathyrus ochroleucus	1	17
Glycyrrhiza lepidota	<1	50
Solidago rigida	<1	34
Comandra umbellata	<1	34
Geranium bicknellii	<1	34
Anemone cylindrica	<1	17
Asclepias ovalifolia	<1	17

4.7 SUMMARY

This chapter reviewed literature on the natural history of Beaudry PHP. The park is on the southern edge of the aspen parkland ecotone. Aspen parkland consists of intermingled patches of grassland and deciduous forest. The dominant tree species of the aspen parkland in Manitoba are trembling aspen and bur oak. Major understory species include hazelnut, red-osier dogwood, poison ivy, wild sarsaparilla and Canada anemone. The dominant mammal of the forest community is the snowshoe hare. In historical times, the white-tailed deer has become numerous in the parkland. Prairie is replaced by forest under the following conditions: sufficient moisture, lack of fires and no grazing animals. Settlement has resulted in increased forest cover because of the reduction of fire and grazing animals. The area of prairie has been reduced primarily because of cultivation.

The tall grass prairie is distinguished from other prairie types by the height of grass species and the dominance of big bluestem. Other important tall grass prairie species include Canadian wild rye, porcupine grass, little bluestem, willow aster, tall goldenrod, wild onion and western snowberry. The grass and forb species of tall grass prairie have extensive root systems which allow the plants to find sufficient moisture and regenerate after fires. The dominant animal was the American bison until it was nearly ex-

terminated. Other large animals of the tall grass prairie have also been reduced in number and some are extinct.

The prairie remnant along the highway right-of-way at Beaudry PHP has two prairie types, big bluestem and porcupine grass-big bluestem. These remnants have been invaded by woody species because of the reduction in maintenance by fire but this has begun to be reversed with the reintroduction of fires by Parks Branch in recent years.

Chapter V

REVIEW OF PRAIRIE RESTORATION LITERATURE

5.1 INTRODUCTION

This chapter is a review of literature on the restoration of native tall grass prairie. The philosophy of prairie restoration will be presented first, followed by a brief outline of the histories of some prairie restoration projects. The methods of prairie restoration will be examined by reviewing literature on seedbed preparation, seed selection and processing, and planting methods. This will be followed by a review of literature on methods of maintaining restored prairie. Since no restoration attempts have taken place in Canada, the literature reviewed is from United States restoration projects. A summary of the restoration activities at Beaudry PHP is included.

5.2 PHILOSOPHY OF PRAIRIE RESTORATION

There are numerous reasons for restoring prairie. The Nature Conservancy lists three principal purposes for the restoration of ecosystems:

- The first involves providing habitat for the preservation of species and ecological phenomena.

- The second reason ... is the process itself.
- The third goal of restoration should be the reestablishment of diversity for diversity's sake in the environments in which most people must spend their time. (Jenkins 1973)

Most prairie restoration projects are for the purpose of providing wildlife habitat, particularly for waterfowl (Angus et al. n.d., Duebbert et al. 1981, Missouri Conservation Commission 1980). The loss of native prairie has resulted in the reduction of plant and animal diversity in former prairie areas (Ahrenhoerster & Wilson 1981). In Missouri, native grasses are being seeded to provide forage for cattle. Utilizing native grasses increases soil fertility, provides higher summer nutrition for cattle, and the maintenance requirements of these species is low (Missouri Conservation Commission 1980).

Restored prairies also provide an historical perspective and can be used for interpretation of cultural and natural history (Ahrenhoerster & Wilson 1981, Schramm 1970) The restoration of prairie is not strictly for utilitarian purposes in all cases as "restored prairies are aesthetically satisfying plant communities, rich in textures and alive with colors" (Kropp n.d.).

5.3 HISTORY OF U.S. PRAIRIE RESTORATION SITES

The University of Wisconsin Arboretum prairie restorations were begun in the 1930's when virtually nothing was known about the subject. The purpose of the Arboretum is to recreate the natural habitats of Wisconsin. Blewett and Cottam (1984) recently reviewed the Arboretum's history. Early efforts of prairie restoration entailed transplanting sods and planting single species plots which required a large volunteer labour force. A variety of planting techniques were used through the 1940's and 1950's. These experimental efforts were quite successful. Research projects have been conducted since the 1940's on planting requirements and ecology of prairie plants. Blewett and Cottam (1984) concluded from the restoration achievements "that careful planting of stratified seeds on soil that has been cultivated to reduce weeds is the most economical way to re-establish a large prairie." Though natural prairie cannot be restored in all its complexity, arboretum staff feel that a representative prairie can be produced by providing the higher plants and introducing small prairie animals.

One of the largest prairie restoration projects is at the Fermilab National Accelerator Laboratory in Illinois (Thompson n.d.). Inside a moat for cooling water, 175 ha of land have been seeded to prairie grasses. The project, begun in 1972, is run by a volunteer committee. The Morton Arboretum provided seed for the first few years and the amount of

available seed limited the area that could be planted each year. By 1979 approximately 40 ha had been planted with such great success that Fermilab began to harvest its prairie for grass seeds to plant additional areas. Flower seeds were still collected by hand from other prairie sites. A forb garden was begun in 1981 to provide a self-sufficient seed source. Introduction of small prairie animals has been attempted to help complete the ecosystem.

In Missouri, the only prairie restoration projects are for providing cattle forage (Clubine pers. comm.). The Department of Conservation is actively promoting prairie restoration by providing assistance such as seed drills. In the past few years over 1000 ha per year have been seeded. Native grasses, once established, do not have to be seeded each year, thus saving money and time for cattle producers.

5.4 METHODS OF PRAIRIE RESTORATION

5.4.1 Seedbed preparation

The most important factor in seedbed preparation for native prairie species is weed control. To achieve this, the ground must be worked several times prior to seeding (Lehr 1981, Nichols & Entine 1978, Smith & Smith 1980). Some authors suggested cultivation a year prior to seeding (Nichols & Entine 1978, Schramm 1970, Smith & Smith 1980). Schramm (1970) stated that leaving the field fallow for one year and regular shallow disking or harrowing is the best method of

weed control. A more popular method of seedbed preparation is to plow deeply the fall previous to seeding (Angus et al. n.d., Illinois Conservation Dept. n.d., Missouri Conservation Commission 1984a, Smith & Smith 1980, Vassar et al. 1981).

Spring cultivation is essential, whether the fields to be restored have been plowed the previous summer or fall or not. If the soil has not been previously plowed, it should be done in the spring. Plowing is followed by disking (Angus et al. n.d., Lehr 1981, Nichols & Entine 1978). Angus et al.(n.d.) suggested disking 2 to 3 times in spring and this should be followed by harrowing (Lehr 1981, Nichols & Entine 1978, Rock 1981), though Angus et al.(n.d.) recommended pulvi-mulching as the final step before seeding. Harrowing or light disking before seeding provides a firm seedbed and controls early spring weeds.

Attempts have been made at planting native grasses into cover crop stubble. The Soil Conservation Service worked their restoration sites the summer prior to seeding of native grasses. The soil would be worked shallow until midsummer and then a forage cover crop planted. In the fall the crop was hayed, leaving a 30 to 35 cm stubble into which native grass was then seeded (Rock 1981, Wilson 1970). Vassar et al. (1981) also seeded prairie species into cover crop stubble after spraying a pre-emergent herbicide. Duebbert et al. (1981) suggested that, on medium to coarse-tex-

tured (sandy) soils or steep slopes subject to erosion, an annual grain crop should be planted for 1 year. Prior to planting the protective crop, the site should be prepared. Planting should be delayed till 1 or 2 crops of annual weeds have germinated and been killed by shallow tillage. The following spring, native grasses can be seeded into clean standing stubble without further seedbed preparation. Species which can be used as protective cover include sudan grass (Sorghum sudanese), oats (Avena sativa), barley (Hordeum vulgare), millet (Panicum miliaceum), and flax (Linum spp.) (Duebbert et al. 1981, Fergus Falls WMD 1981). Angus et al. (n.d.) however do not recommend using small grain stubble to seed native grasses into, as they discovered the following problems:

- First, the amount of residue is excessive and reduces soil temperatures to sub optimum levels.
- Second, small grains frequently promote the annual weedy grasses, especially foxtails (Setaria spp.).

Angus et al. (n.d.) also commented on the use of other types of stubble as a protective crop. To use corn stubble, it must be chopped and removed as silage and the grass seeded in by no-till methods. They also used soybeans as the protective crop and found that it "leaves a small amount of dark-colored residue following harvest and foxtails can be controlled in the crop with several different chemicals."

Missouri Conservation Commission (1984a) suggested seeding native grasses into milo or soybean stubble 10 to 15 cm high in March to May. Minnesota's Waterfowl Management Districts (WMD) found that a 1982 seeding on soybean stubble provided the most success that year (Fergus Falls WMD 1982). Wilson (1970) found soybean stubble to be the best seedbed for native grasses in the U.S. corn belt. "This type of cover protects the ground surface from blowing, keeps a moist top layer of soil for the longest period, keeps crusting to a minimum, provides shade for the seedling and keeps sheet water erosion to a minimum" (Rock 1981).

In contrast to the use of protective crops, Schulenberg (1970) wrote that all planting of prairie species at the Morton Arboretum have been in bare ground, plowed at least six months prior to planting.

Herbicides and fertilizers are sometimes used on prairie restoration projects for cattle forage and waterfowl nest cover. Missouri Conservation Commission (1984a) stated that early spring seeding will require either frequent early mowings or the use of herbicides to control weeds. Ahrenhoerster and Wilson (1981) recommend the spray, disk, spray method of seedbed preparation. The sequence for preparation is:

- Weeds actively growing on site - spray.
- Approximately 2 weeks later plants are dead. Shallow disk to surface dormant weed seeds.

- Wait 2 to 3 weeks to allow seeds to sprout, then repeat spraying.
- Two weeks later the site is ready for a fall seeding.

Anrenhoerster and Wilson (1981) suggested the use of 'Roundup' in the above sequence. Other recommended sequences of weed control were 1) burn, spray, disk, spray or, 2) spray, burn, disk, spray. Burning removes ground litter and breaks the dormancy of some seeds. 'Roundup' is also used for restoration projects on Minnesota WMD. The herbicide is applied to plots one week prior to seeding and later after seedlings are established. Older seedlings are also sprayed (Fergus Falls WMD 1981, 1982). 'Atrazine' was used on poorly established 2 year old seedlings on Minnesota WMD prairie projects (Fergus Falls WMD 1981). Clubine (1985b) reports that atrazine sometimes damages switchgrass and big bluestem seedlings which can usually tolerate this herbicide. He recommended against using herbicides on a widespread basis as many species are not tolerant of them.

Landers et al. (1970) reported that spraying of herbicides was not allowed in the establishment of native grasses in an Iowa state park. Weed control was provided by rototilling the seedbed prior to seeding and harrowing afterwards. Weeds were not a major problem after 3 growing seasons.

Schramm (1970) stressed not using fertilizer in seedbed preparation as it will increase the vigour of the competing

annual weeds. Clubine (1985a) also recommended against using fertilizer as there are difficulties in timing which can favour undesired species. Although nitrogen can boost yields if applied after grasses have begun growth in early spring, late spring burning is then necessary, in the years prior to and after fertilization to reduce weed competition.

5.4.2 Seed selection and processing

Native prairie seeds may be purchased commercially or collected from prairie remnants. When selecting seed, it is important to find that which is suited to the photoperiod of the restoration site (Olson 1978).

> When strains of grasses from northern sources are moved southeastward from the point of origin, they mature earlier, are shorter, produce less herbage, and are more susceptible to leaf and stem diseases. When strains from southern sources are moved northward they generally mature later, are taller, and produce more herbage (Duebbert et al. 1981).

To achieve this, the US Soil Conservation Service recommends planting native grass seed no more than 480 km north, 320 km south and 480 km east or west of its origin (Angus et al. n.d.). Ahrenhoerster and Wilson (1981) advised using seeds or transplants from within 80 km of the planting site for best results and maintenance of local genetic stock. Illinois Conservation Dept. (n.d.) recommended using seeds from within 160 km of the restoration site. It further suggested not purchasing 'improved' or selected varieties or strains. Fermilab harvests seed from its established plots to provide

seed for new plots (Thomsen 1982). Minnesota WMD harvest their seed from prairie remnants in the state.

Seeds must be collected and processed properly to ensure successful germination. If seed is to be collected the first step is to locate the flowering plant and mark it. Seeds should be picked when ripe or just before, collected, kept in paper bags and dried (Illinois Conservation Dept. n.d., Smith & Smith 1980). Smith and Smith (1980) dried seeds on screens, and then threshed and cleaned them before storing. Rock (1981) also used screens for cleaning but notes that many seeds can be cleaned by crushing in a paper or cloth bag. Olson (1979) used the following process for cleaning seed:

- Scalper - a two screen method to remove the straw and some of the very light seed.
- Debearding - this removes the awn and as much of the pubescence as desired.
- Fanning Mill - a four screen process to further refine and separate.

Minnesota WMD have modified an agricultural seed cleaner to treat their mechanically harvested native seed. Illinois Conservation Dept. (n.d.) suggested not drying seeds more than 2 months, as too long a drying period will cause the seeds to lose their viability. Smith and Smith (1980) recommended storing seed dry at outdoor temperatures the first winter. Bland (1970), Illinois Conservation Dept. (n.d.) and Nichol and Entine (1978) recommended dampening most

seeds before cold storage. Seeds can be dampened with their own chaff or placed in damp soil.

Exposing seeds to winter temperatures, called seed stratification, is recommended and practiced by numerous agencies. Stratification mimics the natural cold spell the seeds need in order to break dormancy and to result in successful germination (Ahrenhoerster & Wilson 1981, Blewett & Cottam 1984, Rock 1981, Thompson n.d.). Seeds should be stored in moist sand, peat moss, vermiculite or sawdust at temperatures between 0 & 5°C (Rock 1981). Blewett and Cottam (1984) reported on germination studies which showed that 73 percent of prairie species benefitted from some stratification treatment. The success rate varied from year to year, probably due to varying physiological conditions. They noted that prairie grasses and composites need cold treatment for successful germination. Rock (1981) reported that some species were not affected by stratification, while others are harmed but he suggested cold storage for all seeds unless time is available for selective stratification. He noted that legumes germinate better when also scarified. This is a "process in which the seed coat is weakened by scratching it with abrasives or by using hot water or chemicals". Rock (1981) stated that hot water is a simple effective way of scarification as is rubbing the seeds across a screen. He found that legumes grew better when inoculated "with the proper bacterial mixture to supply the necessary

root bacteria for the production of nitrogen compounds so very valuable to the plants".

5.4.3 Planting Methods

There are three basic methods of planting for prairie restoration: broadcasting, transplanting and drilling. Broadcasting is used on small areas. Smith and Smith (1980) suggested hand broadcasting for up to 3.2 ha. They also suggested mixing the seed with vermiculite for more even seed distribution. Schramm (1970) noted that hand broadcasting calls for even more tedious weeding. For slightly larger areas a whirlwind seeder or fertilizer spreader can be used (Illinois Conservation Dept. n.d., Smith & Smith 1980). Fermilab used a highway salt-spreader for broadcasting seed, a method found to be quicker that drilling (Thompson n.d.). Another broadcast method used at Fermilab for seeding grass was with a hydroseeder which sprays a water-seed-slurry onto the ground. Fermilab found that broadcasting, instead of drilling, eliminated problems of fuzz and chaff clogging the drill tubes and that fewer people were required. Missouri Conservation Commission (1984a) stated that broadcasting is more efficient if debearded seed is mixed with phosphorous-potassium (P-K) fertilizer before spreading. Rock (1981) cited successful methods of broadcast seeding on open sod, mostly in the fall. Broadcasting can be used to introduce more species to a prairie remnant

(Smith & Smith 1980, Warkins & Howell 1982). Smith and Smith (1980) stated that the remnant should be disked or rototilled very lightly to disturb the open soil prior to seeding and the seed covered slightly with soil.

A more expensive, time-consuming and labour intensive planting method is transplanting. Transplants can be sods, plants from prairie remnants or seedlings from a greenhouse. Some authors advise against using plants from remnants (Ahrenhoerster & Wilson 1981) while others actively used such transplants (Blewett & Cottam 1984, Illinois Conservation Dept. n.d., Landers et al. 1970, Smith & Smith 1980). The exact means of collecting plants from remnants was outlined by Smith and Smith (1980). For greenhouse transplants, stratified seed can be planted in flats or individual pots (Bland 1970, Nichols & Entine 1978, Rock 1981, Schulenberg 1970). After a few weeks, when the plants have their first or second pair of true leaves, the plants may be transplanted into the field (Nichols & Entine 1978, Rock 1981). Schulenberg (1970) planted in irregular strips to avoid straight rows when planting seedlings at the Morton Arboretum but this tended to make weeding difficult. Rock (1981) suggested transplanting in May for U.S. locations. Transplanting is advantageous in getting maximum use from a limited amount of seeds, allowing exact placement of species and providing a head start for native species over weeds (Rock 1981, Sperry 1982). Warkins and Howell (1982) found that forb see-

dlings introduced into restored prairie to enhance species composition were generally successful.

For larger restoration projects, the best method of planting is by seed drill. Three types of drills are generally used. The Truax rangeland drill is equipped with large and small seedboxes, double-disc furrow openers, depth bands and positive wheel-type packers (Vassar et al. 1981). Angus et al. (n.d.) and Olson (1979) used this drill for seeding native grasses and it continues to be used by Minnesota WMD. Different textures of seed can be handled with the varying sizes of seed boxes. The Nisbet drill has been used by the Soil Conservation Service and the Morton Arboretum (Armstrong 1982, Wilson 1970). Rock (1981) noted that the John Deere rangeland drill is as effective as the Nisbet grass drill. If a rangeland drill is unavailable, he suggested that a hopper type can be substituted. He also suggested repeating seeding in different directions to give a better distribution.

Whichever method is used, there are a number of procedures to be followed in planting. The suggested seeding rates vary from 215 to 860 live seeds per m^2 (Angus et al. n.d., Duebbert et al. 1981, Rock 1981). Smith and Smith (1980) noted that seeding rates of native grasses for livestock feed in Nebraska and neighbouring states was 14.7 kg per ha. Missouri Conservation Commission (1984a) offered seeding rates for a few species. For wildlife, rates are 1

to 3 kg per ha. Forage seeding rates are 3.5 to 5.5 kg per ha. for broadcasting, 25 percent higher than for drilling. The rates for pasture hay are higher at 22 to 54 kg per ha. The amount of seed used depends on the size of the area to be seeded and the amount of seed available. Rock (1981) commented that a blend of 30% grass seed and 70% forb seed is a good combination but may not be possible. Smith and Smith (1980) noted that acceptable grass to forb ratios are between 3 to 2 and 9 to 1. Thomsen (1982) stated that one method of restoration is to establish the dominant grasses and then introduce the secondary species, especially the forbs.

The recommended seeding dates for U.S. locations vary from early April to July 1, depending on latitude and weed control mechanisms used (Duebbert et al. 1980, Illinois Conservation Dept. n.d., Missouri Conservation Commission 1984a, Rock 1981, Schramm 1970). Spring plantings are generally considered to be more successful than fall seeding (Duebbert et al. 1981, Missouri Conservation Commission 1984a, Wilson 1970) although fall seedings have been used in some cases (Missouri Conservation Commission 1984a, Rock 1981, Schulenberg 1970, Thompson n.d.). Rock (1981) suggested seeding in late fall, before the first snow so that prairie and weed seeds do not germinate and, advised using a mulch of prairie hay at this time. In contrast, Missouri Conservation Commission (1984a) stated that fall seedings

should not occur after November 1 as the grasses won't sprout before spring and the survival rate will be reduced. The seeding rate for fall should be increased to allow for seed that will rot by spring. Fall plantings at Fermilab were found to require more harvest, cleaning and sowing co-ordination and were not as successful as spring plantings (Thompson n.d.).

Recommended seeding depths vary from 1 to 1.25 cm (Angus et al. n.d., Duebbert et al. 1981, Lehr 1981, Missouri Conservation Commission 1984a, Vassar et al. 1981). A number of authors suggested covering seeds lightly with soil by raking, harrowing and/or rolling the soil (Blewett & Cottam 1984, Illinois Conservation Dept. n.d., Nichols & Entine 1978, Rock 1981, Schramm 1970). Missouri Conservation Commission (1984a) also stated that seeds should be lightly covered but emphasized no harrowing of native grasses.

