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University of Alberta

Woodland Cree Traditional Environmental Knowledge of Critical Ungulate Habitat in the Caribou Mountains of Alberta

by

Tanja Schramm 

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Doctor of Philosophy

Department of Renewable Resources

Edmonton, Alberta
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Dedication

To the people of the Little Red River Cree Nation.

To my parents,
Harro & Winnie Schramm
And in memory of my grandparents,
Adolf & Pauline Schramm and
Folke & Meta Olsson
Who, through their stories,
taught me the value of my own heritage.

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Abstract

This study documents traditional environmental knowledge (TEK) of critical ungulate habitat for the Caribou Mountains region in northern Alberta. Woodland Cree TEK experts from the Little Red River Cree Nation contributed knowledge of seasonal patterns of habitat use, and local distribution and movement of moose (*Alces alces andersoni*), woodland caribou (*Rangifer tarandus caribou*) and wood bison (*Bison bison athabascae*) on their traditional lands. The study further examines TEK in relation to existing regional natural resource conflicts and the effects of human and natural disturbances on wildlife and the boreal forest environment.

As a study which acknowledges TEK as a knowledge system in its own right, the field methodology was developed with Little Red River Cree representatives and TEK experts at all stages. Interviews and map overlays were analyzed with the help of QSR*NUDIST and ArcView.

Results include the observation that woodland caribou leave the Caribou Mountain plateau from late winter to early spring to stay in the white spruce zone along the southern rim of the Caribou Mountains to feed on arboreal lichen. This calls for the protection of the last remaining old-growth white spruce zone as critical caribou spring habitat. The accounts of a single encounter of a very large caribou herd in the Caribou Mountains and the past existence of large caribou near the Birch Mountains inspire a variety of new research questions. Participants described behavioural, morphological and habitat selection differences between three local bison herds (two of which are located outside the National Park). The Wentzel Lake bison herd was classified as a wood bison herd whereas bison from the Mikkwa herd

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were described as plains bison. Of all three herds the Mikkwa herd is the furthest away from the plains bison release site in Wood Buffalo National Park, which raises questions about its origin and challenges some of the assumptions in the political debate about bison eradication. The results for the moose component show that different knowledge systems (TEK and science) are able to independently reach similar conclusions. Finally, a list of recommendations for management considerations and future research is provided.

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I would like to thank my co-supervisors Dr. Naomi Krogman and Dr. Robert Hudson for their excellent supervision, great support, and kind encouragement. As a sociologist, Naomi provided important advice on the sociological components of this work and was central in helping me to stay focused. As a wildlife expert, Bob provided important advice on wildlife topics and ecological issues, and never failed to motivate me through his enthusiasm for my project.

I owe many thanks to my committee members. Anthropologist Dr. Milton Freeman was on my supervisory committee from the beginning and, through his expertise, influenced my approach to this study in many ways. Anthropologist Dr. Andie Palmer and Zoologist Dr. Roderick Riewe joined the committee as external members. I very much appreciate their support.

I would like to thank the Little Red River Cree Nation for inviting me to conduct my fieldwork in their communities. Special thanks to Chief Johnsen Sewepagaham for his support at all stages of this research. The support of Jim Webb, Vern Neil, Tim Gautier, and Ron Leframbois was of major importance to this project. I would like to remember the late band\manager Richard Dumaine for his fast and unbureaucratic help whenever I needed it. Little Red River as host Nation not only allowed me to use band charters for much needed transportation but also covered my accommodation.

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The creation of the maps involved the expertise of many people. Timberline Forest Inventory Consultants provided the digital base maps and granted me access to their facilities for digitization of my field data. Ramona Sewepagaham assisted in the digitization, which I greatly appreciate. Special thanks to Guido Langen, Mark Cooney, Brian Morrison, and Chris Hempel, who provided their expertise whenever an emergency required help. The final analysis and creation of the maps was done in the University of Alberta Spatial Analysis Systems laboratory. Rick Pelletier from the Department of Renewable Resources provided valuable information and solutions that helped to make the analysis much more efficient.

I gratefully acknowledge the Sustainable Forest Management Network (SFMN) for providing the funding for this project. SFMN Aboriginal co-ordinator Marc Stevenson provided valuable advice and much support especially during the early stages of this project; I am very thankful for that.