The use of companion crops with native species has had variable results. Some authors suggested planting a fast growing annual or short-lived perennial such as wild oats or rye (Elymus spp.), with the prairie seeds (Ahrenhoerster & Wilson 1981, Nichols & Entine 1978, Rock 1981). The companion crop will quickly crowd out weeds and reduce soil erosion. The slower growing native species will gradually replace the companion crop. According to Rock (1981) competition from the companion crop and any weeds that develop can be reduced by mowing the field. He advised mowing

just above the developing forbs in early summer and again in late summer if necessary. Blewett and Cottam (1984) noted that at the University of Wisconsin Arboretum, wild rye was successful as a companion crop as were oats. Indian grass (Sorghastrum nutans) was a poor companion crop as it was too competitive.

Ahrenhoerster and Wilson (1981) and Nichols and Entine (1978) stated that a light clean mulch is helpful. The former noted that for larger restorations, erosion netting can also be used. Irrigation of seeds and transplants will be necessary if it does not rain during the first few weeks after seeding (Blewett & Cottam 1984, Illinois Conservation Dept. n.d.). Once seedlings have developed their first true leaves, irrigation is no longer necessary.

5.4.4 Maintenance During Establishment

"The objective of management is to increase the competitive advantage which prairie species have over weedy plants" (Nichols & Entine 1978). All non-native plants are considered weeds. During the first year mowing fields to control weeds is suggested by a number of authors (Illinois Conservation Dept. n.d., Missouri Conservation Commission 1984a, Nichols & Entine 1978). The former advised not letting weeds grow higher than 30 cm. The field should be mowed to a stubble height of 10 to 15 cm the first time, 15 to 20 cm the second time. The fast growing weeds will be cut, but

the seedlings of prairie plants will remain unharmed. Mowing should not occur after the first week of August. Missouri Conservation Commission (1984a) and Smith and Smith (1980) advised mowing in both the first and second years. Rock (1981) advised using a rotary mower rather than the sickle bar type. Vegetation should be cut fine to avoid covering the native species (Lehr 1981). Wilson (1970) noted that a mower doesn't cut fine enough and that a rotary shredder should be used. Hand weeding is also suggested, but may only be possible on small sites depending on the available workers (Armstrong pers. comm., Illinois Conservation Dept. n.d., Rock 1981, Schulenberg 1970). Smith and Smith (1980) noted that, if necessary, new plants can be added during the third summer.

After the second summer the only type of maintenance recommended by virtually all authors is burning. At the Morton Arboretum, hand weeding is still practiced by a volunteer crew (Armstrong pers. comm.). Early spring, from mid-March to mid-April, is the recommended time for burning in the U.S. (Clubine 1985a, Nichols & Entine 1978, Rock 1981, Schramm 1970, Schulenberg 1970, Smith & Smith 1980). Burns should be conducted when native grasses are 2.5 cm high (Clubine 1985, Missouri Conservation Commission 1984b). Burning discourages annual weeds and woody plants and stimulates prairie species (Nichols & Entine 1978, Rock 1981, Schulenberg 1970, Smith & Smith 1980). Schulenberg (1970)

stressed not burning in fall as this removes winter habitat for wildlife. Burning only part of the site in spring leaves some habitat for animals (Schramm 1970, Smith & Smith 1980). Every 2 or 3 years the prairie should be burned to remove accumulated debris as well as to discourage weeds and woody species. If prairie is to be harvested, it should be burned the spring prior to harvest to stimulate production of more seed (Olson 1978).

5.5 HARVESTING

Once prairie species become established, the plots can be harvested to provide seeds for further plantings. The Fermilab project began harvesting its own prairie in 1979. Since 1981, 3600 to 5500 kg of grass seed have been harvested per year by a self-propelled combine (Thompson n.d.). In Missouri, native grass stands are harvested to provide a seed supply for further plantings (Clubine 1984, 1985c). Native grasses are also harvested on waterfowl management districts in Minnesota, North and South Dakota for seed supplies (Fergus Falls WMD 1981, 1982). Most grass species are straight combined. Switchgrass is harvested by swathing, which is easier but more expensive than combining.

5.6 RESTORATION AT BEAUDRY PHP

The restoration project at Beaudry PHP is in a preparatory stage. In the spring of 1985 part of the prairie remnant along the highway right-of-way was burned, resulting in a thicker stand of prairie plants. This spring a larger portion of the right-of-way was scheduled to be burned but was not due to weather conditions. Figure 7 shows the division of field plots in the park.

Areas A-1, B-1 and C-1 have been planted to alfalfa hayfields and waterfowl nesting cover. Areas E-1 and A-1 have been seeded to hayfield for deer forage in spring 1986. The first area to be seeded to prairie is section D-2. For the 1986 crop season it will be planted to either barley or oats. The use of Treflan, Atrazine or other residual products will not be allowed. Section D-3 will have the same preparations in 1987 and be seeded to prairie in 1988. Possible seed sources are the Oak Hammock Marsh and Lake Francis prairies. Both sites were scheduled to be burned this spring to provide enough seed but weather conditions prevented burning. Weather conditions will determine the health of the seed source.

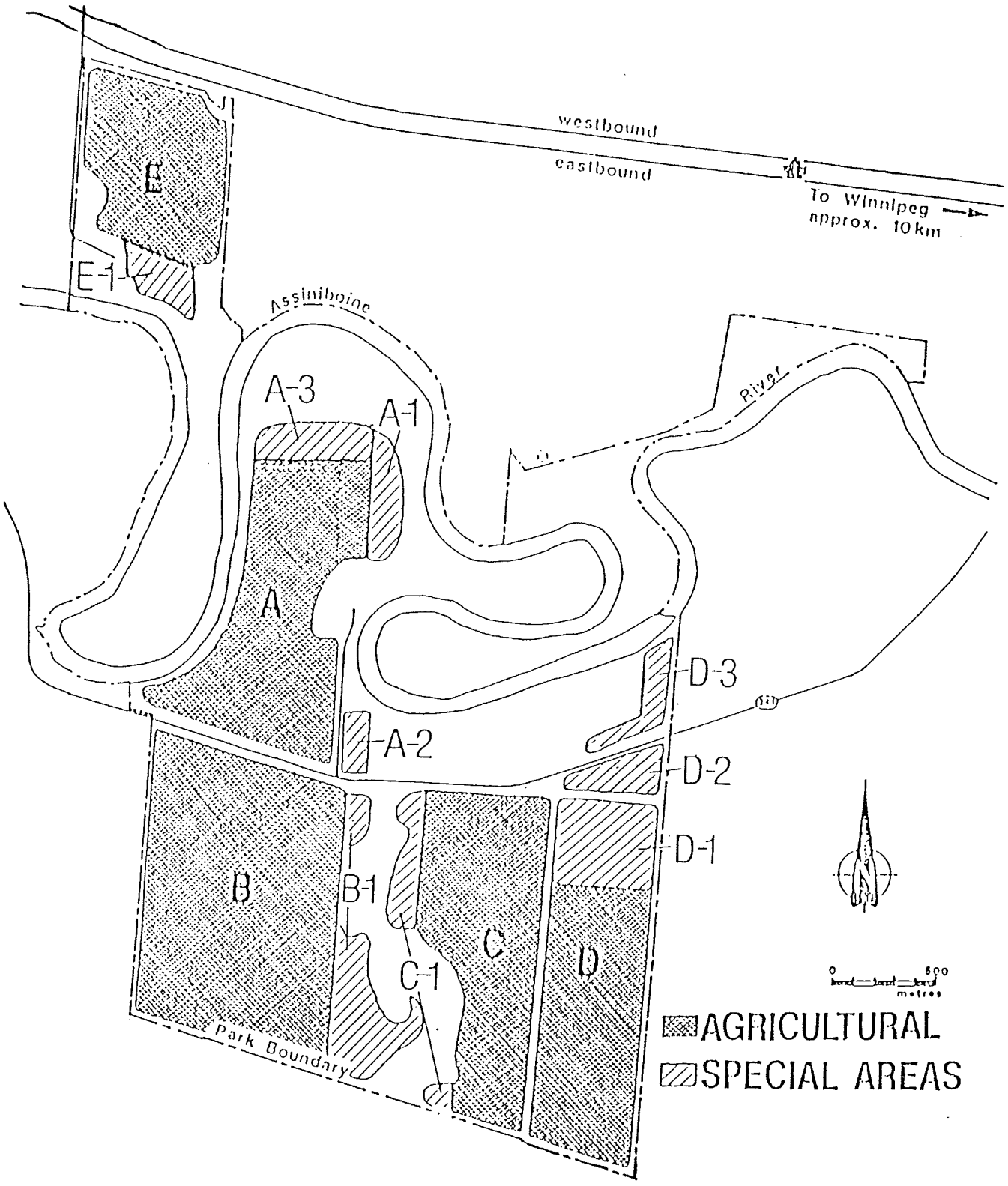

Figure 7: Restoration at Beaudry Provincial Heritage Park (Parks Branch files)

5.7 SUMMARY

This chapter reviewed literature on prairie restoration. Restored prairies provide wildlife habitat, forage for cattle, interpretation opportunities and preserve and enhance ecological diversity. Weed control is the most important factor in seedbed preparation and this is achieved by working the ground numerous times prior to seeding. Cover crops are also used to control weeds as well as to prevent erosion. Seeds must be dried and then stratified, if necessary, prior to seeding. Methods of planting are: broadcasting, transplanting and drilling. Broadcasting by machine and drilling are the most effective methods for large restoration projects. Seeding in spring is more successful than in fall. Once the site is planted, management to control weeds is essential. This is accomplished by mowing during the first two summers and burning every 2 to 3 years afterwards. Restoration at Beaudry PHP is in the preparatory stage and seeding will begin in spring of 1987.

Chapter VI

REVIEW OF CULTURAL HISTORY LITERATURE

6.1 INTRODUCTION

This chapter is a review of literature on the cultural history related to Beaudry Provincial Heritage Park. The history of the general area in which the park lies will be examined as will the limited site specific information. The review is in chronological order so that first the prehistory will be outlined, followed by reviews of native groups post-contact, Metis and then white settlers. The emphasis of this review is on the relationship of people with the land. Thus much of the social and political aspects of history will only be examined in relation to the development of human impact on the prairie.

6.2 PREHISTORY

Little is known about the actual prehistory of Manitoba. Much is surmised from the dispersed archaeological findings from American prairie states and Canadian prairie provinces. Thus only a brief overview is possible.

Pettipas (1983) provides a suitable compilation of works on Manitoba prehistory for review. The following summary of the subject is from his text unless otherwise noted.

Archaeological evidence exists only for the post-glacial period. Any archaeological deposits from the pre-glacial period were probably destroyed by the glacier. Thus "the known record of man's habitation of Manitoba goes back no further than 12,000 years, by which time the ice was in the process of retreat."

6.2.1 Early Prehistoric Period (10,000 - 4,500 B.C.)

The glacier began receding from the southwest corner of the province. As it receded, glacial Lake Agassiz was formed; the area it covered included Beaudry PHP. Lake Agassiz began its final drainage around 7,000 B.C. At this time people of the late Sister's Hill complex (Plano pattern) moved eastward into the Lake Agassiz basin. These people hunted bison. Summers were spent in the grasslands. As the bison moved to sheltered areas at the edge of the plains in fall, the people moved ahead of them.

6.2.2 Middle Prehistoric Period (4,500 B.C. - 1,000 A.D.)

A period of comparatively high heat and aridity, called the "Altithermal' occurred throughout the region around 7,500 to 5,000 B.P. It resulted in dessication of grasslands and a depletion of bison by reducing their winter survival rate, thereby reducing the peoples' food source. Bison would be more numerous in wetter areas, where there was more available grass for food. The warmer climate would

have reduced the availability of surface water for humans, thereby increasing the distance between water sources. This caused people to move into the river valleys and aspen parkland along with the bison.

6.2.2.1 The Logan Creek Culture (4,500-500 B.C.)

This culture overlaps from the early prehistoric period. These bison hunting peoples occupied the eastern margins of the grasslands. They followed the Red River Valley northward into southern Manitoba. The environment at this time was in transition, which supported a greater abundance and diversity of plant and animal forms. Small game were hunted, plants collected and shellfish were perhaps harvested.

By 3,500 B.C. the extreme conditions of the altithermal had moderated. After this time the human population of the grasslands increased. With this may have come communal hunting of bison on the grasslands in summer and smaller scale hunting in the aspen parkland during winter.

6.2.2.2 The Oxbow Culture (3,500-1,000 B.C.)

Downriver from Beaudry PHP, at Headingley, the Kuypers archaeological site has been partially excavated. It demonstrates occupation by peoples of the Oxbow Culture. There are artifacts from a number of prehistoric cultures. "Excavated material incorporates the full range of tool types

known from Oxbow sites, but does not include any artifact styles or classes restricted to other prehistoric complexes" (Buchner 1980).

The site was probably occupied in the fall. In summer bison were more numerous in the grasslands and moved into the aspen parkland. Oxbow peoples would have followed the animals. The site was probably flooded in springtime, preventing occupation then. Subsistence was based upon bison but other species were also utilized; elk, wolf, dog, fox, rabbit, goose, clams, hackberries (Celtis occidentalis) and cherries were also consumed (Buchner 1980).

6.2.2.3 The McKean Culture (3,000-1,000 B.C.)

The people of this culture also depended upon bison, supplementing their diet with other species. Food collecting was an important supplement to hunting. They, too, were nomadic, following the bison herds. Artifacts from the Kuypers site incorporate this period (Buchner 1980).

6.2.2.4 The Pelican Lake Culture (2,000 B.C.-1 A.D.)

This phase was probably a development out of the McKean culture. It likely had a specialized big game hunting economy centering on the bison. The people were likely nomadic. Projectile points from the Kuypers site are possibly from this period (Buchner 1980).

6.2.3 Late Prehistoric Period (1,000 B.C. - 1670 A.D.)

During this period there were many technical innovations: pottery-making, bow and arrow and the use of pounds or corrals to capture bison.

Southern Manitoba was visited and/or inhabited by many different groups. These people came to hunt the bison which moved into the aspen parkland for the winter. During this time trade became very important. Late prehistoric people hunted and fished for a living, supplementing the diet with plants. The complexes of the late prehistoric period in southern Manitoba all belong to the 'Woodland Pattern'.

The only complex of any significance to the Beaudry area during this period is the Blackduck Culture (800-1700 A.D.). It developed out of a generalized Late Prehistoric pattern. Pottery sherds from the Blackduck culture were found at the Kuypers site (Buchner 1980). Pottery vessels were used for cooking and food storage.

Two valuable resources became more available as these people moved up into the aspen parkland: bison and Knife River flint form North Dakota. It is thought that these people lived in oval, bark or rush mat wigwams built on a light framework of saplings. These structures were probably scattered along terraces of the river valleys in clusters of related families.

6.3 NATIVES POST-CONTACT: 1670-1870

In the post-contact era, Indians were major influents upon the land from the time of contact to 1821. Thus the emphasis in this literature review is on that time period. The following review is based upon Ray (1972, 1974) unless otherwise noted.

6.3.1 Resources

The woodland was limited in large game, both in terms of species and in total game population density. Moose and woodland caribou (Ranigifer tarandus caribou) were the only such species. Small game was abundant, providing furs and some food. Species included marten (Martes americana), fisher (Martes pennanti), otter (Lontra canadensis), lynx, mink, muskrat and beaver. On the prairie, small game was limited. The large game animals, bison, pronghorn antelope, elk and mule deer, (Odocoileus hemionus) were abundant. In terms of vegetation, both areas provided a variety of nuts, berries, greens and roots. The popular breadroot (Psoralea esculenta) grew on the prairies while the southeastern forest had wild rice (Zizania aquatica). The parkland contained resources from both zones. All game animals were present, except for woodland caribou. Fish were harvested in prehistoric and historic times. Shay (1980) catalogued the vegetative resources of these regions. He noted that the role of plant foods in the diet of historic and prehistoric peoples has been underestimated.

Both plant and animal resources of each zone were available on an annual cyclical basis, with some parts of the year having more than others. These cycles were complementary between regions. In the woodlands the period of greatest food abundance was during the summer, or late spring and in early summer, and again in late summer into fall. Food resources were then concentrated around the margins of water bodies. During winter, fish and waterfowl were unavailable and the large game animals were scattered. In the grassland, summer was also bountiful. Bison gathered in large herds during summer and in average or severe winters, moved into the parkland for shelter. Other game animals followed suit. Thus in the parklands, food was abundant during winter.

6.3.2 Pre-1763

The Assiniboine people are considered to have been responsible for the Blackduck or Manitoba Culture. The Laurel Culture probably represents early Cree Culture (Hlady 1960). In the late prehistoric period the Assiniboine and Cree probably travelled in migratory bands, the size determined by available resources. In springtime they would leave the parkland to fish at its edge. Between mid and late summer the people would move onto the prairie to hunt large game, primarily bison. In fall they would travel along the forest edge and head back into the parkland for winter. This pat-

tern continued even after European contact. During the seventeenth and early eighteenth centuries, trade with Europeans was accommodated between annual migrations that were influenced by resource availability. Winters were spent hunting for subsistence (Friesen 1984). Figure 8 illustrates the cycles of exploitation characteristic of the tribal groups occupying southern Manitoba between 1690 and 1765.

The fur trade provided the Assiniboine and Cree with valuable tools and greater political power. These tribes became the middlemen between the European traders and other Indian groups. "Throughout the seventeenth and eighteenth centuries, the Indians, especially the Assiniboine and Cree, held the upper hand in the fur trade at York Factory, and to a considerable extent they dictated the terms of trade" (Ray 1974). The middlemen were primarily from the north and west populations of Cree and Assiniboine.

These two groups moved gradually north and west after 1670 when posts were constructed on Hudson Bay. They expanded their areas with force until 1720 when they held a complete monopoly on trade and inter-tribal trading patterns became well established. Tribal distributions around 1650 and 1763 are illustrated in Figure 9.

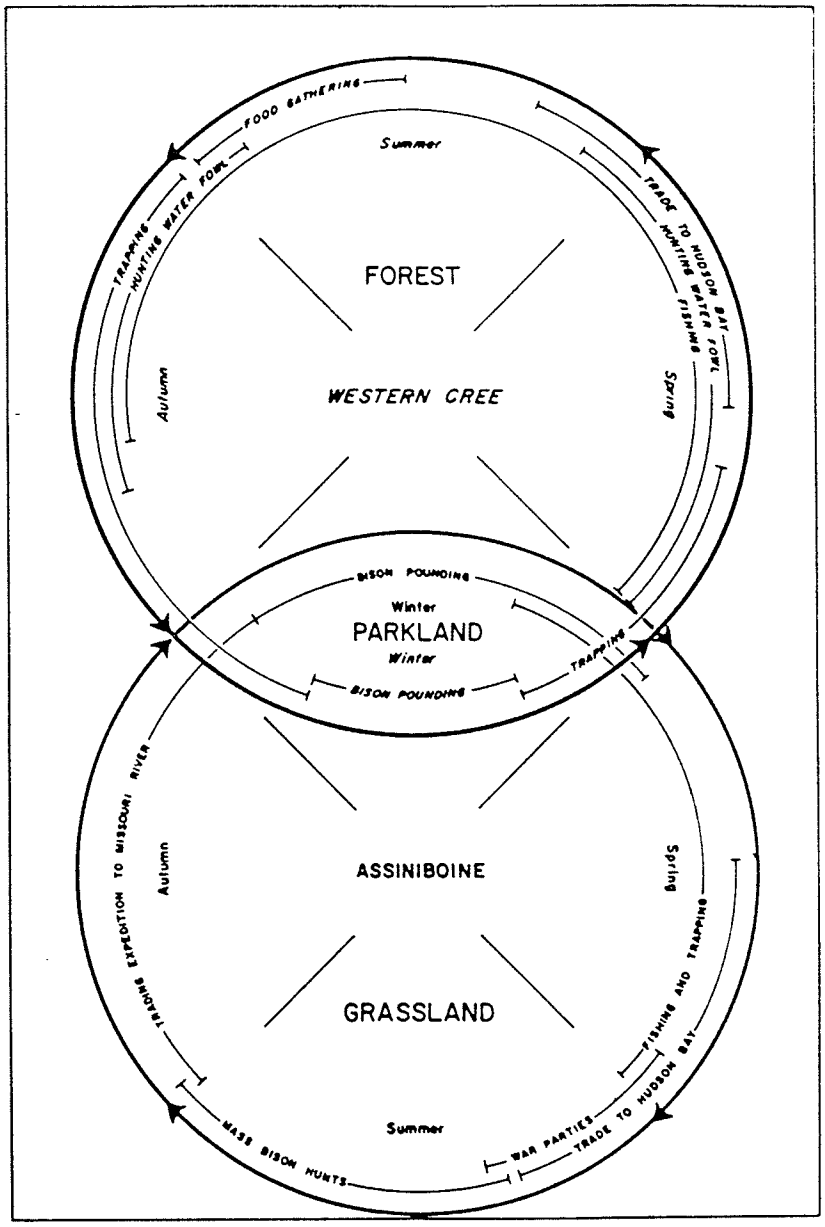

Figure 8: Parkland Exploitation Cycles (adapted from Ray 1974)

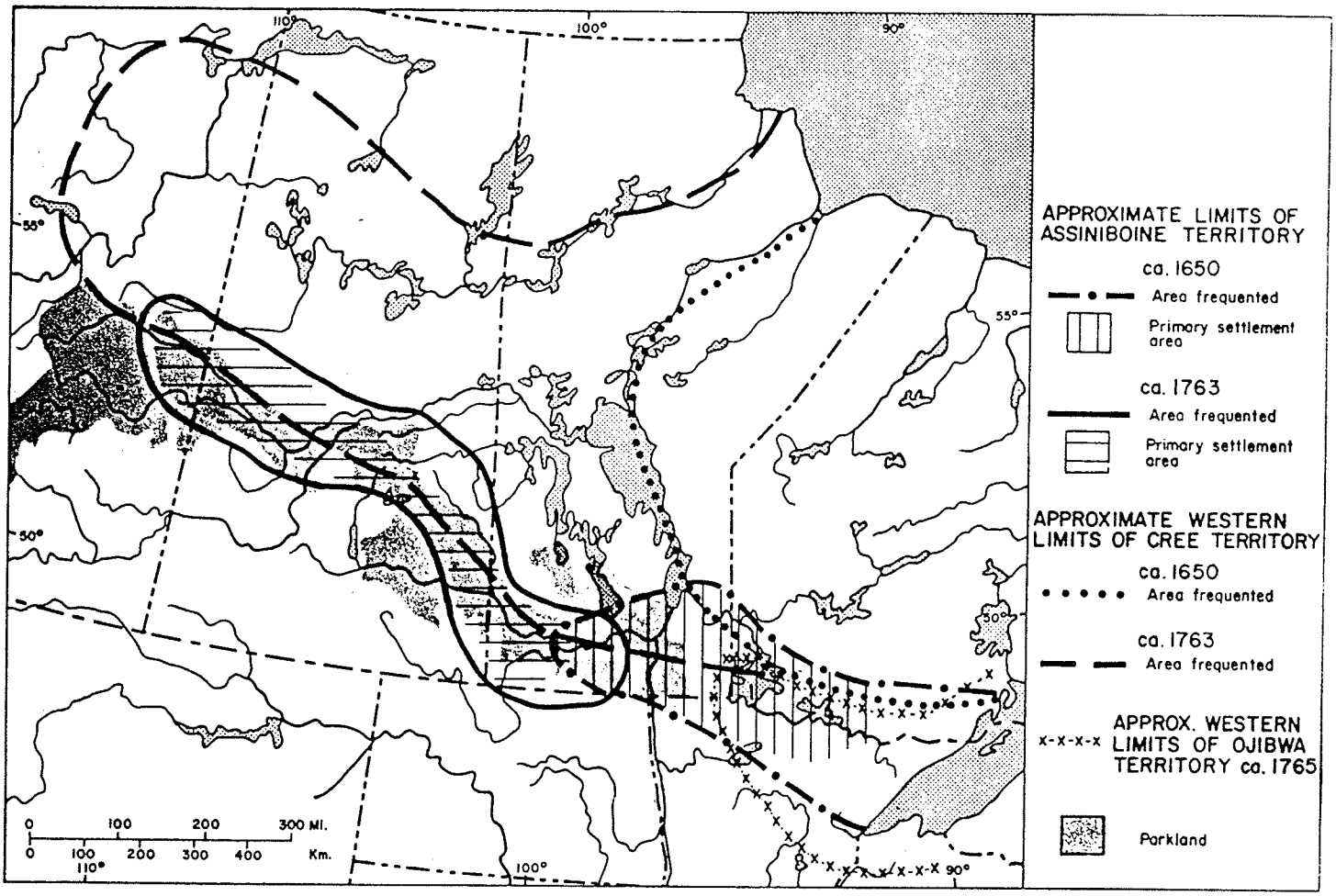

Figure 9: Tribal Distributions to ca. 1763 (adapted from Ray 1972)

6.3.3 1763-1821

After the fall of Quebec in 1760, a number of trading alliances attempted to compete with the Hudson's Bay Company (HBC). The North West Company (NWC) was the most significant of these competitors. The influx of new traders, and the resulting competition, meant that the Indians eventually lost their role as middlemen. The resources of the forest could no longer support the fur trade. The numerous new inland trading posts and increased lines of communication created food networks which drew upon the bison of the prairie and parklands (Friesen 1984, Ray 1974). Pemmican, a mixture of bison meat, fat and berries, became the staple of the fur trade. Indians began supplying pemmican to the fur trade. New posts were established as provision depots. Thus the Cree and Assiniboine found a new economic opportunity and a new means to obtain the European goods they had come to depend on. It appears that the Assiniboine were quick to adapt to the role of provisioner, and by 1770 they switched from furs to pemmican. The natives assumed new power as the Europeans came to depend upon them for food (Friesen 1984). The fur trade thus encouraged increased exploitation of the prairie-parkland environment.

By the early 1800's the economic organization of southern Manitoba was quite different from that of earlier years. The seasonal movements across the forest-prairie boundary were limited. The Ojibwa became the dominant group in the

lower Assiniboine and adjacent Red River valleys. They moved in from the southeast, as the Assiniboine and Cree migrated to the north and west. They did not exploit the parklands on a seasonal basis, but rather, "they lived in small bands and shifted their locations frequently in response to local game conditions" (Ray 1974). The Ojibwa retained many features of their woodland culture. In winter, the social unit was a hunting band which consisted of a few families. In spring a few of these bands would unite to trap furs for trade with the Europeans. During summer these bands were absorbed into larger lakeside fishing villages. "Such a social system helped the Ojibwa cope with the harsh environment of the forests during the winter without having to have recourse to the bison herds of the parklands" (Ray 1974). Along the Red River Valley south of the Forks many Ojibwa practiced some horticulture on a part-time basis to supplement hunting and fishing. Figure 10 shows the tribal distributions in 1821.

6.3.4 1821-1870

In 1821 the North West Company and the Hudson's Bay Company merged. The new HBC still depended on the Indians of southern Manitoba for food for a short time period. By 1870 however, there were so many interests competing for the declining numbers of bison, that the Indians' way of life was drastically changed. This effect upon their economy, com-

bined with the coming of the railways, and increasing white settlement caused the Canadian government to begin treaty negotiations. The Indians felt that they had little choice and thus gave up the rights to their lands in exchange for a few concessions and the reserves.

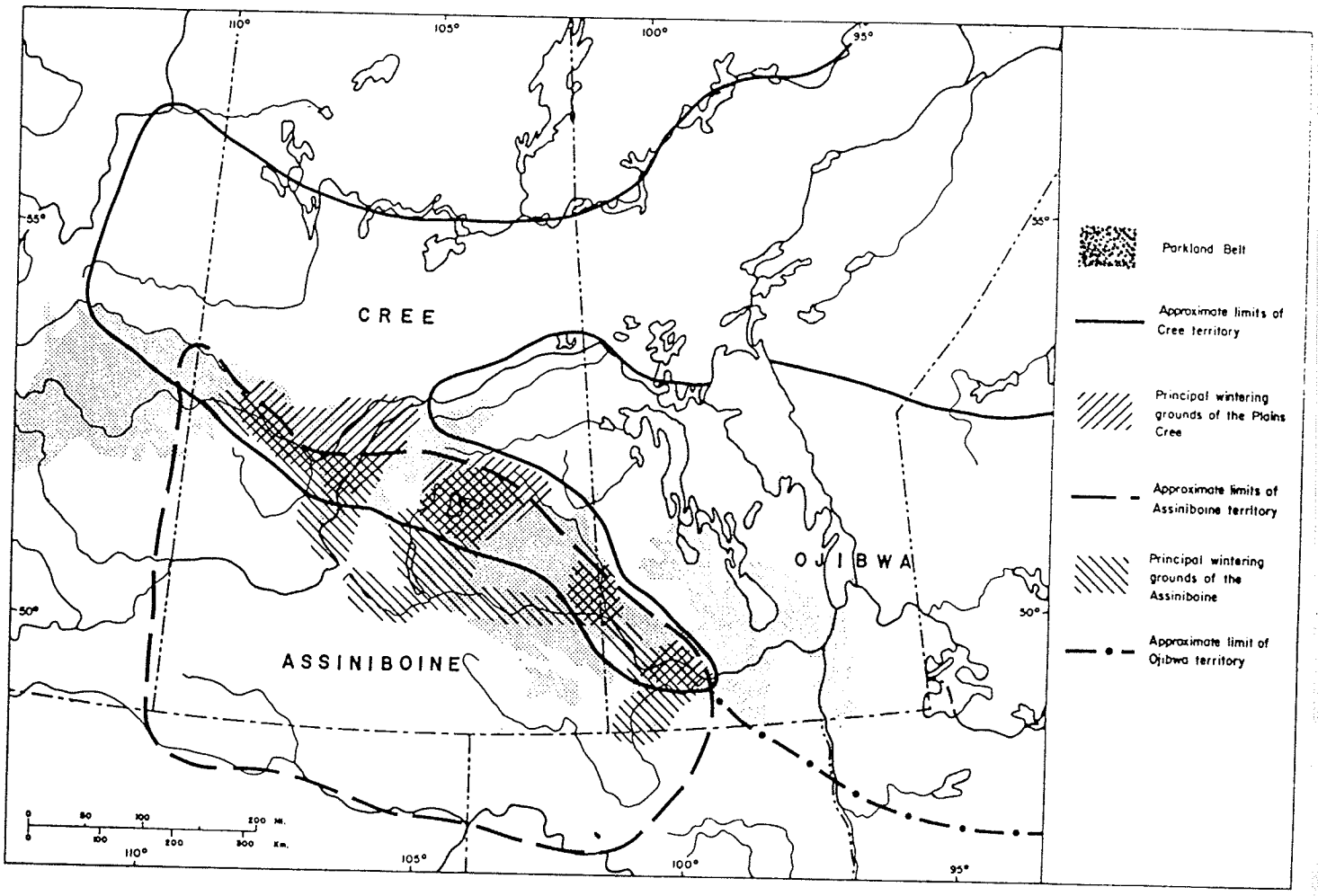

Figure 10: Tribal Distributions in 1821 (adapted from Ray 1972)

6.4 METIS

6.4.1 Origin of the Metis-A New Nation

The Metis were born of two distinct cultures - the French or British, primarily Scotch, fur traders and Indian women. They have been called the 'true Natives of Canada' (Sealey & Lussier 1975). Fur traders took Indian wives not only for company and domestic labour, but primarily for trade relations. An Indian bride ensured that the relatives would do business with the fur trader (Sprague & Frye 1983). These marriages resulted in children, but the father usually returned to Europe alone, his children and native wife returned to her family. Whether out of family responsibility or love of the land, some retired fur company employees settled near the trading posts. French traders married and stayed more frequently than the Scotch (Sprague & Frye 1983).

The children of the fur traders found employment with the NWC. Those of wealthier fathers were directly employed by the company, while most were suppliers of pemmican, an essential foodstuff of the fur trade. The Nor'westers' Fort Gilbralter at the forks of the Red and Assiniboine rivers became a major provisioning point. The fort was the key to the rivers, the pemmican trade, and even to the north west fur trade (MacLeod & Morton 1963). When the Earl of Selkirk, an officer of the HBC, chose to start a settlement near the Forks, the Nor'westers realized the threat.

During the first few years of the Red River colony, the Metis saved the settlers from starvation by providing them with pemmican. The colony's governor, Miles Macdonnell, forbade the Metis from trading with anyone but the HBC. In January 1814, when food was scarce, Macdonnell prohibited, by proclamation, the exportation of provisions from the colony and forbade the running of buffalo (Friesen 1984, MacLeod & Morton 1963). The NWC encouraged the Metis to harass the colony and drive the settlers away in order to open the Forks up for trading again. In these efforts the Metis were led by a clerk of the North West Company, The Captain of the Metis, Cuthbert Grant. His strategy was to seize the HBC pemmican supply on the Qu'Appelle - Winnipeg River route, capture Brandon House (HBC post), and take the pemmican to the NWC canoe brigade on Lake Winnipeg, bypassing the Forks. The colony would then be slowly starved into submission (Friesen 1984, MacLeod & Morton 1963).

Events did not follow as planned and the Metis and a party of settlers with Governor Semple clashed at Seven Oaks. The result was the 'battle of Seven Oaks' in which Semple and a number of settlers were massacred. The battle was a heroic event to the Metis. The events of 1814 - 1816 led to their development into a community. They were 'a new nation', the 'bois-brules' (Friesen 1984, MacLeod & Morton 1963, Sprague & Frye 1983). The settlers left only to return with Selkirk and the de Meuron mercenaries soon after.

The fur trade competition escalated, and in 1821 the two companies merged under the name of the Hudson's Bay Company. Almost 1,300 employees lost their jobs in the merger. Many of these people settled at Red River including some Metis families (Sealey & Lussier 1975, Sprague & Frye 1983). Most of the Metis went to Pembina which became the largest concentration of Metis. Pembina was determined to lie south of the border between the United States and British North America. The HBC was worried that the Metis would trade with the Americans. Governor Simpson pressured Bishop Provencher to bring the Metis closer to the settlement. This effort, coupled with attacks on the Metis by the Sioux ensured that Bishop Provencher could convince the Metis to relocate. They settled at the Forks, camping along the river for two years (MacLeod & Morton 1963).

6.4.2 Grantown

6.4.2.1 The Foundation of Grantown

In 1824 Governor Simpson convinced Grant to settle his people on the White Horse Plains. The Metis would be away from the settlement of the Forks but still within HBC territory. Thus they would have to accept company monopoly and rule. The Metis settlement would serve as a buffer between the Red River colony and the Sioux to the southwest. Simpson also wanted to use Grant's services as a private freighter, to transport goods and to serve as a trader between the Metis and the company. Thus Simpson ensured that Metis furs were not sold to American traders.

The settlement became known as Grantown. It lay on the north side of the Assiniboine, beginning twelve miles (19.3 km) west of Fort Garry and extended west for six miles (9.7 km) to the 'coteau des festins' (an old Indian encampment where dog feasts were held) and six miles (9.7 km) in depth back from the riverfront. Beaudry PHP lies along the eastern boundary of this historic community. The lots were perpendicular to the river, as all lots in the Red River colony were. Grant built his home, a large white house in the Red River frame style, on the coteau. On either side of him he placed his family and friends, Pierre and Mary Falcon, Pascal and Maria Breland, Angus McGillis, Urbain Delorme, as well as lots for the Catholic mission. Between eighty and one hundred famlies settled at Grantown that spring. They began building houses and broke the land for agriculture. Agriculture was new to them. It was not a living that they adopted completely. They still hunted buffalo during the spring and fall. Grantown was the first native farming settlement and the first westward extension of the Red River colony (MacLeod & Morton 1963).

6.4.2.2 Lifestyle

In April the people of Grantown would prepare for the sugar-making trips to Riviere aux Ilets de Bois (now the Boyne River) or perhaps Portage la Prairie (MacLeod & Morton 1963, Pelletier 1977). The Manitoba maple or box elder, was

the species tapped. Red River carts were used to carry the vessels (rogans) of maple sap back to the settlement. The sap would be boiled down for sugar or syrup, some of which was sold at the trading posts (Pelletier 1977).

When the soil was dry enough, in late April or early May, the fields were plowed and the seed sown. Morton (1967) noted that wheat, barley, oats, Indian corn and potatoes were planted at Red River. These species were most likely also planted at Grantown. Once seeding was completed, the only farm work until haying would have been the building of fences and carts. The need for water, travel, shelter, drainage, desire for neighbourhood and the belief that the prairie could not be cultivated bound agriculture to the river (Morton 1967).

The people of Grantown were considered lazy by those of the Red River Settlement (Ross 1972). Doyle (1977) collected data illustrating that the former cultivated less land, owned fewer farm implements and raised less livestock than the people at Red River. His data are not all compared per capita or per homestead. Raising livestock was not a major occupation of the Grantown settlers, but closer examination of Doyle's (1977) data illustrates that they did cultivate a higher per capita amount of land for more years than Red River. Still they were only part-time farmers, as the primary occupations of the Metis were freighting and hunting buffalo (Sealey & Lussier 1975).

The staple feed for livestock was wild hay from the prairie (Morton 1967). On the outer two miles behind the river lots hay was cut during a limited season determined by the Council of Assiniboia. The season was in late July or in August which often conflicted with harvest (Martin 1898, Morton 1967). After the wheat was harvested, it had to be ground. Handmills were used in early years but a number of windmills and watermills were later constructed. Cuthbert Grant's watermill at Sturgeon Creek, the first at Red River, was never very successful so he built a windmill in the 1830's at Grantown which lasted the rest of his life (MacLeod & Morton 1963, Morton 1967, Ross 1972).

There were two buffalo hunts a year. The spring/summer hunt served to repay the debts that the Metis had accumulated over the winter with the HBC. The fall hunt was smaller. Its primary purpose was to collect food for the winter (Sealy & Lussier 1975). The summer hunt began the first or second week of June and lasted about 2 months (Ross 1972). The fall hunt lasted from 6 to 8 weeks. It would start anytime between mid-August and October 1 (Belcourt 1944, MacLeod 1957, Ross 1972).

There were three parties in the hunt, people from Pembina, the Forks (mostly St. Boniface) and the White Horse Plains. Each year the number of participants increased, though in later years the parties did not always hunt together. The parties would rendezvous, sometimes at Pembina,

before heading southwest to the prairies (Belcourt 1944, Ross 1972). A council would be held in which officers or captains, then scouts and guards would be chosen. The rules would then be determined and then proclaimed to the entire party (MacLeod 1957).

The charging buffalo and stray shots made the hunt dangerous and there was also a constant threat from the Sioux. In later years, as the buffalo population declined, the Metis had to travel farther southwest into Sioux territory to hunt. The Sioux war of 1840-44, culminating in the battle of the Grand Coteau, was the outcome of these tensions. In 1844 Cuthbert Grant negotiated with the Sioux so that the Metis could thereafter enter into Sioux lands peacefully.

Cows were prefered to bulls as the meat was not as tough. Once the hunters killed and butchered the animals, the women cut it up, dried it, and made pemmican. It would take 8 or 10 cows to make a cart load of pemmican (Belcourt 1944). A lot of meat was wasted in the process of butchering (Belcourt 1944, Ross 1972). The tallow and marrow were also collected. The dried meat and tallow was sold to the HBC upon return to supply the fur traders and was a major food source for the colony itself, as important as farming and fishing (MacLeod & Morton 1963, Sealey & Lussier 1975, Sprague & Frye 1983). The hunt was a vital industry to the Metis, HBC and Red River colony.

The products of maple sugaring and buffalo hunts were transported on Red River carts. These lightweight carts were capable of carrying hundreds of pounds. Grantown became noted for the construction of the 'dished' wheels of the cart (MacLeod & Morton 1963). A single driver could tie a number of carts together. A series of cart trails radiated out of the Red River colony. The first trails went south and west. The western trail was known as the Portage or Carlton Trail. It extended west from the Forks along the north bank of the Assiniboine River to Portage la Prairie. From there it branched north and south. The trail definitely passed through what is now Beaudry PHP (Champagne 1978, Russell 1971, Sealey & Lussier 1975).

The priests followed their flock to the hunt, beginning with the Reverend Jean Harper in 1828 (MacLeod & Morton 1963). They also went to the fur trapping grounds and fish stations, though the missionaries tried to convince the Metis of the benefits of permanent agricultural settlements (Sealey & Lussier 1975). Grantown was primarily a Catholic settlement. Upon the marriage to his third wife, Marie McGillis, Cuthbert Grant became a devout Catholic. In the early years of the settlement the Roman Catholic community worshiped at Grant's house. Bishop Provencher ensured that the town did not lack the ministrations of the church. Missionaries travelled back and forth from St. Boniface until 1829 when Rev. Harper moved into Grant's house. The first

chapel built in 1828 near Grant's house, was small and crude. It was replaced in 1833 by a larger chapel onto which a presbytery was built in 1834. A third church was constructed in the 1840's (Doyle 1977, MacLeod & Morton 1963). In 1834 the religious community became the Parish of Saint Francois-Xavier. Up river in 1834 Reverend Georges-Antoine Belcourt established the mission of Baie St. Paul for the Saulteaux Indians. He also served at Grantown when necessary (Historic Resources Branch 1984a, MacLeod & Morton 1963). Bishop Provencher had difficulties finding missionaries who could cope with the difficulties of prairie life and in maintaining a schoolmaster for the school at the church. In the 1850's Reverend L. Lafleche established a school for the boys and two Grey Nuns later assisted (MacLeod & Morton 1963).