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Maria Orcherton, Ravind Prassad, Dr. Shelley Pruss, Lynn Safroniuk, Oliver Riebl, Dr. Barabara Sander & Dr. Matthias Grube (and family), Elders Sam & Shirley Shirt, Victoria Sim (Lubcke), Silvia & Michael Sommer (and family), Dr. Stella Spak & Nickolas Wolsworth, Annette & Camron Suominen (and family), Alex Susan & Cindy van Wyck (and family), Leslie Treseder, John Walker, and Jeji Vargese. My apologies to anyone who I might have forgotten to mention.

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WOODLAND CREE TRADITIONAL ENVIRONMENTAL KNOWLEDGE OF CRITICAL UNGULATE HABITAT IN THE CARIBOU MOUNTAINS OF ALBERTA

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1 INTRODUCTION

This study documents traditional environmental knowledge (TEK) of critical ungulate habitat for the Caribou Mountains region in northern Alberta. Woodland Cree TEK experts[1] from the Little Red River Cree Nation and Tallcree First Nation[2] contributed knowledge of seasonal patterns of habitat use and local distribution and movement of moose (*Alces alces andersoni*), woodland caribou (*Rangifer tarandus caribou*) and wood bison (*Bison bison athabascae*) on their traditional lands. The study further examines TEK in relation to threats to existing regional natural resources as understood by TEK experts. Participants also described effects of human and natural disturbances on wildlife and the boreal forest environment. It concludes with a variety of management and research recommendations.

The south-eastern escarpment of the Caribou Mountains in northern Alberta is currently slated for oil/gas exploration, mineral exploration, and logging. Apart from seismic lines and some logging activities, this area is relatively undisturbed and contains critical habitat for local populations of moose, caribou, and bison. In historic times, all three species were of importance in the subsistence economy of the Little Red River Cree Nation. Recent declines in numbers of caribou and bison lead to the decision of the Little Red River Cree Nation for a voluntary moratorium on hunting of these species, which is observed by most hunters. Today, moose primarily cover the local subsistence meat demand. An increasing hunting pressure by outsiders and an expanding Aboriginal population contributes to the local fear that the hunting level might soon not be sustainable.[3] In order to secure the future of the local subsistence economy, the Little Red River Cree Nation would therefore like to ensure sustainable populations of all three ungulate species through appropriate environmental management practices.

The last two decades have seen an increased recognition of Native rights over land and natural resources. Land claims in Canada's north (e.g., the Gwich'in land claim), natural resource crises (e.g., the perceived decline of the Beverley-Qamanirjuaq Caribou herd) and industrial

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[1] I.e., local people with a detailed knowledge about the land.
[2] This study was initiated and officially supported by the Little Red River Cree Nation but also includes contributions from two Tallcree elders. Throughout this thesis, references to *Little Red River TEK experts* also include the two Tallcree participants.
[3] Chief Johnsen Sewepagaham stated the problem as follows: "The environment is like a bank account. Currently it is as if there is nothing in the account. We want to continue our traditional lifestyle as long as possible." (Meeting in Fox Lake, March 1999).

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developments such as the James Bay hydroelectric scheme triggered negotiation processes with local aboriginal residents about the integration of their knowledge into natural resource management plans. The integration of this knowledge into the management process has been challenging and is not without criticism. Different scholars have pointed out that many of the TEK studies decontextualize the environmental knowledge from its cultural context for the purpose of integrating it into science to inform science-based decision-making (Nadasdy 1999, Cruikshank 1998[4], Stevenson 1998, 1999). Ultimately, this process can disempower Native people because it does not base decision-making on actual indigenous knowledge but rather on a science-filtered version of it (Nadasdy 1999). TEK, however, can be successfully integrated where Native people share powers in decision-making (e.g. Spak 2001) and where aboriginal management systems are integrated in the management process rather than science-filtered versions of TEK (Stevenson 1998, 1999).