6.4.2.3 Cuthbert Grant

After the move to the White Horse Plains Grant was kept busy trading furs for the HBC. In this endeavor he was away from Grantown a great deal in its early years. Governor Simpson, ever concerned about the loyalties of the Metis, created a position for Grant on the Council of Northern Development. Thus in July 1828 Grant became 'Warden of the Plains of Red River', his duties the "prevention of illicit Trade in Furs within that District" (MacLeod & Morton 1963). The salary that accompanied the position meant that Grant no

longer needed to trade and freight, which allowed him to spend more time at the settlement. By the 1830's Grant had succeeded in giving the settlement a means of livelihood. Grantown was the most characteristically Metis community in Red River. It grew in importance through its functions of providing protection and supplying pemmican for the Red River colony.

In 1834 the Selkirk family gave Assiniboia back to the HBC. The Council of Assiniboia was enlarged as a result and Grant was made a member. In 1835 he was appointed Justice of the Peace for the fourth judicial district, White Horse Plains. Grant later became Magistrate for the Upper District. Grant's position of councillor was renewed in 1839 and he was appointed one of the two sheriffs of Assiniboia. He was one of the chief men of the Red River colony (MacLeod & Morton 1963). Grant held this esteem till the free trade problems in the mid-1840's.

Metis of Red River began trading furs to posts just south of the border. It was illegal to do so as the HBC had monopoly power in Red River, but free trading provided the young Metis with employment. Grant remained loyal to the HBC. In 1849, four Metis were charged with free trading and the HBC hoped to curb free trade through prosecution. The first Metis to be tried, Guillaime Sayer from Grantown, was tried by the Magistrates of Assiniboia, which included Cuthbert Grant. Though Sayer was found guilty, he was set free,

for an angry mob of Metis surrounded the courthouse. His release signified free trade to the Metis and company rule was broken (Friesen 1984, MacLeod & Morton 1963).

After this event, Grant fell out of favour with the HBC as he lost his influence over his people. Simpson did not renew Grant's position as Warden of the Plains, which he had held for 21 years. New Metis leaders were beginning to emerge. "Only in Grantown was Grant still chief" (MacLeod & Morton 1963).

Grant remained active in his later years, even going on the buffalo hunt in 1852 when he was 59 years of age. He requested that Simpson renew his free trade licence. His neighbours, Urbain Delorme and Pierre Falcon, were becoming chief plains traders, but Simpson hesitated in making a decision regarding Grant. Grant fell from his horse in 1854 and never recovered. He was buried beneath the altar of the church he helped establish. After his death, the village of Grantown became known as Saint-Francois-Xavier (MacLeod & Morton 1963).

6.4.3 The Insurrection of 1869-70

By the 1860's the Metis way of life was coming to an end. The bison population was declining, forcing the hunters to travel farther southwest. The scientific expeditions of Dawson and Hind and Palliser confirmed that the prairie was

very fertile land. This in turn encouraged settlers from the east and south. The Metis, particularly the French-speaking community, were afraid that their rights and culture would be lost in Canadian expansionism (Friesen 1984, Sealey & Lussier 1975). They wanted to own the land they now farmed, to sit in government, to maintain their language, faith and schools. "This concern for their collectivity, for their culture in the broadest sense, not for 'frontier' and not for language and religion alone, underlay the metis struggles of 1869-70" (Friesen 1984).

The HBC sold its rights in the northwest to Canada in 1868 for $1,500,000 in an attempt to halt American annexation. Before the agreement came into effect the Canadian government sent surveyors to the Red River settlement. The Metis refused to allow the surveying as the permission of the settlement had not been requested. The Metis had a leader in Louis Riel, an educated man with an understanding of politics. They refused to let the Lieutenant-Governor designate of Red River enter from Pembina. The provisional government of Red River was proclaimed on December 8, 1869. Delegates went to Canada in the spring of 1870 to negotiate. The Metis believed that their principal demands had been met in the Manitoba Act and the Canadian government sent troops and Lieutenant-Governor A. G. Archibald to the new province (Sealy & Lussier 1975, Sprague & Frye 1983).

Riel had forced the Canadian government to negotiate with the people of Red River. He did not secure the support of all segments of the colony, especially after the execution of Thomas Scot. Morton (1967) noted that the farmers and traders of St. Boniface and St. Francois-Xavier did not support Riel. Pascal Breland, for one, joined in opposition to the Canadian surveyors but later left the settlement temporarily when forcible resistance was used by Riel. Breland's choice of a moderate approach may have influenced his people in St. Francois-Xavier not to participate in the resistance (Historic Resources Branch 1984b).

6.4.4 Post 1870

The postage stamp province created by the Manitoba Act was almost a mockery of what the Metis had fought for. The federal government retained control over crown lands and natural resources, unlike in the other provinces. A guarantee of land titles was given and 1,400,000 acres (565,200 ha) were to be alloted to the Metis' unmarried children. Language, education and religious rights were also guaranteed (Friesen 1984, Morton 1967). In 1874, the Manitoba Act was amended to grant land to the heads of Metis families (Sprague 1980). Through the land grant system, the Metis could take the land or government scrip if they did not want the land (Martin 1898). The scrip was treated like money so it is difficult to determine whether the Metis used it to purchase land (Sprague 1980).

The Metis had to apply to the Dominion Government to obtain clear title for their lands and they had to demonstrate 'undisturbed occupancy'. Many Red River settlers had not been registered in the HBC's Land Register and many Metis were not named as residents by the Dominion land surveyors (Friesen 1984, Sprague & Frye 1983). Metis who made their living by the buffalo hunt or who traded furs were usually passed over by the surveyors. White settlers often moved in while the Metis were away. Upon return, the Metis did not believe they would receive justice so they gave in and left Red River (Sealey & Lussier 1975). Many Metis dispersed north and west due to the land grant problems and the realization that their way of life at Red River had ended (Sealey & Lussier 1975, Sprague & Frye 1983). Metis from Red River went to other established Metis communities or developed new settlements. Most of the Metis settled along the South Saskatchewan River (Sealey & Lussier 1975). There they resumed the old way of life till westward expansion caused them problems again in 1885.

The Metis who stayed at Red River were faced with slow assimilation. Some of these people played important roles in the new province. The first premier, John Norquay, was an English Metis. Pascal Breland was elected to the first Legislative Assembly to represent the constituency of St. Francois-Xavier East. Breland remained in the legislature for four years, but he lost his race for federal office in

1872. He was a member of the North-West Council from 1870-1875. When the Council was reduced to three members in 1875 there were no Metis representatives on it. The government responded to appeals for such representation and appointed Breland to the Council again in 1878. He served until its dissolution in 1887 (Historic Resources Branch 1984b).

With the increase in immigration and a new society based on agriculture the character of Red River changed dramatically. Previously the French speaking, Catholic Metis had been the most numerous group. During the 1870's this was reversed as English-speaking Protestant settlers flooded in. Everything the Metis had fought for in 1869-70 was lost (Friesen 1984, Morton 1967).

6.5 HOMESTEADERS

6.5.1 Pre 1870

The first occupation of most settlers in Red River from the Selkirk colony to the early 1900's was farming. Immigrants were primarily from Europe, but Canadians and Americans made up a large number of settlers in the late 1800's.

The Selkirk settlers brought winter wheat from home, but it never provided a good crop. Thus, early settlers had to rely on wild resources for food. A series of good crops from 1827 on, finally established agriculture at Red River

(Morton 1949). Farmers had to adapt to the environment in order to produce food. The first major adaptation was the use of an early maturing spring wheat. Prairie du Chien was the first such strain and so became the standard Red River wheat (Morton 1949). A number of other wheat strains were used in the early years but until 1858, farmers produced only enough for local consumption. From 1858 to 1878, there was enough wheat for the local market and the increasing number of travellers that passed through the settlement. From the beginning, wheat was the predominant field crop at Red River, with barley and potatoes being popular in early years (Strange 1954, Spector 1983).

Agriculture was bound to the rivers for ease of communication, water and timber supply. The most loamy and best drained soil was on the river banks (Morton 1949). The lots ran back from the rivers and were of equal size. The belief that water could not be obtained by digging wells away from the rivers, and that the soil of the open prairie was infertile, also bound settlement to the river (Morton 1967). Implements were primitive which partly prevented agriculture from being profitable. "Crops were sown by broadcast method, harvested with scythes, and threshed with hand flails or the trampling of farm animals" (Spector 1983).

There were few domesticated animals in the settlement in early years. Horses were used to pull the wooden ploughs. After 1827 livestock were gradually integrated into the

farming economy. As grain supplies were limited, settlers relied on native grasses for livestock feed (Kaye 1984). Within the inner two miles of the settlement, each colonist could cut the hay and graze animals on his own lot. Beyond this, settlers had the exclusive right to cut hay on the outer two miles behind their lots. Beyond the 'hay privilege' was 'the common' to which all settlers had access (Kaye 1984). Even with the hay privileges, farmers had trouble collecting enough feed due to fluctuations in grass growth, shortage of labour, conflict with harvest time and the lack of machinery (Kaye 1984). The 'hay privilege' was settled and ploughed after 1870, except for the poorly-drained fields which continued to be used for hay.

6.5.2 1870-1900

The influx of settlers completely altered the characteristic of the Red River Settlement. The prairie was determined to be extremely fertile by various expeditions, so the Canadian government began surveying land away from the rivers. At first, immigrants trickled in and then, with the campaigns by the railway companies, they flooded in. The railways offered cheap land in order to create a market for themselves (Wilson 1981). The first of these homesteaders took lands close to the railway lines. Once on the land the first tasks were to plough fields and build a house. The only plough that could work in the prairie soil was steel,

especially popular was John Deere's plough (MacEwen 1980). If logs were available, a house was built in the speedy 'notch and saddle' style (Morton 1967).

Numerous advancements in farming occurred during this period as settlers tried to adapt to the farming conditions of the prairies. Red Fyfe, a hard spring wheat was introduced in the 1870's and by the 1890's, was the dominant strain. It was high yielding and had unsurpassed milling and baking qualities. Its one fault was that it was late in maturing and therefore often caught by frost (MacEwen 1980, Spector 1983). In 1876 the first export of grain left Red River for Ontario (Strange 1954). New implements increased productivity. The press drill increased seed germination, steam driven ploughs were more economical than animal ploughing, and steam driven threshing machines were seen as the only means to complete the harvest (Spector 1983). In the late 1880's the self binder replaced the reaper, and the sulky and gang plough became popular. Barbed wire was used to keep livestock in their pastures. Previously, the shortage of wood had prevented the extensive use of fencing. Summer fallowing first became popular in the 1880's as a method of weed eradication and soil enrichment. In the 1890's it became popular as a means of preserving moisture. The final achievement of prairie farm technology in the 1800's was the control of wheat smut through bluestoning. Mixed farming increased in Manitoba, especially from 1885

on, but wheat farming was still the primary farming activity as wheat was seen as the main means of profit (Morton 1967, Spector 1983).

6.5.3 1900-1920

During this period farming techniques were improved and refined. After the turn of the century there were advances in land breaking, seed selection, tillage improvements, weed control, advanced smut control and the popularization of the steam-powered tractor (Morton 1967, Spector 1983). In the 1910's the most important new farming implement was the disc. It pulverized newly broken land, thereby preparing land for seeding. The disc was also used in weed control (Spector 1983).

Immigration increased in the early 1900's because of cheap land, high wheat prices and cheap railway and steamboat charges. The Grand Trunk Railway, which ran through what is now Beaudry PHP, was built in 1908 to offer competitive service to the growing population (Morton 1967, R.M. of Cartier 1985). The Beaudry Station was built in 1911. The line was abandoned after World War II.

From 1910 to 1920 farming techniques were refined further. Methods of ploughing and cultivation were designed to preserve moisture. Seed selection was improved and Marquis wheat became popular. It was subject to stem rust and thus

genetic experimentation sought to further improve strains (MacEwen 1980). The era of steam power ended in 1912 to 1914 with the development of a new engine. The gasoline tractor had many advantages over the steam engine: fewer mechanical problems, more horsepower, easier starting, less bulky fuel and greater versatility (Spector 1983). This new tractor allowed farmers to be more self-sufficient as they could operate the machine themselves. The days of custom threshermen also ended.

Wheat remained the prime crop because techniques were developed to cultivate it successfully under semi-arid conditions. In 1919, 63 percent of all crops was wheat. The other major crops grown, in order of importance, were: oats, barley and flax. Oats cleaned fields of weeds while providing a fodder crop. Barley could make marginal lands productive. Flax was not produced in large quantities as the market was limited (Spector 1983).

The wheat boom of the early 1900's in Manitoba increased the prosperity of farmers. The profits of this economy went into breaking of new land, purchases of livestock and machinery, new barns and houses. The new houses were square and grave or L-shaped with gables and were surrounded by shelterbelts. The old log stables were replaced by giant red barns of the hip-roof style. A few dry seasons followed and in 1918, Manitoba farming experienced large-scale soil-drifting for the first time (Morton 1967).

6.5.4 1920 to the present

The drop in wheat prices in the 1920's resulted in increased cultivation of other crops. Barley became the major alternative so that in 1926 the total yield of barley almost equalled that of wheat (Morton 1967). Rapeseed was introduced during World War II as a wartime source of vegetable oil (Spector 1983). The soils of Manitoba began to lose their virgin fertility in the 1920's but commercial fertilizer was rarely used. Crop rotation was practiced to combat the increasing weed problem.

The depression of the 1930's brought numerous problems to farm land: drought, pests, soil erosion and lower prices. World War II helped alleviate some of the troubles and the climate became less extreme. After the war the major changes in machinery were the use of newer types of cultivators instead of the plough. The cultivators loosened the soil and left organic matter on the surface which reduced soil erosion. During the 1930's the telephone was introduced and country roads were extended. Electrification of farms came in the 1940's (Morton 1967).

Pesticides, a result of the war, were produced commercially for widespread use. From 1956 to 1960, there was a 70 percent increase in the sale of pesticides on the prairies. The use of commercial fertilizers has also increased significantly since the late 1930's. Soil loss has in-

creased from water erosion and wind blowing, especially on summer fallow lands (Strange 1954, Wilson 1981). Chemicals will increasingly be used as soil nutrients are lost. The long term solution to soil loss includes reduction in tillage operations, reduction in summer fallow acreage, better water management, and more sophisticated cropping and rotation patterns (Wilson 1981). Zero tillage leaves the stubble on the field to build up the organic content of the soil. Planting legumes returns nitrogen to the soil but fertilizer is still necessary. Farmers cannot engage in long term restoration of soil when faced by high costs of machinery and fuel (Wilson 1981).

6.6 SUMMARY

This chapter reviewed literature on the cultural history of Beaudry PHP, with an emphasis on the relationship of people with the land.

Prehistoric peoples followed the bison onto the grasslands in summer, and back to the parkland in fall. Though bison were the major food source, plants and other animals supplemented the diet. The Kuypers site at Headingley demonstrates occupation by Oxbow people, probably in the fall.

The cyclical pattern of resource exploitation was practiced by the Cree and Assiniboine. These two groups became the middlemen of the fur trade between the European fur com-

panies and other Indian groups. The Cree and Assiniboine gradually lost this role, as more Europeans entered the fur trade and in time they became provisioners of pemmican to the companies. The Indian way of life changed dramatically and they were forced to live on reserves.

The Metis replaced the Indians as provisioners of pemmican. The largest settlement of Metis at Red River was at Grantown, just west of what is now Beaudry PHP. The Metis at Grantown were part-time farmers as well as hunters of bison. Twice a year they would go southwest to hunt. The Metis at Grantown were noted for their ability to make wheels for Red River carts. The Metis way of life was threatened by the decline in bison, the influx of white settlers and the policies of the Canadian government. Many Metis dispersed to the northwest after 1870.

Farming was the first occupation of white settlers in Red River. Like the Metis, these people settled along the rivers, cultivated a few acres and cut hay from the prairie for their livestock. Once it was determined that the soil of the prairie was extremely fertile, settlers began taking up homesteads away from the rivers.

The 1880 to 1920 period was an era in which the land was made more productive in terms of agriculture. The land was broken and native prairie was destroyed. New strains of wheat were produced to cope with the short season, pests and

diseases. This research has continued to the present time. The years 1900 to 1910 saw advancements in land breaking, seed selection, tillage improvements, weed control, advanced smut control and the popularization of the steam-powered tractor. From 1910 to 1920 these techniques were refined, and the lightweight gasoline tractor and threshing machine were introduced to Manitoba. Since the 1920's, farmers have been overusing their lands to remain economically viable, and many soil problems have resulted.

Chapter VII

INTERPRETIVE PLAN

7.1 INTRODUCTION

Beaudry Provincial Heritage Park (PHP) is located 10 km west of Winnipeg (Figure 11). It was established by the Manitoba Parks Branch in 1975. The area was set aside in part due to recognition of its natural features, including the unique riverbottomland forest, designated as an International Biological Programme site. The Programme was designed to ensure the preservation of rare or valuable terrestrial ecosystems (Levin & Keleher 1969). The park has been recently designated as a Heritage Park that will represent one of twelve natural regions of Manitoba - the tall grass prairie (Parks Branch 1985). Provincial Heritage Parks:

> represent landscapes or sites that are one-of-a-kind in Manitoba. They preserve and interpret key elements of Manitoba's natural and cultural history. Heritage parks provide a range of outdoor recreational opportunities and experiences that emphasize appreciation of heritage values. Major commercial resource extraction/harvest activities are not permitted (Parks Branch 1985).

Since 1975 the park has had little development for recreational purposes. A series of hiking and cross-country ski trails through the bottomland forest were completed in 1984.

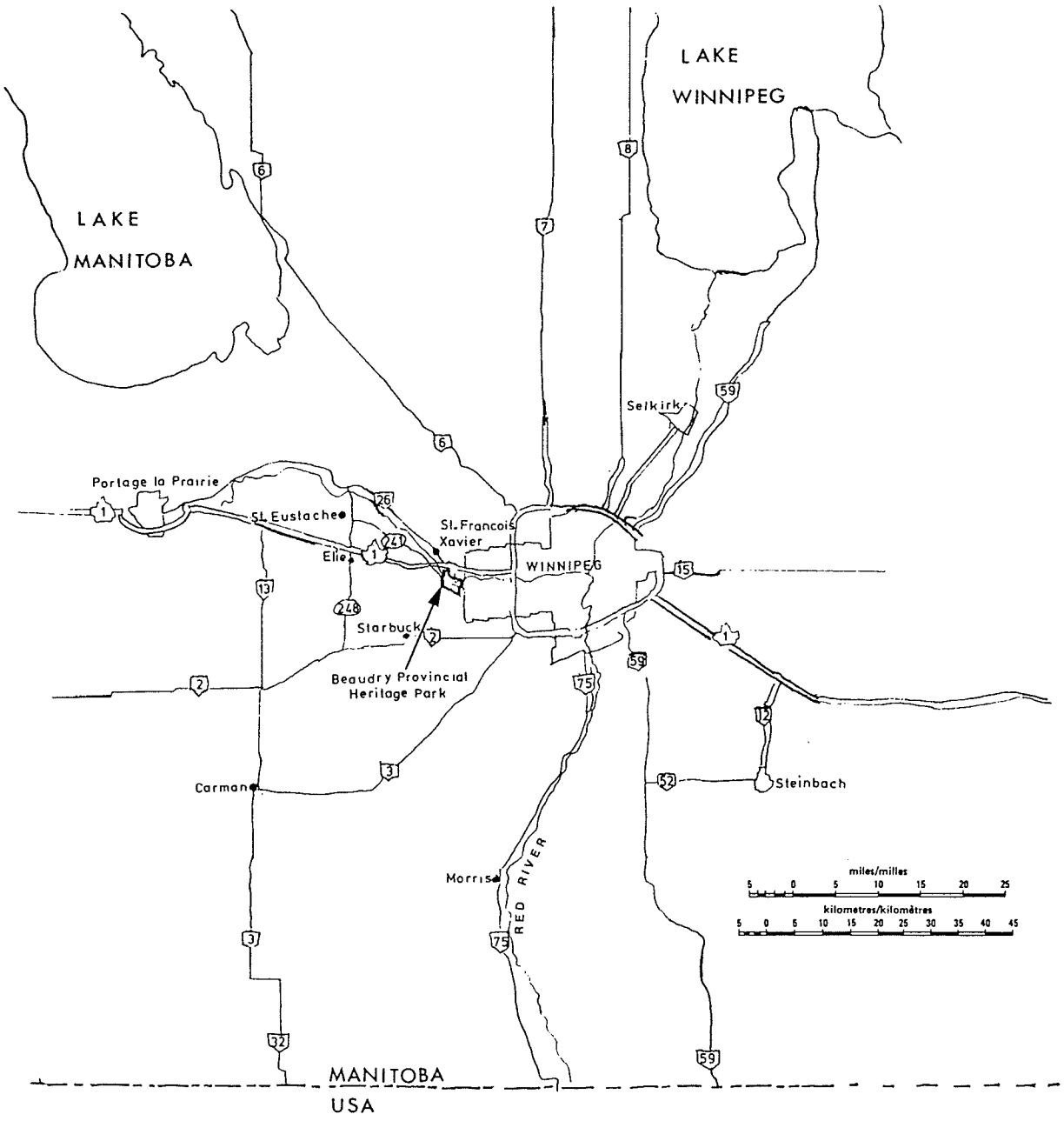

Figure 11: Location of Beaudry Provincial Heritage Park

In 1985, washrooms and an interpretive kiosk were installed near the parking lot to facilitate the increasing number of visitors to the park. Figure 12 illustrates the current land use in the park. The park consists primarily of river bottomland forest and agricultural fields but there are two small prairie remnants which have been invaded by woody species, one of which was surveyed for the International Biological Programme. There are a number of smaller prairies scattered throughout the aspen-oak groves and a pond with aspen and oak growing along its banks.