This TEK study, which aims to document a First Nation viewpoint (as much as possible within its given limitations), contributes background information and primary data to provide perspectives for culturally appropriate natural resource planning and management for the Caribou Mountains, with a focus on moose, bison and caribou. Currently, only few documents on ungulate research in the Caribou Mountains exist. The Boreal Caribou Research Program collected radio telemetry data for woodland caribou in the Caribou Mountains (Dzus 2001, McLoughlin 2002). Gates et al. (2001a) completed a report on bison movement and distribution in Northern Alberta, which also includes information on the Caribou Mountains region. University of Toronto M.Sc. student Sarah Derrane[5] studied the effects of logging on caribou and moose population sizes in the region, and Pyc (1998, 1999) documented the importance of moose in the subsistence economy of the Little Red River Cree settlement of Garden River. The traditional knowledge component of the Northern Rivers Basin Study included some information on ungulate traditional knowledge (Bill et al. 1996). With the exception of Derrane's project, all studies focus on a single ungulate species. Prior to the current study, there was no general regional study on critical ungulate habitat and local conflicts over wildlife use and management[6]. A particular concern is that to this point, no scientific research has been conducted on the two local wild bison herds situated outside of Wood Buffalo National Park.

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[4] Chapter 3: "Yukon Arcadia, Oral Tradition, Indigenous Knowledge and the Fragmentation of Meaning, p. 45."

[5] Sarah Derrane, personal communication, May 2002.

[6] Some resource use issues have since been addressed by Hickey et al. (2004).

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Purpose and Research Question

This project was initiated by Little Red River Cree Nation representatives (in partnership with the Sustainable Forest Management Network), who wanted to gain a better understanding of traditional environmental knowledge of critical moose, caribou, and bison habitat on their traditional lands in order to implement management strategies that ensure viable populations of all three ungulate species in the future.

The resulting research questions were:

- What kind of knowledge on ungulates in the Caribou Mountains region do Little Red River Cree TEK experts hold?
- How can this knowledge be translated into a format useful for First Nation planners and managers with minimal decontextualization?

Research objectives were to:

- Document TEK on ungulates and their critical habitat.
- Translate the TEK data into a format useful for planners, managers and scientists.
- Analyze natural resource conflicts (involving ungulates and their critical habitat) borne out of lack of understanding of cultural differences in natural resource use priorities among Little Red River Cree members and other stakeholders.
- Develop management and research recommendations.

Research Approach

This dissertation shares the view of Augustine (1997, p. 2) that TEK (and TK = traditional knowledge) is a knowledge system in its own right:

> In the same way that occidental science does not define itself in relation to TK, TK needs not authenticate itself according to the criteria of occidental science. TK exists in its own right, and its intrinsic validity stems directly from survival techniques used by generations of Native Americans.

Carl Popper (1963, p. 27) proposes that there are no ultimate sources of knowledge and that every source and suggestion is welcome and should be subjected to critical examination. Both

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traditional knowledge and Western scientific knowledge are constructed within the philosophical, religious, and historical boundaries of their respective cultures. Although Western science has a long tradition in the systematic gathering of knowledge, it is not necessarily superior over other knowledge systems. This study therefore does not attempt to evaluate and validate TEK data and their accuracy through direct comparisons with bio-scientific research results. Rather, I compare the contributions of both knowledge systems to identify knowledge differences and research gaps.

Critical wildlife habitat studies have long been the domain of biologists, who use standardized quantitative bio-scientific methods to collect data. This project differs from the standardized bio-scientific approaches in that it utilizes qualitative social-scientific methods to achieve its goal. This dissertation is based on the view that TEK is a knowledge system in its own right that utilizes its practitioners' own preferred methods of knowledge communication. In order to minimize the risk of framing the study in a format of standardized bio-scientifically oriented research questions, the concept for the study was jointly developed between the Little Red River Cree Nation, the Sustainable Forest Management Network (SFMN), and myself (under the guidance of my supervisory committee). It was jointly decided to develop methods that rely on the knowledge of Little Red River Cree traditional environmental knowledge experts. SFMN emphasized the importance of including data on natural and human disturbance and forestry issues. At a community meeting in March 1999 in Fox Lake, community members expressed concerns about local resource conflicts (e.g., practices of outside trophy hunters and the impact of logging on the environment). Since these conflicts directly impact on wildlife and habitat management, the project also addresses such resource conflicts.