An attempt is being made to restore tall grass prairie on 200 ha of the agricultural land, the first such restoration project in Canada. Because of the nature of prairie vegetation it will be at least 10 to 12 years before a suitable replicate of native tall grass prairie is established. In 1983 a consulting firm was contracted to develop a concept plan for Beaudry PHP as a park with restored tall grass prairie (Hilderman et al. 1984). Guidelines for interpretation were then written by Parks Branch staff (Anderson 1985). The interpretation of themes during the restoration period has not been addressed as the themes written in these documents presuppose the presence of tall grass prairie. The first planting of native seed will be in 1987 and the park will be in operation during this restoration period. Therefore an interim interpretive plan is necessary. This plan was developed to address that need as a practicum at the Natural Resources Institute, University of Manitoba.

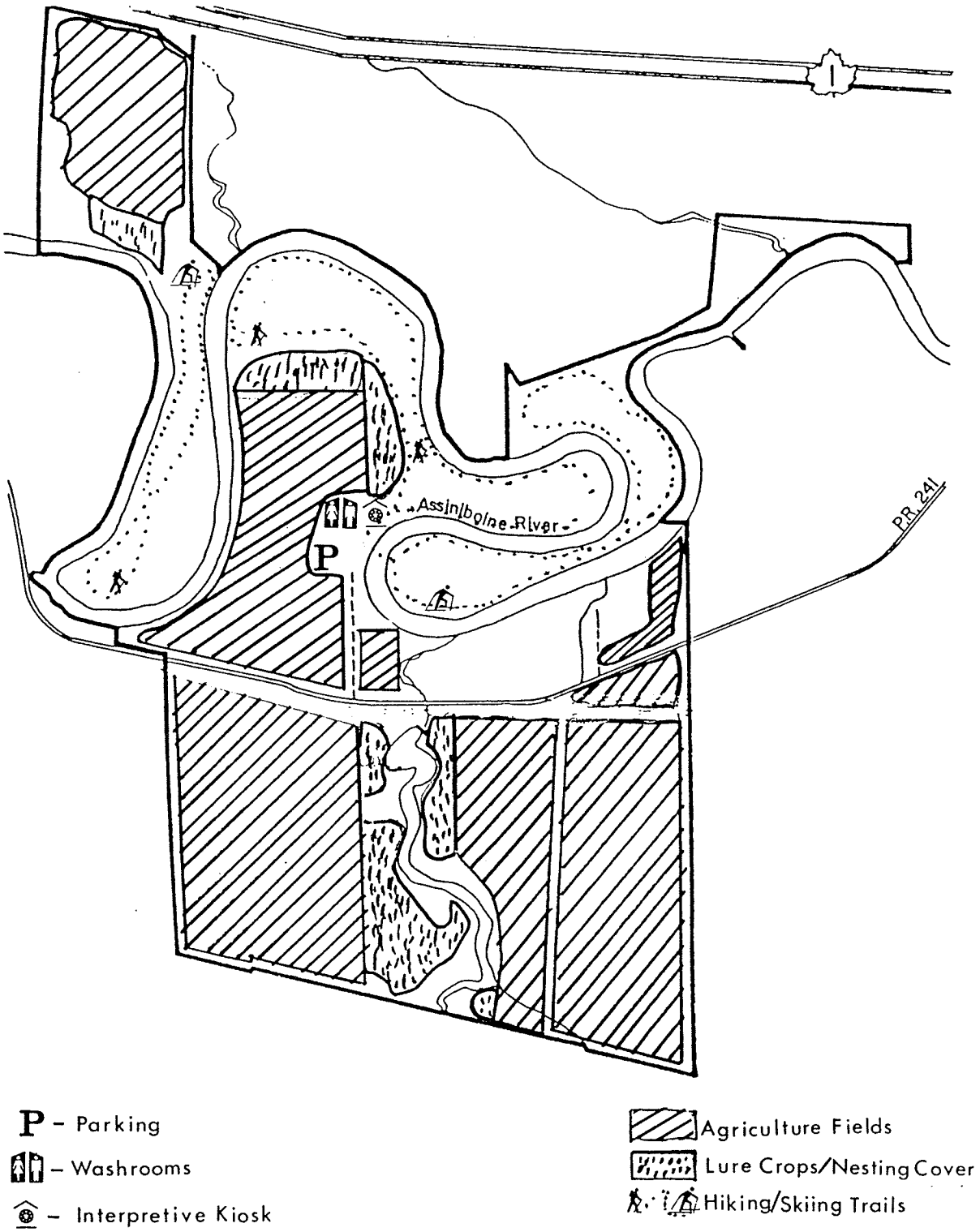

Figure 12: Current Land Use in Beaudry Provincial Heritage Park

7.2 PROGRAM OBJECTIVES

The objectives of the park provide policy statements which define program direction and balance for the entire park. The park objectives listed below are the park precepts defined in the systems planning document.

7.2.1 Park Objectives

Beaudry Provincial Heritage Park will:

- Protect representative natural features of the tall-grass prairie natural region.
- Provide interesting and vivid learning experiences of the prairie people and their use of the land.
- Encourage a wide range of experiences for seniors, disabled citizens, families and school groups.
- Promote research which leads to a better understanding of the prairie and its people (Parks Branch 1985).

7.2.2 Plan Objectives

Plan objectives provide guidance in determining opportunities available for interpretation. The objectives for this interpretive plan were defined to be:

- To interpret the purpose and process of prairie restoration including the ecology of the grassland communities.
- To provide opportunities for the public to understand and enjoy the restoration of prairie at Beaudry Provincial Heritage Park as representative of tall grass prairie in Manitoba.
- To interpret the natural history of the tall grass prairie and its relationship with the aspen parkland of

Manitoba as it relates to restoration of tall grass prairie.

- To interpret the cultural history of Beaudry Provincial Heritage Park as it relates to restoration of tall grass prairie. Thus the impacts of Native, Metis and European cultures upon the tall grass prairie will necessarily also have to be be interpreted.

7.3 NATURAL HISTORY

7.3.1 Aspen Parkland

Beaudry PHP lies near the southern edge of the aspen parkland transition zone. This zone consists of a mosaic of grassland and groves of deciduous trees. In the south the parkland is predominantly grassland, but the percentage of tree cover increases as one moves northward.

The dominant tree throughout the parkland of Manitoba is trembling aspen with bur oak becoming important in the south. The vegetation of Beaudry PHP is illustrated in Figure 13. Stands of aspen and oak are found along the water bodies in the park. The stand of trees along the banks of the Assiniboine River is termed river bottomland forest. The most numerous tree species in the river bottomland of Beaudry PHP are green ash, basswood and American elm. Also present are Manitoba maple, trembling aspen, bur oak and eastern cottonwood. Due to the presence of Dutch Elm disease, many elm trees have been removed from Beaudry PHP during the past few years.

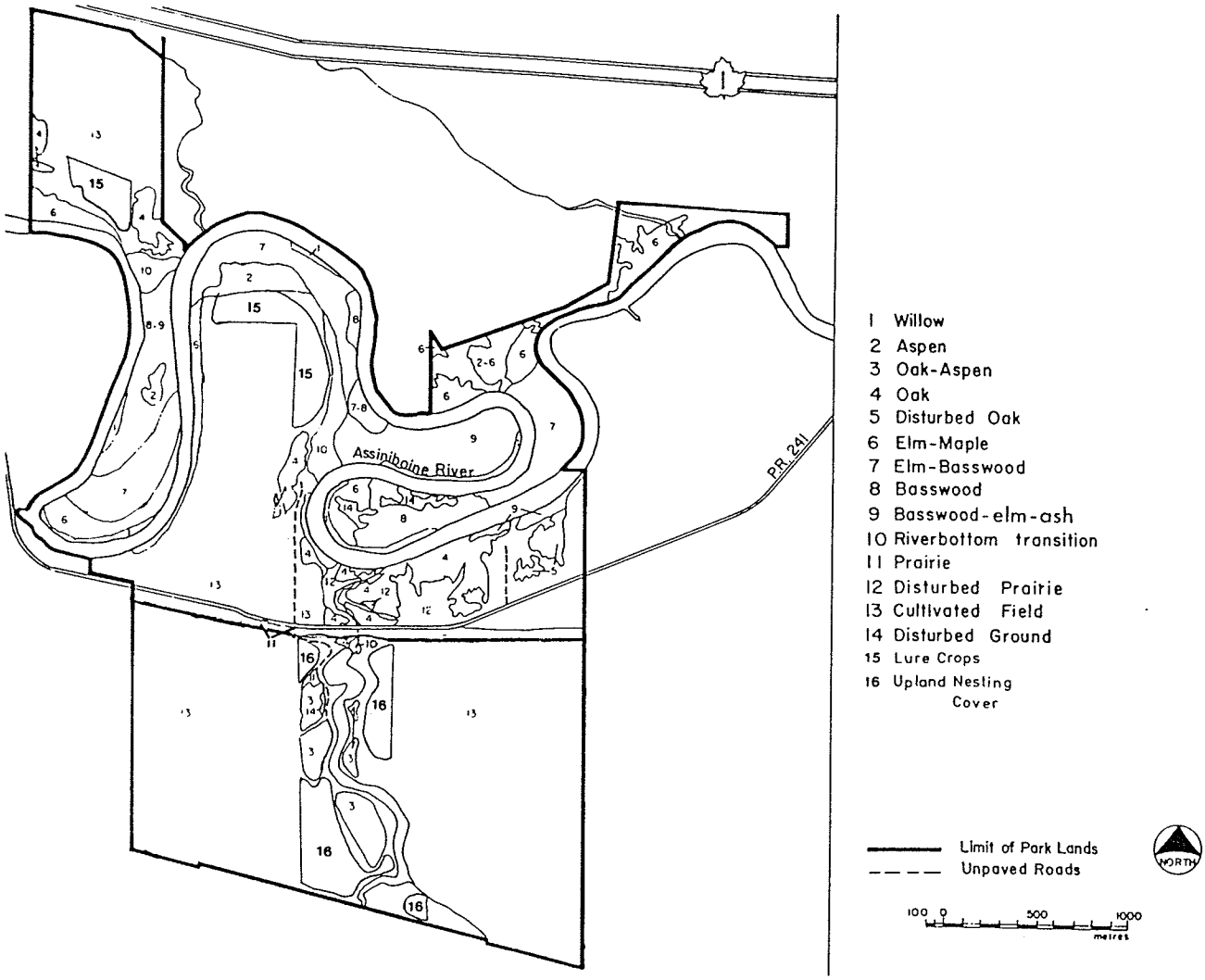

Figure 13: Vegetation of Beaudry Provincial Park (adapted from Dorber 1978)

The shrub stratum includes hazelnut, riverbank grape, red-osier dogwood and poison ivy. The herb strata include ostrich fern, wild sarsaparilla, Canada anemone and wood nettle. The area of aspen parkland in Beaudry PHP has increased due to the reduction in prairie fires. Animals common to the forests of Beaudry PHP included eastern cottontail, white-tailed deer, least chipmunk, striped skunk, raccoon, black-billed cuckoo, great gray owl and leopard frog.

7.3.2 Tall Grass Prairie

The grassland portion of the aspen parkland in which Beaudry PHP lies is tall grass prairie. The tall grass prairie is one of two grassland communities that occurs in Manitoba. It previously covered an area of approximately 4,000 km^2 and "lay almost wholly west of the Red River, extended north to approximately the Assiniboine River, and west to the rising ground of the Manitoba escarpment" (Watts 1969). It is characterized by the height of grass and forb species, and by its dominant species, big bluestem, which can grow to a height of 2 m in Manitoba. In the most favourable sites of U.S. prairie states 3 m has been noted. Other species typical of the tall grass prairie, which are also found at Beaudry PHP, are porcupine grass, western snowberry, northern bedstraw, wild bergamot and wild onion. The location of the principal prairie remnants in Beaudry

PHP are shown in Figure 13. The remnant along provincial road 241 has been maintained because it lies along an old railway right-of-way which was periodically burned. Since the removal of the railroad, the remnant has been burned in order to discourage woody species and weedy annual species and to enhance prairie species.

Tall grass prairie plants are tolerant of fire because of their extensive root systems and vegetative reproduction. These long roots allow the plants to survive in times of low precipitation. Different species have different lengths of roots so that they do not all compete for moisture at the same soil levels. Many prairie plants produce extensive foliage. This results in a layer of dead plant material which decomposes slowly due to the short arid summer. Thus seeds do not often reach the soil surface. If they do manage to reach the soil, the amount of light and moisture reaching them is minimal, thereby limiting the chance of germination. Prairie plants reproduce primarily vegetatively, by rhizomes, rather than by seed. Fire removes the build up of organic matter, allowing plants to grow more vigorously and to produce more seed. If a seed does germinate, it must quickly develop its first root and leaf systems for support. Root growth is rapid in order to reach available moisture in the soil. A prairie plant will develop an extensive root system before developing much foliage.

Numerous species of small animals characteristic to prairie are found at Beaudry PHP. Large animals , such as bison and elk, have been extirpated from the area. Prairie animals common to the park include thirteen-lined ground squirrel, Richardson's ground squirrel and western meadowlark.

7.3.3 Interpretive Potential

The restoration process of prairie at Beaudry PHP is obviously linked to the adaptations of prairie plants. Interpretive themes based on the ecology of tall grass prairie plants and animals are thus especially relevant during the restoration period. The following interpretive messages for this period are drawn from the research conducted on natural history, and the objectives set for the park.

1. THEME: Ecology of Aspen Parkland

   a) Aspen parkland consists of a mosaic of grassland and groves of deciduous trees.

   b) Prairie is replaced by forest under certain conditions.

2. THEME: Ecology of Tall Grass Prairie Plants

   a) Tall grass prairie is distinct because of species composition and plant height.

   b) Upon germination, prairie plants spend more energy developing roots than foliage.

   c) Once tall grass prairie is established, most plants propagate primarily by vegetative structures.

   d) The root systems of tall grass prairie plants provide tolerance to fire and allow plants to survive in times of drought.

e) Fire enhances prairie species and discourages woody and weed species.

3. THEME: Ecology of Tall Grass Prairie Animals

a) Prairie animals are integral to the ecology of prairie plants.

7.4 RESTORATION OF PRAIRIE AT BEAUDRY PROVINCIAL HERITAGE PARK

The restoration of tall grass prairie at Beaudry PHP is in a preparatory stage. The prairie remnant along provincial road 241 was partially burned in 1981 and more recently in spring of 1985. It was scheduled to be burned in spring of 1986 but could not be due to weather constraints. The portion that was burned had fewer woody and weedy species after burning and was taller and more dense in cover than the portion that was not burned.

Figure 14 illustrates the field plots in the park. The first area scheduled to be seeded to prairie in 1987 is D-2, followed by D-3. Four stages will be followed in restoring tall grass prairie in the park: seed source, seedbed preparation, planting methods and maintenance. The process, as it has been developed thus far , is as follows. As the restoration project progresses, the process will be adjusted as necessary.

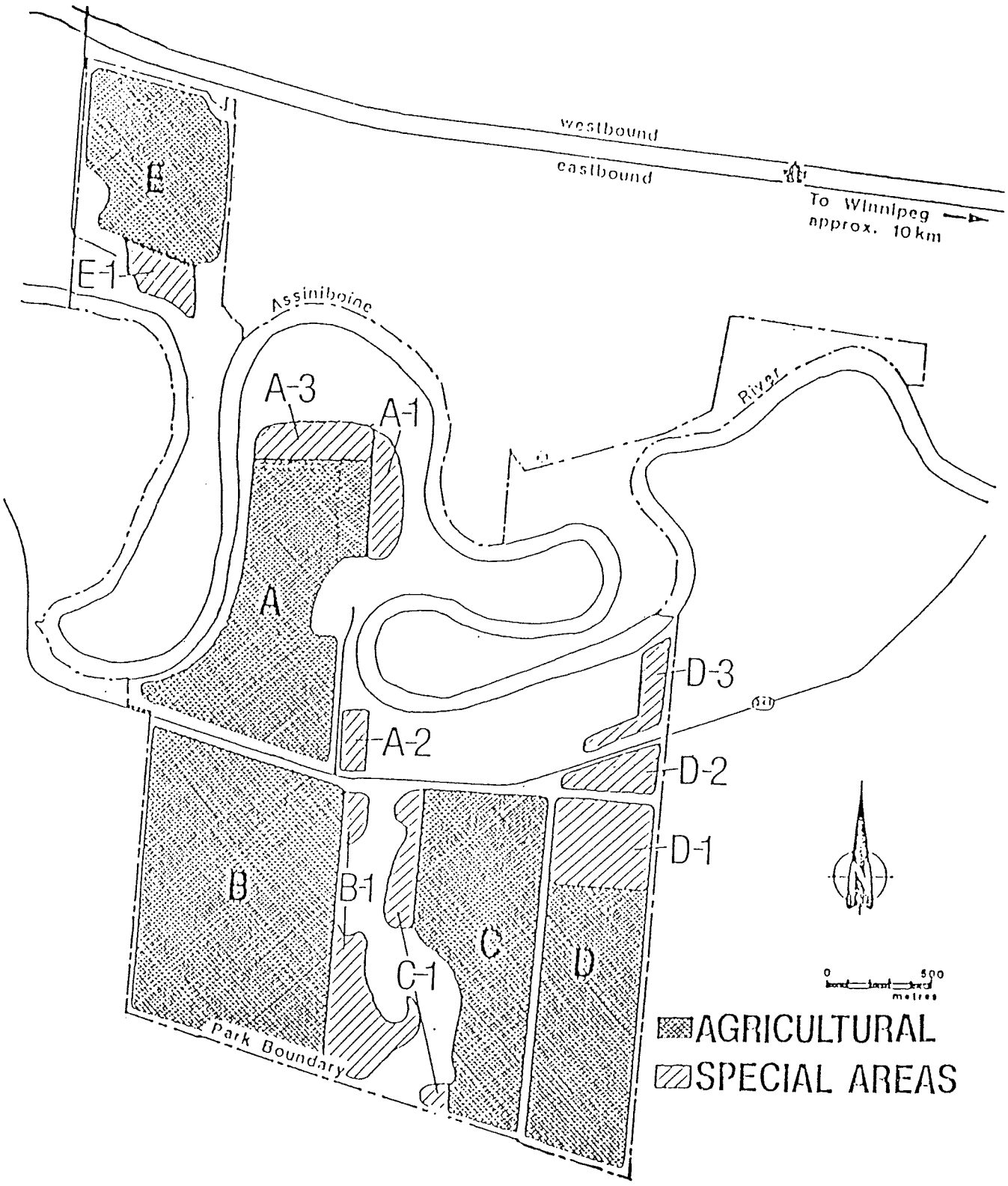

Figure 14: Division of Plots at Beaudry Provincial Heritage Park (Parks Branch files)

7.4.1 Seed Source

To restore prairie, a local seed source is necessary so that the plants are suited to the soil and moisture conditions and the photoperiod of the restoration site. If the selected seeds are not suitable, the plants will not mature properly and will be subject to disease. U.S. guidelines indicate seed should not be planted further than 480 km north, 320 km south and 480 km east or west of its origin, although the closer and more similar the sites are with respect to soils and microclimate, the better.

Two suitable seed sources have been found to date for the initiation of tall grass prairie restoration at Beaudry PHP. The tall grass prairies at Oak Hammock Marsh and Lake Francis can provide enough seed for planting in section D-2 in spring of 1987. Both seed sources were scheduled to be burned in spring of 1986 so that enough seed could be produced for harvest in the fall. Poor weather conditions prevented burning. As the restoration project progresses, the search will continue for other suitable seed sources. After a few more spring burns, the prairie remnant along provincial road 241 in Beaudry PHP will be used as a seed source as well, particularly for forbs. This is the best seed source as it is on the site of the restoration project.

7.4.2 Seedbed Preparation

The most important factor in seedbed preparation for native prairie species is weed control. The agricultural land within the park is leased to farmers. The terms of the lease for section D-2 in 1986 are to prepare the land for prairie restoration beginning in 1987. For the 1986 crop year, only barley or oats may be planted in section D-2. In controlling weeds, the farmer cannot use residual herbicides. If weather conditions do not allow cultivation of the barley or oat stubble, native seed will be planted into the stubble in spring of 1987. Barley and oat stubble is better for native seeds than wheat stubble as it does not reflect light as much (which would dehydrate the seeds). If the stubble is cultivated, then the soil will be worked to kill weeds, and the native seeds planted onto a firm seedbed. The same process will be used for section D-3 which will be prepared and restored one year after section D-2. During the seeding of native species, the plots will be laid out to allow for fireguards to facilitate maintenance burning.

7.4.3 Planting Methods

Native prairie seed could be planted at Beaudry PHP using one of two methods: broadcasting or seed drill. Broadcasting would be done by machine. This method necessitates using more seed as the seed is spread on top of the soil and

some percentage will be lost to predators and dessication. Broadcasting does create a more natural distribution of seed, however. Seed drills use less seed than broadcasting as the seeds are placed directly into the soil. The distribution of species is not random and rigid rows are formed with seed drills. The availability of machinery and seed will determine which method is used. Broadcasting is the preferred option.

7.4.4 Maintenance

The purpose of maintenance is to increase the competitive advantage which native prairie species have over weed species. All non-native plants are considered weeds. During the first two summers of growth, mowing the fields will be the principal means of weed control. Mowing just above the prairie plants cuts off the fast growing weeds, leaving the prairie seedlings unharmed. Once enough litter has accumulated to carry fire, likely beginning in the third summer, burning replaces mowing as the primary means of maintenance. Burning selects for prairie species and against weed and woody species. Burning would be done annually for the first 3 to 5 years. Thereafter, a burning cycle of 3 to 5 years is recommended. The prairie remnants will also be burned to increase the health of the stands. Management of the tall grass prairie by fire will continue past the restoration period to maintain a healthy prairie. Hand weeding through-

out the restoration process is another means of removing weed species but it is too time consuming to be practical on large sites.

7.4.5 Interpretive Potential

The primary interpretive themes during restoration will focus on the purposes and processes of prairie restoration. From the research conducted, the objectives set for the park and plan and the procedures to be used at Beaudry PHP, the following emerge as relevant interpretive messages for the restoration period:

1. THEME: Purposes of Prairie Restoration

    a) Beaudry PHP represents the zone of tall grass prairie in the Manitoba parks system.

    b) Prairie restoration at Beaudry PHP allows for reestablishment and subsequent protection of representative natural features of the tall grass prairie region.

    c) Restoration of tall grass prairie at Beaudry PHP will provide opportunities for the interpretation of the natural history of tall grass prairie.

    d) Restoration of tall grass prairie at Beaudry PHP will provide opportunities or the interpretation of cultural interaction with and impact upon the prairie of Manitoba.

    e) Beaudry PHP will provide opportunities for the public to enjoy the natural and cultural history of the tall grass prairie.

2. THEME: Processes of Prairie Restoration

    a) Local seed source for tall grass prairie restoration is necessary for optimum results.

    b) The most important factor of seedbed preparation is weed control.

c) Different methods of planting yield different results.

d) The purpose of prairie management is to increase the competitive advantage which native prairie species have over weed species.

e) Burning selects for tall grass prairie species and against woody and weed species.

f) Regular burning must continue every few years after tall grass prairie is established to maintain the health and vigour of prairie.

g) There is a gradual change in species composition and relative abundance over time as more and more species are established.

7.5 CULTURAL HISTORY OF BEAUDRY PROVINCIAL HERITAGE PARK

7.5.1 Prehistory

As the glacier receded, people moved in from the south between 10,000 to 4,500 years before present (B.C.). Prehistoric peoples hunted the migratory bison. Summers were spent in the grasslands. As the bison moved to the parkland in fall, the people moved ahead of them. Evidence of prehistoric peoples in the Beaudry PHP area is at the Kuypers archaeological site downriver of the park. The site was partially excavated and demonstrates occupation by peoples of the Oxbow Culture (3,500 to 1,000 B.C.). Subsistence was based upon bison but species such as elk, fox, rabbit, goose and hackberries were also consumed. Artifacts from the Blackduck Culture (800-1700 A.D.) were also found. Much is surmised about the life styles of prehistoric peoples. It is evident though, that their impact upon the land was minimal.

7.5.2 Natives Post-contact

After contact with European cultures, native groups still followed the large game animals and continued to use the resources of the parkland and prairie on a cyclical basis. The Assiniboine and Cree first served as middlemen in the fur trade, then as provisioners of pemmican after the amalgamation of the fur trade companies in 1821. Native groups, pre and post-contact, did not cause major impacts upon their environment, but certainly they affected local populations of plants and animals. The fur trade encouraged increased exploitation of the prairie-parkland environment. With the decline in bison and the increase in white settlement, the Indians were forced to sign treaties and give up their lands.

7.5.3 Metis

The Metis were born of European fur traders and their native wives. They too hunted the bison to supply the fur trade and later the Red River Settlement as well. The collective identity of the Metis as a 'new nation', began with the battle of Seven Oaks in 1816. A few years later the Metis settled in two parishes at Red River, the largest at Grantown. Beaudry PHP lies on the eastern border of this historic settlement. There the Metis became part-time farmers. The Metis of the Red River Settlement practiced the lifestyles of both ancestral groups, bison hunting and farm-

ing. Their culture was a transition between the natives who lived as hunter gatherers and the European settlers who, by turning to agriculture, destroyed the natural cycles of the land.

By the 1860's the Metis way of life was coming to an end. The bison population was declining and white immigration was increasing. The Hudson's Bay Company (HBC) sold its rights in Rupert's Land to Canada in 1868 in an attempt to halt American annexationists. The government did not consult with the settlers of Red River about bringing them into confederation. The Metis, under Louis Riel, organized a provisional government in 1869 to negotiate with the Canadian Government which eventually resulted in the formation of the postage stamp province of Manitoba in 1870. Though Metis were granted lands under the Manitoba Act they had difficulties in obtaining title to their lands. Many Metis dispersed north and west due to the land grant problems and the realization that their way of life at Red River had ended.

7.5.4 Homesteaders

After 1870 white settlers trickled in and then, due to the campaigns by the railway companies, they flooded in. With these immigrants came new ways of farming. The primitive methods of the early Red River settlers were gradually replaced. Oxen replaced horses; steel ploughs replaced wooden ploughs. These in turn were replaced by steam driven

ploughs; shorter seasoned spring wheat replaced winter wheat; and the press drill replaced hand broadcasting. With these initial improvements, much of the prairie was ploughed under, and wheat became the predominant field crop. By 1914 the era of steam ended as the gasoline tractor was more efficient. The disc was the most important new farming implement of the 1910's. It prepared more land for seeding faster and was used in weed control. As a result, however, since 1918, soil erosion by wind and water has become an increasing problem. The consequent loss of soil fertility has been a concern since the 1920's.

Since World War II, chemical fertilizers have been used at an increasing rate to compensate for the loss of soil nutrients. The increasing costs of machinery and fuel has meant that farmers have fewer options for agricultural production on their lands. This may prevent them from adopting conservation practices.

7.5.5 Interpretive Potential

The cultural interpretive messages relevant to the restoration period are listed below. These messages were determined from the research conducted and from the objectives for the park and the interpretive plan. They relate to those messages determined for interpretation of tall grass prairie natural history and restoration.

1. THEME: Prehistoric Peoples

   a) Prehistoric peoples of the tall grass prairie depended on the natural cycles.

2. THEME: Natives Post-contact

   a) Cree and Assiniboine cultures used resources of the tall grass prairie and aspen parkland on a cyclical basis but exploited the resources on an increasing level.

3. THEME: Metis of Grantown: Culture in Transition

   a) Metis hunted buffalo to supply fur trade and settlement.

   b) Metis at Grantown were part-time river lot farmers.

   c) Many Metis dispersed from Grantown after 1870.

4. THEME: Homesteaders

   a) Early farming was bound to the river.

   b) The influx of settlers changed the nature of farming.

   c) Improved technology rapidly destroyed the native tall grass prairie.

7.6 VISITOR ANALYSIS

In 1985 the number of vehicles that entered Beaudry PHP from May 15 to September 15 was partially estimated at 2,823 (Parks Branch 1986). Statistics for previous years or winter use are not available. Given the limited facilities available, this is a significant visitation rate. Overall, the visitation to provincial parks was down slightly in 1985 from 1984 by 6.5% to 1,376,525 vehicles. In the southeastern region, in which Beaudry PHP lies, vehicle attendance

was down 3.7% from 1984 to 160,151 vehicles. Hilderman et al. (1984) offered estimates of visitor numbers to Beaudry PHP during various stages of development. These numbers were partially based on research they did on related facilities and on Wang (1977) which is considered to be out of date. Hilderman et al. (1984) calculated the expected visitation at 157,500 to 180,500 people when the park is fully developed according to their plan. During the first few years of restoration, visitation will probably remain at the current level if there is no advertising. As interpretive facilities and opportunities develop, visitation should be encouraged on an exponential basis. Visitation should not be actively encouraged in the early years of restoration, as the lack of interpretive possibilities would be disappointing and detrimental to future visitation. At this stage of development it is difficult to estimate visitor numbers. Once interpretation of restoration begins, visitor analysis should be undertaken to determine numbers of people in order to gauge future developments and staffing.

At this stage it is visitor types that are important for theme development. Hilderman et al. (1984) offer the following breakdown of the origin of potential visitors to Beaudry PHP:

65% - Winnipegers, especially those west of downtown
- includes school groups, retired people, families and special interest groups

15% - Other Manitobans, especially those within one hour's driving distance
- includes families, school groups and special interest groups

10% - Other Canadians, especially from Saskatchewan visiting relatives and friends in the Beaudry PHP area.

5% - Americans, primarily from North Dakota and Minnesota.

2% - Overseas visitors to the Beaudry PHP area.

The above breakdown is reasonable; though if other Manitobans and their guests within a one hour drive are expected to visit Beaudry PHP, it seems likely that Winnipegers from east of downtown would be just as likely to visit.

The visitor types noted below are derived from visitor analysis in interpretive documents (Cobus 1984, Hilderman et al. 1984, Peart 1974b, 1977) and the researcher's experience in interpretation.

During the first years of tall grass prairie restoration, visitation should be kept low so as to not damage young plots. Visitation should be encouraged on an increasing scale with facility development so that sufficient activities exist for visitors.

Visitors will be day users and will probably spend 1 to 3 hours in the park (visits will be longer as the park develops). Families and individuals want to tour the park themselves, while school groups prefer structured programs. Miscellaneous groups will want both types of visits.

In winter, Beaudry PHP is a popular cross-country skiing site. Most of the general public visitors will go to the park for this purpose and should be encouraged to visit the Interpretive Centre (once it opens).

VISITOR TYPES

FAMILY/INDIVIDUALS	The increasing population of single people should not be forgotten in park planning.
Local	Residents within 40 km of the park. Includes Winnipegers, a large urbanite population with little knowledge of rural lifestyles or experience in a natural environment. Non-urbanites will be more familiar with a natural environment but are used to farm and small town atmosphere. May visit at anytime, but primarily summer.
Regional	South-central Manitobans (excluding locals). Primarily from small towns and farms, therefore have the same experience and knowledge as local non-urbanites. May visit at anytime, but primarily summer.
Tourist	Other Manitobans, other Canadians, Americans, from Overseas. This group will provide fewer visitors than others but they will consist of more varied backgrounds. These people will be largely unaware of the cultural and natural history of Manitoba, but may be able to relate it to their own experiences. Will visit primarily in the summer.
SCHOOL GROUPS	Potentially a large market. Will visit primarily in the fall and spring. Can visit in winter also.
Winnipeg	East of the park for 40 km. This groups is largely unfamiliar with rural and natural environments.
Local	North, south and west of the park for 40 km. These children will be familiar with rural life and to some extent natural environments.
Other Manitobans	May visit park during special trips to Winnipeg. Largely a rural population.

MISCELLANEOUS GROUPS	Will be of different ages and backgrounds. They will originate primarily from Winnipeg and local towns. Will visit primarily during spring, fall and winter.
Boys & Girls Clubs	Will be of varied backgrounds. May be interested in assisting with restoration activities.
Seniors	May be quite familiar with rural lifestyles.
University	Will be interested in studying aspects of the park rather than touring it.

7.7 INTERPRETIVE STORYLINE

The tall grass prairie of Manitoba once covered an area of approximately 4,000 km^2 from the Red River on the east, north to the Assiniboine River and west to the Manitoba escarpment. It extended northward from the tall grass prairie of Minnesota and North Dakota into the deciduous forest between which lies the aspen parkland. Beaudry PHP lies along the southern border of the aspen parkland zone which is a mosaic of grassland and deciduous trees, primarily trembling aspen. Tall grass prairie is characterized by the height of plants (1 to 2 m), species composition and the dominance of big bluestem. Prairie plants have extensive root systems to allow the plants to survive in times of drought. Tall grass prairie plants produce seed but reproduce mainly by vegetative structures. These plants are thus resistant to fire, while woody species are not. In historical times the aspen parkland has increased in area due to the reduction in

fires. The park contains only two small remnants of some size and several smaller pockets of tall grass prairie. Most of the area of former prairie in the park is now under agricultural production.

The tall grass prairie of Manitoba has always been occupied by people. Prehistoric peoples depended on the natural cycles of the prairie and parkland. They would move to where food was seasonally available. As technology was limited and populations small, prehistoric peoples affected the local environment on a small scale. Downriver from Beaudry PHP the remains of a fall encampment of Oxbow peoples, with evidence of bison hunting was partially excavated in 1980.

After contact, native peoples continued to utilize the resources of the tall grass prairie and parkland on a cyclical basis. The Cree and Assiniboine became provisioners of pemmican to the fur trade and so exploited the environment on an increased level. The Metis later took over the role of provisioner. They had to travel farther southwest each year to hunt bison. The Metis also farmed part-time. Thus they followed the pursuits of both ancestral groups. The largest concentration of Metis at Red River was at Grantown. Beaudry PHP lies along the eastern edge of this former Metis settlement. Like the early white settlers, the Metis were bound to the water's edge for numerous reasons, including the lack of implements suitable for farming on the prairie.

The flood of white settlers after 1870 quickly altered the tall grass prairie. With improved technology they ploughed under the native grasses and replaced them with cereal crops not native to Manitoba. Since then, farmers have introduced farming practices to produce greater yields but have had to adapt the plants to the climate. Today there are few Manitobans who have seen tall grass prairie in its original state.

Beaudry PHP represents the natural zone of tall grass prairie in the Manitoba parks system, yet it consists primarily of agricultural fields. Thus the park is typical of the 'prairie' as we know it today. However, Beaudry PHP contains some small remnants of native tall grass prairie. The land under agricultural production is scheduled for prairie restoration during the next few years.

Restoration of tall grass prairie at Beaudry PHP requires a local seed source so that plants are suited to the photoperiod and other environmental conditions of the site. The first plots are being prepared by planting barley or oats for weed control. Prairie plants spend more energy developing a root system than foliage, so that the plant will have adequate moisture. As there is little foliage at first, weedy annual species are able to establish on the relatively exposed surface soil of the restoration site. Controlling the weeds by mowing and later by burning increases the competitive edge that native species have over weed species.

Burning must occur every few years to mimic natural conditions so that the prairie remains healthy. Regular burning also removes accumulated standing litter which can be a fire hazard.

Few extensive remnant tall grass prairies remain in Manitoba. Manitoba Parks Branch is restoring tall grass prairie at Beaudry PHP to provide the public with opportunities to enjoy and understand the cultural and natural history of this zone. As well, prairie restoration allows for the protection of representative components of the tall grass prairie.

7.8 MESSAGE ANALYSIS

The interpretive themes and messages determined in sections 1.3-1.5 are examined below. They are discussed in terms of the following criteria:

- Importance during the restoration period.
- Relative importance for interpretive programming.
- Relation to post-restoration period.
- Relation to other themes.
- Purpose of message.
- Interpretation possibilities.
- Appropriate audience.

THEME: 1) PURPOSES OF TALL GRASS PRAIRIE RESTORATION

Each of the purposes mentioned are vital messages in terms of why the park was developed, why prairie is being

restored and what the overall essence of the park is. These messages will be relevant during and after the restoration period and will be equally important in both periods. These are not major interpretive messages in terms of programming. As this theme is interconnected with all the other themes, its interpretation is a part of the interpretation of the others.

a) Beaudry PHP represents the zone of tall grass prairie in the Manitoba parks system.

   i) A systems plan was developed for Manitoba's provincial parks as a management guide. Beaudry PHP has been designated as representative of the tall grass prairie natural region in the system.

   ii) Diagram of the 'Balanced Park System'. General audience.

b) Prairie restoration at Beaudry PHP allows for reestablishment and subsequent protection of representative natural features of the tall grass prairie region.

   i) Parks Branch's mandate includes the preservation of natural resources.

   ii) Maps (locations of other remnants and prairie animals). General audience.

c) Restoration of tall grass prairie at Beaudry PHP will provide opportunities for the interpretation of the natural history of tall grass prairie.

   i) Parks Branch's mandate includes the provision of interpretive facilities and programs.

   ii) Map (location of other remnants with their interpretive facilities). General audience.

d) Beaudry PHP will provide opportunities for the public to enjoy the natural and cultural history of the tall grass prairie in Manitoba.

   i) Parks Branch's mandate includes the provision of high quality recreational opportunities and interpretive facilities and programs. If the public is given a well developed program at Beaudry PHP they will leave the park satisfied. Thus, this message is the essence of the entire park. General audience.

THEME: 2) PROCESSES OF PRAIRIE RESTORATION

This is the primary theme during the restoration period, in conjunction with the purposes of tall grass prairie restoration. It is thus the most important theme for programming during the early years of restoration along with the ecology of tall grass prairie. As the restoration project proceeds, this theme will become less important as other themes are developed. In the post-restoration period this theme will still be important but will receive less focus in programming. Messages 2e and f are exceptions as they will become more important as the restoration project develops and will continue to be important in the post-restoration period. The processes of prairie restoration are directly linked to the ecology of aspen parkland (Theme 3) and tall grass prairie plants (Theme 4). Interpretation of these themes will be interconnected. The processes of restoration are also related to the theme of homesteaders (Theme 9) as the technology used in restoration is similar to that of farming.

a) Local seed sources for tall grass prairie restoration are necessary for optimum results.

   i) Not all individuals of a species can grow and reproduce under the same conditions. Species are affected by local conditions and over the years, different ecological races, variants or types have arisen. Of particular importance in affecting ability to produce seed are latitude or altitude.

   ii) Display and/or diorama (different prairie environments), slides, seed collection outings. outings. General audience, volunteer group.

b) The most important factor of seedbed preparation is weed control.

   i) Working the ground several times before seeding will reduce weeds. Control of weeds is important so that the native species can get a good start.

   ii) Plots, diorama, slides. General audience, especially urbanites.

c) Different methods of planting yield different results.

   i) Broadcasting seed gives a more natural appearance than does a seed drill. Some species can only be transplanted while others can only be grown from seed.

ii) Plots, slides. General audience, especially urbanites.

d) The purpose of prairie management is to increase the competitive advantage which native prairie species have over weed species.

i) Weed species are able to colonize the restoration plots before the native plants are dense enough to crowd them out. Mowing, burning and hand weeding removes competitive weed species.

ii) Plots (before and after), slides. Spring burns can be observed by small groups. Mowing and handweeding can be undertaken by volunteers or in a special program. General audience, volunteer group.

e) Burning selects for tall grass prairie species and against woody and weed species.

i) Tall grass prairie plants have extensive root systems and reproduce vegetatively so they can tolerate fires. Weed species are mostly annuals that reproduce by seed. Many shrub and tree species have shallow root systems so they are not tolerant of repeated burnings.

ii) Plots (pre and post burn), slides, diorama, observation of burns. General audience.

f) Regular burning must continue every few years after tall grass prairie is established to maintain the health and vigour of the prairie.

i) Woody species invade prairie if there are no fires. Burning removes the accumulated litter so that tall grass prairie plants receive more sunlight, moisture and nutrients released in burning. The result is a more healthy prairie.

ii) Plots (pre and post burn), slides, observation of burns. General audience.

g) There is a gradual change in species composition and relative abundance over time as more and more species are established.

i) As prairie species become established they crowd out weedy species. Certain prairie species are more vigourous and will become dominant as they establish.

ii) Plots (different stages), slides.