The communication of knowledge between TEK experts and the researcher in this study was primarily oral. In order to reflect original contributions as accurately as possible, I extensively included original quotes from my interviews. Some quoted passages are quite lengthy but were important to include because they helped to better understand the position of the respective TEK expert. In order to stay close to the storytelling tradition in which TEK often is presented, I chose to only slightly edit the interviews (e.g. eliminating repetitions).

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Benefits and Strengths of the Study

This project is the first attempt to document critical habitat for three ungulate species in the Caribou Mountains Region of northern Alberta by using traditional environmental knowledge of local Woodland Cree. Apart from its theoretical contributions, there are a variety of academic, management, and community benefits that result from this study.

As a place-based study of TEK of ungulates and related resource conflicts, this dissertation approaches the topic from a geographer's perspective. Its strength lies in the integration of multi disciplinary aspects (e.g., history, geography, ecology, and ethnology specific to the region) that allow for a placement of the research topic in a wider context. This study therefore contributes to the overall knowledge on ungulates, environment, resource conflicts and management in the Caribou Mountains of Alberta.

The methods used in this project (which were jointly developed between the Little Red River Cree Nation and the researcher) also provide a theoretical contribution to TEK and wildlife research. The methods approach differs from many other projects in that the development of the methodology was part of the fieldwork, in contrast to projects where methods are laid out before the fieldwork begins[7]. Its strength is in the contributions of participants, who identified how their traditional environmental knowledge could best be learned or understood by a non-native, non-resident researcher.

Academically, the study fills knowledge gaps and raises new research questions, especially concerning caribou and bison. Particularly exciting are the TEK contributions on behaviour, habitat selection and morphological characteristics of two bison herds outside Wood Buffalo National Park for which currently no bio-scientific research data exist. The results of this study have the potential to inspire new research projects (e.g., on the genetics of the local bison herds, or the fate of the large caribou).

An additional benefit will be the application of the results and recommendations in the local natural resource planning and management process. The digital GIS (Geographic Information

[7] The study by Thorpe et al. (2001) provides an example for strong and ongoing community input in the development of the project and methods, whereas Tsuji's (1996) and Huntington's (1998a) studies provide examples for the use of pre-determent field methods.

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System) format of the map data allows for an easy visual incorporation of the data into management plans. The cycle diagrams can aid in the timing and scheduling of resource extraction projects. The maps and diagrams can also become educational tools for the Little Red River Cree schools in local TEK education programs.

The thesis further provides a variety of detailed literature reviews, which can lead First Nation and non-native resource managers to related information that might aid in the planning and management process. My overview on the meaning of ungulates and the environment in Woodland Cree culture (Chapter 5) could be particularly useful for non-native stakeholders who want to gain a better understanding about the values at stake as the habitat around the Little Red River Cree Nation changes.

The detailed knowledge provided by the participants demonstrate how important it is to involve local aboriginal residents in the environmental resources planning processes. As such, the study strengthens the position of TEK experts by creating an awareness of their knowledge contribution.

Limitations of the Study

The biggest limitation of the study is that in order to analyze the knowledge contributed by TEK experts the contributions needed to be fragmented into categories (e.g. the focus on three ungulate species and related information). These categories are primarily scientific concepts. I have tried as much as possible to present the categories within their context. I also tried to minimize decontextualization by presenting my results from different perspectives (e.g. a chapter on ungulates and a chapter on disturbances).

The amount of data and depth of results is not homogeneous for the project region. This is primarily due to the fact that the knowledge levels on specific issues vary between participants and regions. It was not possible to involve participants with detailed knowledge of every area in the project region.

The study is also limited by the timing of the field season. The fieldwork was conducted during three months in the summer of 1999. During this time many residents spent time outside their

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communities and it was often difficult to schedule appointments. Due to bad weather and road conditions, some TEK experts were difficult to contact or reach. The length of the field season (which was influenced by a limited budget and logistic concerns) limited the number of follow-up interviews for this study. This problem, however, was partially addressed by the arrangement of a TEK experts' workshop in 2001.

The depth of my understanding of the knowledge contribution of some participants was limited by the fact that I do not speak Cree. Although all interviews in Cree were translated during the interview it is very likely that not all knowledge was transferred to the researcher and that important cues were left unidentified in the process.