THEME: 3) ECOLOGY OF ASPEN PARKLAND

The prairie of Beaudry PHP is part of the aspen parkland. Thus the ecology of aspen parkland is an important theme for both the restoration and post-restoration periods. The forests of Beaudry PHP will remain a primary attraction, especially during the restoration period. Programming for the parkland during the restoration period should occur in order to keep attracting people to the park and, by relating the prairie to the forest, interest for the restoration project will increase. This theme directly relates to the themes of ecology of prairie plants and animals (Themes 4&5) and the activities of prehistoric peoples, natives, Metis and early homesteaders (Themes 6-9). The relationship of the aspen parkland and tall grass prairie ties this theme to the purposes and processes of restoration (Themes 1&2). Interpretation of this theme overlaps with other themes, but it can be interpreted separately as well.

a) Aspen parkland consists of a mosaic of grassland and groves of deciduous trees.

   i) Beaudry PHP consists of groves of deciduous trees and former tall grass prairie land. Trails currently exist through some of the aspen parkland. These should be extended into the restoration plots.

   ii) Trails, slides, diorama. General audience, winter and summer.

b) Prairie is replaced by forest under certain conditions.

   i) Fire inhibits the growth of trees as did the grazing by large prairie animals. When these factors are removed tree growth is encouraged and tall grass prairie plant growth is subsequently discouraged.

   ii) Plots (pre and post burn), diagrams, diorama, slides, observation of burns. General audience.

THEME: 4). ECOLOGY OF TALL GRASS PRAIRIE PLANTS

This theme is directly linked to the processes and purposes of restoration (Themes 1&2) as it explains many of them. It is thus an important theme for the restoration period. It will remain so in the post-restoration period as it is one of the main purposes for creating the park. The presence of remnants provides opportunities for interpretive programming along with the restoration plots. During the restoration period, programming of this theme will be as important as the processes of restoration (Theme 2). The ecology of tall grass prairie plants relates to every other theme so that interpretation of these themes will overlap.

a) Tall grass prairie is distinct because of species composition and plant height.

   i) The dominant plant species of tall grass prairie is big bluestem which can grow to a height of 2 m. While tall grass prairie contains species typical of other prairie types, there are many species unique to the prairie.

   ii) Trails, diagrams, slides, diorama. General audience.

b) Upon germination, prairie plants spend more energy developing roots than foliage.

   i) When grown from seed, many prairie plants spend more time developing a root system than foliage as it is important that they reach an adequate moisture supply. During the first few years of life the plant has little above ground mass and can be crowded out by annuals.

   ii) Diagrams of roots at different stages of growth, slides, diorama of foliage. General audience.

c) Once tall grass prairie is established, most plants propagate primarily by vegetative structures.

   i) Tall grass prairie plants develop rhizomes for reproduction. Though some seeds are produced, the possibility of reaching the soil through the soil layer and then obtaining the proper conditions of sunlight and moisture for germination,and growing a root system in the dense sod to establish the seedling is minimal.

   ii) Diagrams of root systems, diorama. General audience.

d) The root systems of tall grass plants provide tolerance to fire and allow plants to survive in times of drought.

i) Tall grass prairie plants largely are perennial and can produce foliage after a fire. The extensive root system allows the plant to utilize moisture deep in the soil.

ii) Diagram of root systems, diorama. General audience.

e) Fire enhances prairie species and discourages woody species.

i) Fire removes the litter layer, turning it into ash to fertilize the soil. When the foliage grows afterwards it is exposed to more sunlight and moisture and a healthier prairie is produced. Woody species have shallow roots. Repeated burnings will damage roots so that even species that reproduce by suckering are damaged.

ii) Plots, pre and post burning. Diorama, diagrams, slides. General audience.

THEME: 5) ECOLOGY OF TALL GRASS PRAIRIE ANIMALS

The large tall grass prairie animals cannot be reintroduced to Beaudry PHP but their effects on the plant ecology can be discussed in both the restoration and post-restoration periods. In the post-restoration period the ecology of tall grass prairie animals in relation to cultural history will become more important. The smaller animals of the tall grass prairie will probably move on to the restoration sites. As they are important to the prairie plant ecology, they should be included in programming. Animals are more difficult to observe than plants, but opportunities to do so should be developed. Tall grass prairie animals were utilized for food, clothing and shelter by various cultures that occupied the prairie. This theme relates to all of the others and should be interpreted in conjunction with them.

a) Prairie animals are integral to the ecology of prairie plants.

i) Tall grass prairie animals affect plant ecology on a local basis. The most influential animal was the bison by virtue of its size and numbers. It affected plants through trampling, eating, rubbing and wallowing. The presence of this animal retarded the invasion of trees. Other prairie animals large and small were also af-

fected. The destruction of many animal species and populations also affected the ecology of the plants. Numerous small tall grass prairie animals are present at Beaudry PHP. With restoration the local populations will increase.

ii) Observations, diagrams, diorama of animal community. General audience.

THEME: 6) PREHISTORIC PEOPLES

The theme of prehistoric peoples is important during the restoration period as we want to restore the prairie to how it was when they occupied it. In the post-restoration period this theme will have increased importance. In terms of programming it is not a major theme but it is essential and has many possibilities. This theme is the beginning point of the relationships of cultural history with natural history. It relates to the ecology of tall grass plants, animals and aspen parkland (Themes 3-5).

a) Prehistoric peoples of the tall grass prairie depended on the natural cycles.

i) Prehistoric peoples had limited technology so they could affect only the local environment. Like the other large tall grass animals they were migratory, moving to where resources were plentiful. Resources were available on a cyclical basis so they had to know what was available when.

ii) Diagrams, diorama, slides. General audience.

THEME: 7) NATIVES POST-CONTACT

This theme is the next step in the exploitation of the tall grass prairie and parkland resources. During the restoration period it provides a link in the cultural impact on the tall grass prairie. It will become more important in the post-restoration period. In terms of programming, it is not a major theme but does provide continuity. It relates directly to the other cultural themes (Themes 6-9). This cultural group understood the ecology of their environment thus relating this theme to the ecological themes (Themes 3-5).

a) Cree and Assiniboine cultures used resources of the tall grass prairie prairie and aspen parkland on a cyclical basis but exploited the resources on an increasing level.

i) After contact the native peoples continued to use the resources of tall grass prairie and aspen parkland on a cyclical basis. They supplied the fur trade first with furs and later with pemmican thereby increasing their impact upon the land.

ii) Diagrams, diorama of hunting and gathering activities. General audience.

THEME: 8) METIS OF GRANTOWN: CULTURE IN TRANSITION

This theme represents the next step in the cultural history of the tall grass prairie. It is relevant to the restoration period as it represents the period of first settlement on the prairie, the breaking of the land and the demise of the bison. During the restoration period this theme serves mainly as a link in the explanation of what happened to the tall grass prairie. As this period ends, greater emphasis should be put on this theme as it is the most important cultural theme of the park and it will have more significance in the post-restoration period. The cultural history of Metis relates to the other cultural groups (Themes 6-8). It is an important stage between native and European cultures. It relates to the ecological themes (Themes 3-5) as the Metis also depended upon the natural resources of the land for subsistence. In terms of programming this theme offers many opportunities but they must be related to the ecological themes in order to be relevant during the restoration period.

a) Metis hunted buffalo to supply fur trade and settlement.

i) The Metis continued the exploitation of the bison to supply the fur trade. The bison hunt also provided an important food source to the Red River Settlement as agriculture was not very productive before 1870. Each year the Metis had to travel farther southwest to find the bison herds.

ii) Diagrams, prints of paintings, diorama of buffalo hunt. Living history. General audience.

b) Metis at Grantown were part-time river lot farmers.

i) Grantown was the largest of two settlements of Metis in the Red River Settlement. Between bison hunts the people of Grantown farmed small plots to provide themselves with food. Thus they were a partly settled people. Farming was bound to the river. They also kept a few farm animals which fed on the native hay.

ii) Maps, diagrams, living history. General audience, especially urbanites and local people.

c) Many Metis dispersed from Grantown after 1870.

i) The way of life of the Metis was altered with the threat of white settlement after 1870. The old way of life could only be maintained by going west to unsettled lands.

ii) Diagrams, prints of paintings. General audience, especially urbanites and locals.

THEME: 9) HOMESTEADERS

This is the final theme of cultural impact upon the tall grass prairie. This group altered the prairie sod more than any other. It is an important theme during the restoration period for that reason. This theme thus receives more emphasis during the restoration period than other cultural themes and will decline in importance (but not emphasis) in the post-restoration period. Thus it is an important theme in terms of programming but does not offer many possibilities for the restoration period. The theme of homesteaders relates to the other cultural themes (Themes 6-8). It also relates to the processes of prairie restoration (Theme 2) as the technology used in restoration is similar to that used in farming. It relates to the ecological themes (Themes 3-5) only in terms of fire prevention and the complete alteration of the landscape.

a) Early farming was bound to the river.

i) The need for water, trees, transportation and neighbours initially drew settlers to the fertile river banks. Vegetables and some grain was grown on these small farms. Native hay behind the river lots was used for farm animals. It was believed that the prairie was infertile and the technology did not exist to cultivate the dense sod.

ii) Maps of settlement, diagrams, slides, living history. General audience, especially urbanites.

b) The influx of settlers changed the nature of farming.

i) In a few years the prairie was determined to be fertile, surveys for homesteads were begun and white settlers flooded in from Ontario and the British Isles. The steel plough was brought to Manitoba and the native prairie was ploughed under in order that wheat could be produced.

ii) Statistics of new immigrants, diagrams, maps, slides, living history. General audience, especially urbanites.

c) Improved technology rapidly destroyed the native tall grass prairie.

i) More advanced tools meant that more land could be cultivated. This, together with improved strains of grain, produced higher yields. As the soil quality dwindled, chemical fertilizers were used to replenish the soil. Today more land is still being ploughed under as farmers face increasing costs.

ii) Statistics of land cultivated , diagrams, displays, plot comparisons, living history. General audience, especially urbanites.

7.9 INTERPRETIVE MEDIA

The interpretive media chosen for this plan resulted from the message analysis. The simplest medium is a trail system, the most elaborate are a multi-media interpretive centre and living history sites. As prairie restoration progresses the interpretive opportunities will increase, and more elaborate media can be used. The media described below can each be as simple, or as advanced, as necessary, thereby providing alternatives for development, the level of which will be dictated by funding and visitation rates.

1. TRAILS:

Many of the messages can be interpreted on site with trails. During the restoration period, the actual processes of restoration can be exemplified in the plots. Thus the trail brochures will not have to have diagrams of the processes. Trails signs and brochures can diagramatically illustrate messages that can later be represented in the Interpretation Centre by dioramas and displays. In the early years, a single trail will encompass all the sections de-

scribed below. Later, when more land is restored to prairie, the trail system will be more complex. Trails must be designed so as to damage as little of the natural and restored habitat as possible. The trails will also serve as fireguards for management burning. Trails can be either numbered posts with brochures or, signs on post. Both types have their merits. It is suggested that the first trail systems have numbered posts and brochures as these are less expensive and thus can be changed more easily. Posts with text are recommended for later years as these are more attractive, more likely to be read, and visitors can use a number of trail systems without needing a number of brochures. For the first trails systems, posts must be removable.

a) TALL GRASS PRAIRIE RESTORATION TRAIL: During the early years of restoration guided walks are necessary to protect the plots. Once the plots become established the trails can become self-guiding. As more plots are restored, the trails will change course and interpretive messages can be presented with more examples.

   i) MEDIA: Posts with numbers and pamphlets and posts with text.

   ii) APPLICABLE INTERPRETIVE MESSAGES: All but 3a,b.

b) TALL GRASS PRAIRIE REMNANT TRAIL: The remnant prairie serves as an important comparison to restoration plots. During the restoration period it will be the only mature tall grass prairie for visitors to see. The trail will change course as restoration progresses and more restored plots are accessible to and from remnants.

   i) MEDIA: Numbered posts with brochures and/or posts with signs.

   ii) APPLICABLE INTERPRETIVE MESSAGES: All messages except 2b,c,d.

c) ASPEN PARKLAND TRAIL: Trails currently exist through some of the aspen and oak groves in the bottomland forest. The trails should be extended toward the prairie to interpret both components of the parkland. As restoration proceeds, the course of the trails will change to incorporate more interpretive opportunities.

   i) MEDIA: Numbered posts with brochures and/or text with signs.

ii) APPLICABLE INTERPRETIVE MESSAGES: 1 (all), 2e,f. 3a,b. 4e. 6a. 7a. 8a,b. 9a,b,c.

d) AGRICULTURAL FIELDS TRAIL: Prairie restoration techniques are borrowed from modern agriculture. Agricultural fields can be used to demonstrate this, as well as the differences between lands with domestic and native habitats. During the process of restoration the agricultural fields within the park can be used for interpretive purposes. As the purpose of the park is to restore tall grass prairie and the park is surrounded by agricultural fields, there is no need to have modern agriculture within the park in the post-restoration period. An adjacent landowner should be approached for interpretive use of his land (this requires very little land area).

i) MEDIA: Numbered posts with brochures and/or posts with signs.

ii) APPLICABLE INTERPRETIVE MESSAGES: 2b,c. 9c.

2. VISITOR CENTRE:

During the first years of interpretation, park staff will need a place to work and greet visitors. This will only be a temporary facility for the early years of the restoration process. In the later years, the increased number of visitors and advanced interpretive program will warrant the construction of a larger building. A small visitor centre will serve this purpose.

iii) MEDIA: Diagrams and Displays. The centre should provide an introduction to all themes, especially restoration, to the visitors. These media are simple and inexpensive ways of doing this. The media can be used later at other sites in the park.

iv) APPLICABLE INTERPRETIVE MESSAGES: All, especially those under themes 1,2,3 and 4.

3. INTERPRETIVE CENTRE:

The interpretive centre will introduce visitors to the interpretive themes. Certain messages that cannot be fully represented onsite must be told in the Centre. Once visitors are introduced to the park themes, they have the option of touring the entire park or portions of it, but will have an understanding of all the central themes. The Interpretive Centre can be used year-round, even if other interpre-

tive sites in the park are closed or inaccessible. The Centre can serve as a community centre so that local peoples can become closer to and more involved in the park's operations. This community spirit will provide more support and assistance for park. Currently the park is a popular cross-country ski area. This use of the park should continue to be encouraged. The Centre will be an additional attraction to skiers. The display area of the Centre should not be developed entirely at once, as theme representation will change as restoration progresses and other interpretive sites in the park are developed. A small greenhouse would be useful for growing seedlings for interpretation and restoration purposes.

a) DISPLAY AREA: Messages that cannot be interpreted on site can be done effectively if the actual item or a copy of it are displayed in the Centre (e.g. soil profiles, Oxbow encampment).

   i) MEDIA: DIORAMAS. Can be life size or miniature (e.g. Metis buffalo hunt).

   ii) APPLICABLE INTERPRETIVE MESSAGES: 2a,d,e. 3a,b. 4a,c,d,e. 5a. 6a. 7a. 8a,b. 9a.

   iii) MEDIA: DIAGRAMS, CHARTS. Diagrams can be used to introduce themes, used where pictures are not appropriate or available (e.g. older cultures), or used to explain concepts (e.g. 'Balanced Park System'). Charts for statistics are useful to demonstrate trends (e.g. homesteads taken).

   iv) APPLICABLE INTERPRETIVE MESSAGES: 1a,b,c,d. 3b. 4 (all). 5a. 6a. 7a. 8a,b,c. 9a,b,c.

   v) MEDIA:DISPLAYS. Artifacts that must be stored under controlled conditions and/or are not suitable at other sites in the parks should be displayed in the Centre (e.g. Oxbow dig artifacts). In winter, artifacts from other park sites could be moved to the Centre for display (e.g. early farming tools).

b) THEATRE: Slide shows should be developed for each theme for record keeping, use in winter and evening programs, and demonstrating activities and processes that cannot be shown on site (e.g. in later years - restoration processes).

   i) MEDIA: Slide shows.

ii) APPLICABLE INTERPRETIVE MESSAGES: All messages.

c) GREENHOUSE: In later years the greenhouse can be used to demonstrate the lifecycles of prairie plants and to grow species from different locations and prairie types. It will provide living green plants for winter programs, and plants for demonstrations year-round.

i) MEDIA: Growing trays, pots.

ii) APPLICABLE INTERPRETIVE MESSAGES: 2a,b,c. 4a,b,c,d.

4. HOMESTEADER'S TOOL SHED:

Time period represented 1908-1912, the Great Wheat Boom. As farming destroyed the native tall grass prairie sod, it is appropriate to demonstrate farming activities. Tools were stored in the tool shed so this can be used as the site of homestead activity.

iii) MEDIA: ANIMATOR. Living history can be used to interpret the work activities of farmers and the technology they had available.

iv) APPLICABLE INTERPRETIVE MESSAGES: 9a,b,c.

v) MEDIA: ARTIFACTS. The shed will house farming implements from different points in history since the arrival of homesteaders'.

vi) MEDIA: DISPLAYS. Tools that are too delicate, or older than the period being interpreted can be displayed in the shed.

vii) APPLICABLE INTERPRETIVE MESSAGES: 9a,b,c.

5. METIS HOUSE:

Time period represented: 1820's - 1870's The Metis history is the most significant cultural theme at Beaudry PHP. Much of the history is not applicable to the restoration period. As restoration progresses, the Metis culture will have greater focus. A Metis house will provide on site interpretation for themes during both periods. As the park lies along the border of the historic Metis community of Grantown it is historically and interpretively significant to replicate Cuthbert Grant's home.

viii) MEDIA: ANIMATOR Living history can be used to interpret the land use activities of the Metis.

ix) APPLICABLE INTERPRETIVE MESSAGES: 8a,b,c.

7.10 PERSON YEARS

Interpreters are vital to an effective interpretive program. Personal contact enables the visitor to understand more about the site's features. The interpretive program is also more flexible if staff are present. Interpretive staff will be needed for the third summer after the first plot is seeded (year 4). For the next 3 years (years 4-6), interpretive staff will work during the summer only. Full-time staff will be necessary in the seventh year after restoration begins when the Interpretive Centre opens. Volunteers can be used during summers before the Centre opens. For the first or second summers interpretive staff are working, it is not advisable to have volunteers for interpretation. Until the interpretive program develops somewhat, organization of volunteers may not be efficient. During years 5 and 6 volunteers can be incorporated into the summer interpretive program although few volunteers will likely be available during the summer months because of vacations. Other volunteer opportunities will be available from the onset of the restoration program. These include spring burning of prairie remnants and restoration plots, collecting seed, mowing plots, planting, and compiling a slide collection.

Once the Interpretive Centre is opened, staff can be hired for year-round interpretation. On site secretarial

staff will be necessary but janitorial staff need not be a full-time position. The minimum numbers of staff necessary are listed below. All interpretive staff must be knowledgeable in ecology, botany, history and interpretation. Animators may be more specialized. Volunteers must also be knowledgeable in subjects relevant to the park but not necessarily as much as the staff. Funding from a cooperative association to hire staff should be encouraged where possible. The chief naturalist/historian would best be a Parks Branch employee to maintain authority and direction of Beaudry PHP within the existing government policy. Figure 15 illustrates the personnel required during the restoration period.

SUMMER INTERPRETIVE STAFF - (Years 4-6).

- 3 positions - 1 supervisory

VOLUNTEERS - (Year 5 onward)

- As many as can be coordinated.

- 2 positions

PERMANENT STAFF - (Year 7 onward)

- 1 Chief Naturalist/Historian -experienced in administration and volunteer coordination
- 1/2 time interpreter -also experienced in volunteer coordination

- 1 Secretary/Receptionist
- 1/2 time Janitor

SUMMER ANIMATORS - (Year 9 onward)

- Year 9 - 1 position
- Year 10 onward - 3 positions

Year	1	2	3	4	5	6	7	8	9	10	11
Summer Interpreters				3	3	3	2	2	2	2	2
Summer Animators									1	3	3
Volunteers - Summer					X	X					
- Year-round							X	X	X	X	X
Full-time Interpreters							1.5	1.5	1.5	1.5	1.5

Figure 15: Person Years

7.11 IMPLEMENTATION STRATEGY

The strategy for implementing interpretive facilities outlined below can be as flexible as necessary. The progression of restoration will determine when interpretation can begin and how it will develop. For interpretation purposes it is necessary to have a few plots seeded in successive years. Figure 16 illustrates the implementation strategy. Figure 17 shows the location of interpretive sites during the restoration period.

YEAR 1

Restoration begins, first plot (D-2) is seeded. Remnants should be burned, if weather permits, to improve the health of the prairie.

YEAR 2

Second plot (D-3) will be seeded. First plot will be mowed as needed for weed control. Remnants should be burned again if possible. A sign along provincial road 241 explaining that restoration by Parks Branch has begun should be put up to spark public interest.

YEAR 3

Both plots will be mowed as needed. The third plot will be seeded this spring (part of plot A). The remnant should be burned if it was not done in the two previous years. After Year 3 the remnants should be burned every 3 to 5 years. The first trail system should be developed so that interpretation will begin the next summer. It will include the restoration plots, tall grass prairie remnants, aspen parkland and agricultural fields. The trail must be laid out to provide a route for interpretation so that the restoration plots are not damaged by visitors.

YEAR 4

With three restoration plots in progress, interpretation of park themes can be started this summer. The trail and visitor centre must be in place to facilitate interpretation. New Beaudry PHP signs along provincial road 241 and the Trans Canada Highway will inform people about the park

and attract visitors. Summer staff can assist in design of the second trail system by determining stops and text for the brochures. The remainder of restoration plot A will be seeded.

YEAR 5

Restoration continues with the seeding of half of plot B. Summer interpretation continues with guided walks and special programs. Volunteers can be incorporated into the interpretive program. The second trail system should be finished by spring. It will be the same trail as the first but will be self-guiding with numbered posts and brochures with text and diagrams. The posts must be removable so that the trail can be expanded in later years. Planning and design of the Interpretive Centre must begin this year. Input from summer staff and other interpreters for the Centre is required so that it is a practical and efficient workplace. The Interpretive Centre could be delayed one year if visitation is not high enough. It should not be built any earlier than Year 5 as it will attract visitors who may be disappointed by the lack of restored prairie.

YEAR 6

The reminder of plot B will be seeded. Summer interpretation continues with guided walks and special programs. Construction of the Interpretive Centre should begin this year. Summer staff can assist with the design of media for the Centre.

YEAR 7

The Interpretive Centre opens and with it year-round interpretive services will be provided. Full-time staff will be hired to operate the interpretive program. The second trail system should be extended to incorporate more of the restored prairie. The second trail system will blend into the third trail system which will consist of a number of trails. On site staff will design the extension and the text for the third trail system. One-half of plot C is to be seeded.

YEAR 8

The third trail system will be completed. It will consist of a number of trails, one of which will have permanent signage (for the first restored plots and the remnants). The others will have numbered posts and brochures. The trail will run by the future location of the homesteader's tool shed. The remaining half of plot C should be seeded.

YEAR 9

The Homesteader's tool shed will be completed for the summer and the living history program will begin. Phasing in post-restoration interpretive messages should begin this year. Extension of trails past the future location of the Metis house will be done this summer. The final plot (D) will be seeded this year.

YEAR 10

Metis house and farm yard will be operational this summer with onsite animators.

YEAR 11

Post-restoration interpretive themes predominant now. The final trail system should be completed this summer. It will consist entirely of signs with text and diagrams.

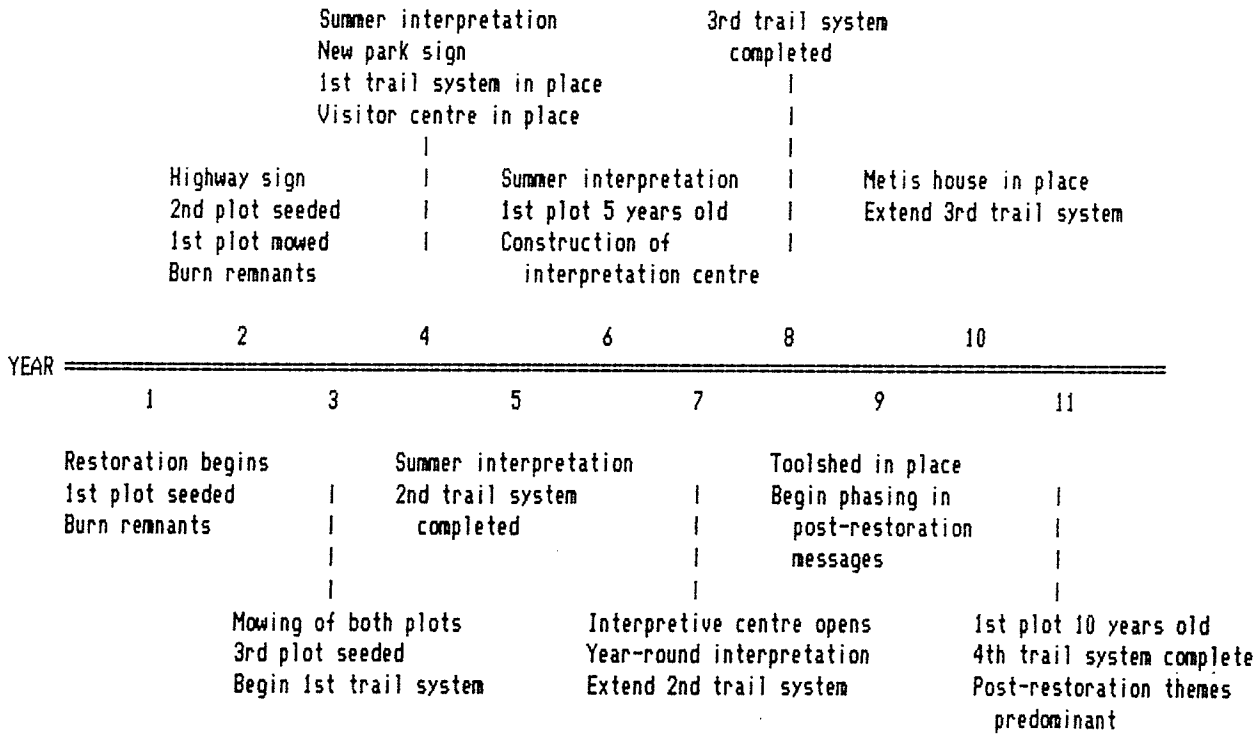

Figure 16: Implementation Strategy

Figure 17: Location of Interpretive Sites During Restoration Period

7.12 RESEARCH

Further biological and historical information of the region needs to be researched to provide further interpretive opportunities:

- Prairie restoration activities should be thoroughly documented to facilitate restoration practices in the future. This information will be useful for on and offsite research and restoration projects.
- Soil research should be conducted to provide evidence for changes in soil structure and chemistry from restoration of native species. Biological inventories of prairie plant and animal species should be conducted on the remnants to provide information on species composition. This in turn will assist with restoration.
- Further research in the ecology of aspen parkland and tall grass prairie plants and animals will provide site specific information for interpretation.
- Land titles for the park and adjacent lands can be traced to provided more information about local homesteaders and farming practices.

Related agencies should be encouraged to conduct research in the park.

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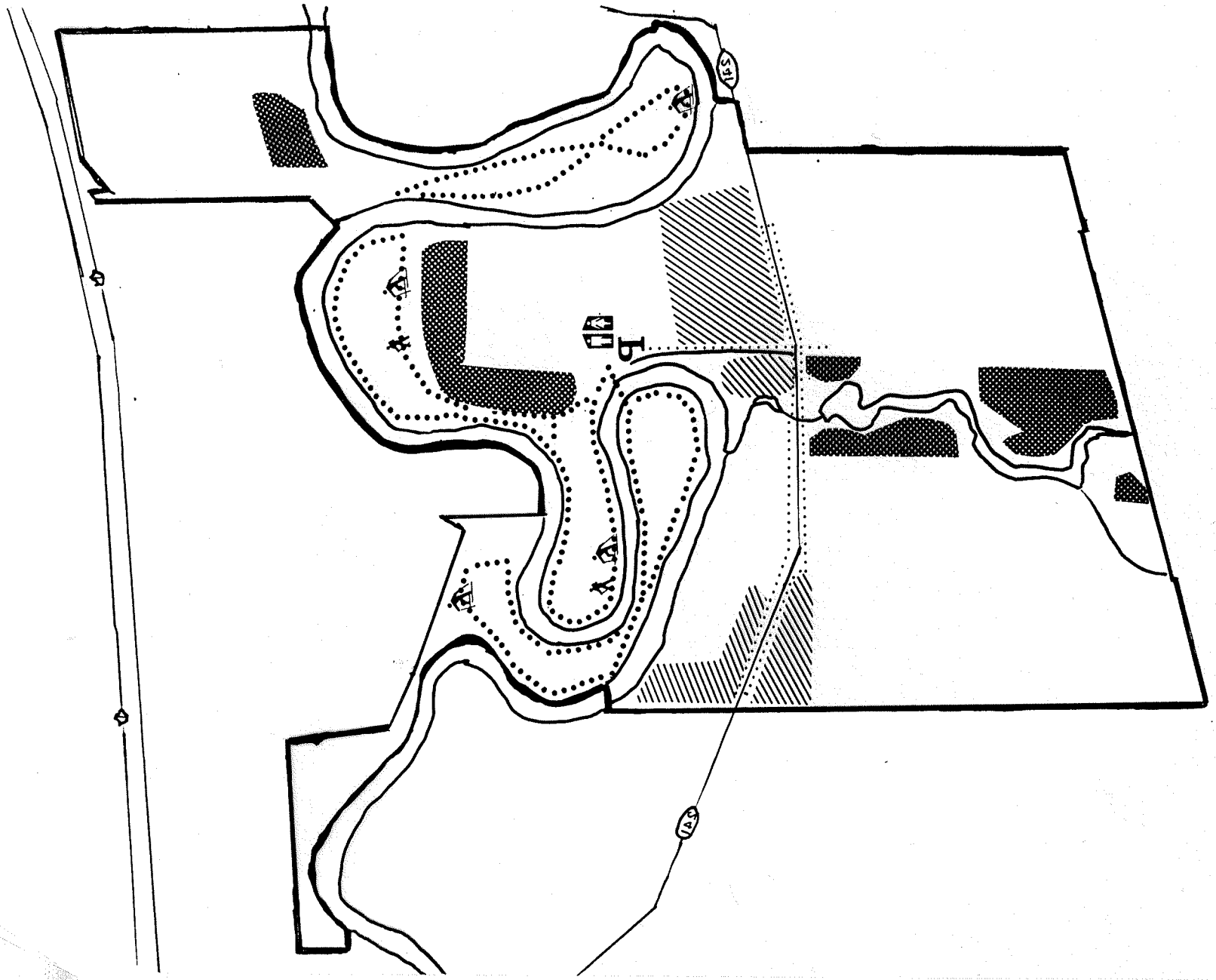
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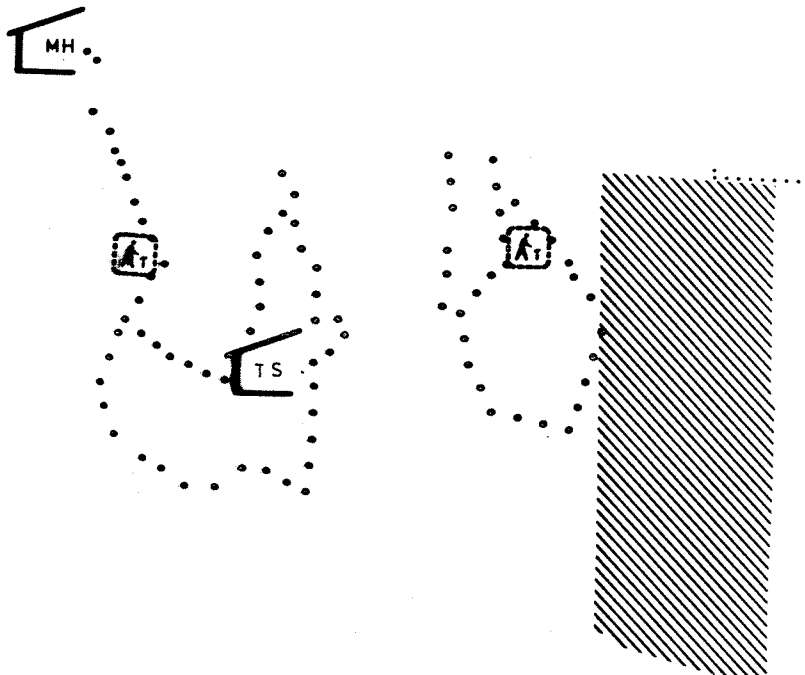
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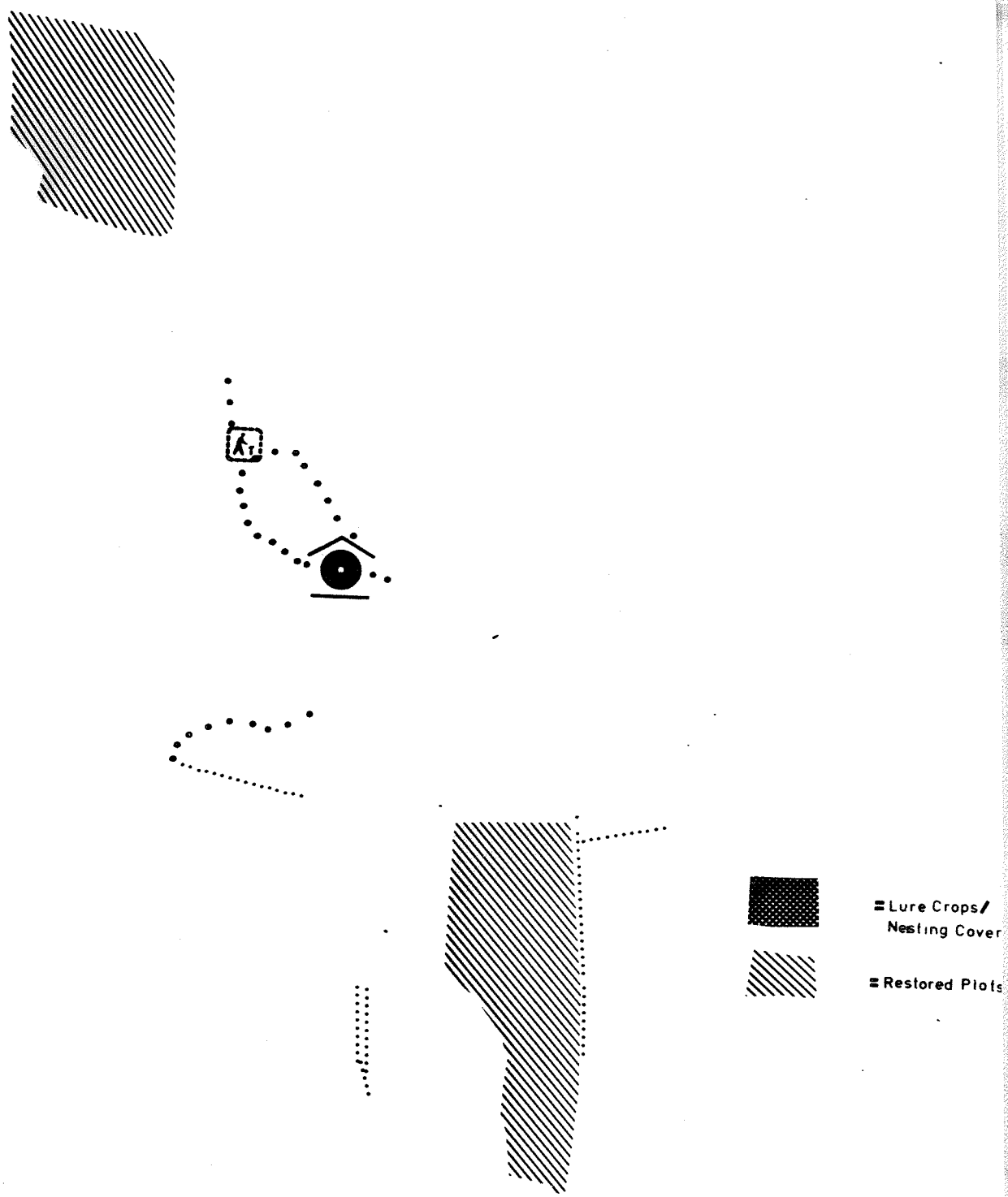
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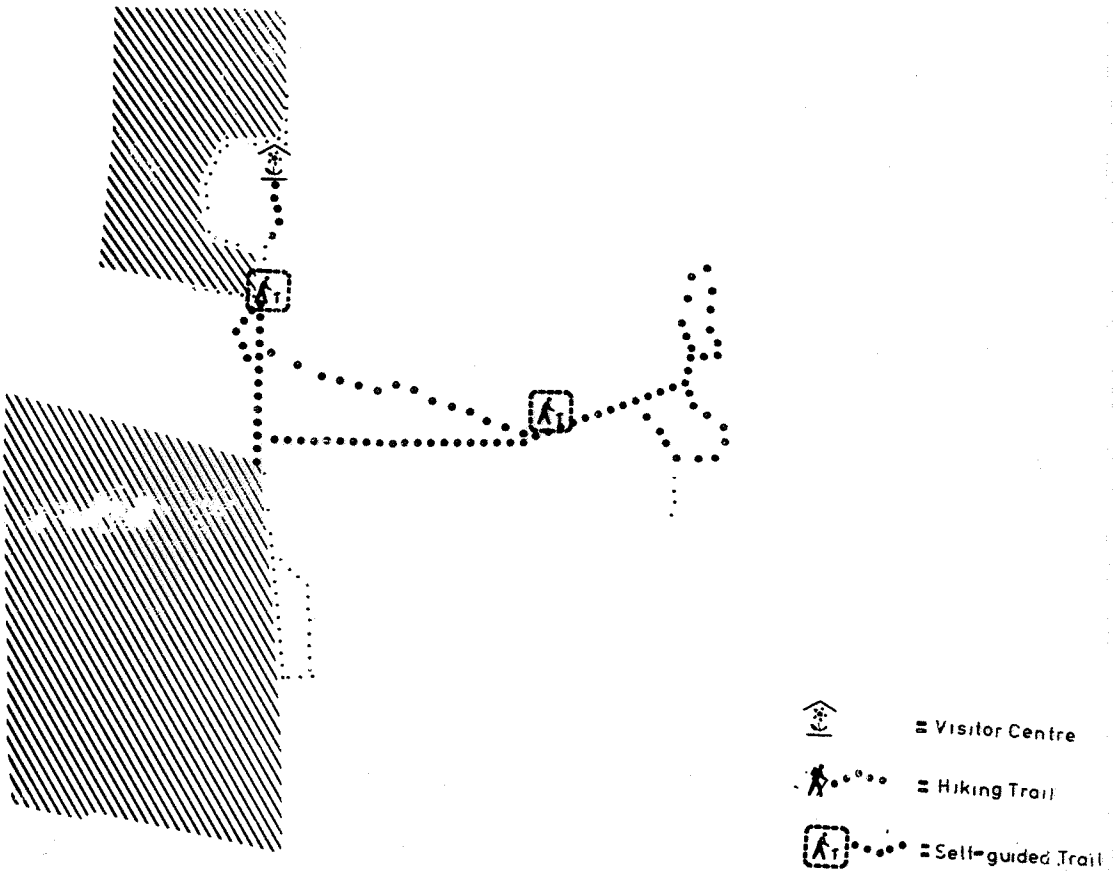

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