Having a professional background in geography rather than biology, my wildlife knowledge is solid but not extensive, which limited the follow-up questions I was able to ask.

Some readers will likely perceive the lack of a quantitative approach to data gathering as a limitation of the methodology. The choice of an unstructured, open-ended interview style that leaves the choice of direction to both participant and interviewer has the disadvantage that not all aspects of wildlife and habitat information will be covered in each interview. Since this study was concerned with the documentation of ungulate knowledge that TEK experts considered important, incorporating a quantitative approach would have disrupted the flow of the interview and led away from the topics important to TEK experts. The strength of the chosen interview style lies in the minimization of fragmentation and decontextualization during the data gathering process. The approach further allows for a better representation of the priorities that participating TEK experts expressed when they contributed their knowledge on ungulates.

In my research with the Little Red River Cree I tried to gain an understanding of the spiritual dimensions of local peoples' knowledge of wildlife and the environment. However, most participants who shared their insights were very uncomfortable sharing sacred spiritual knowledge with the 'outside world'. Trying to communicate basic spiritual concepts in a respectful and sensitive matter therefore became a challenge in the process of writing this dissertation. Chapter Five – *The Place of Ungulates and the Environment in Local Cree Culture* uses information and stories provided by local participants who granted explicit permission of use. Further information was added from published sources on Cree culture and spirituality. All

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local elders and other participants involved, however, freely offered to share their ecological and environmental aspects of knowledge.

Organization of the Dissertation

The first four chapters following the introduction provide the necessary framework that will help to put the results and discussion of this dissertation into perspective. This framework includes an overview of traditional environmental knowledge (Chapter Two), a description of the research setting (Chapter Three), an outline of the research methodology (Chapter Four), and an overview of the place of ungulates and the environment in the local Cree culture (Chapter Five). All four chapters are strongly interconnected. The background provided in the TEK chapter (Chapter Two), for example, helps explain why the project methods were developed as an open approach (Chapter Four). The cultural dimensions discussed in Chapter Five also firmly link to Chapter Two in that the TEK overview chapter introduces cultural concepts of knowledge acquisition and transmission, some of which (e.g., story telling, observation) appear when participates describe their relationship with the environment in Chapter Five.

The next two chapters (Chapter Six and Seven) describe the results of this study. Chapter Six on critical ungulate habitat knowledge introduces the reader into scientific and TEK perspectives by keeping the results from the scientific literature review and the results of the TEK study separated. This approach was taken in order to avoid direct evaluation of one knowledge contribution against the other. Chapter Seven summarizes the TEK study results on human and natural disturbances.

Chapter Eight, a discussion of the results and their relevance, draws from all previous chapters and provides management and research recommendations. The dissertation ends with a reference section of literature quoted.

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2 TRADITIONAL ENVIRONMENTAL KNOWLEDGE – AN OVERVIEW

The title of this thesis *Woodland Cree Traditional Environmental Knowledge of Critical Ungulate Habitat in the Caribou Mountains of Alberta* includes the key terms this study centres around. In the following section, I will provide background information on Traditional Environmental Knowledge (TEK), its epistemology, and its application in wildlife research and environmental management.

What is Traditional Environmental Knowledge?

In the field of research that deals with knowledge of non-Western cultures, a broad variety of terms are currently applied, such as: traditional environmental knowledge (TEK), traditional ecological knowledge (also TEK), indigenous knowledge (IK), traditional knowledge (TK), local knowledge (LK), anecdotal knowledge, and folk knowledge. In this thesis, I choose to use the term *traditional environmental knowledge* (TEK)[1]. TEK is part of a larger indigenous knowledge system, here represented by the term *indigenous knowledge* (IK).[2]

As a non-aboriginal researcher trying to explain the concept of IK and TEK to a primarily non-aboriginal audience, I often use the diagram in Figure 2.1. In it, indigenous knowledge is represented as a circle which is influenced by the natural environment in which people live, their forms of spirituality, social organization, cultural value system, and - more and more, non-indigenous value and knowledge systems. These factors inform how people perceive their

[1] The terms traditional environmental knowledge and traditional ecological knowledge are almost applied identically or interchangeably in this field of research. Smith (1996, p. 4) provides one of many working definitions of *ecology* as: "the study of the structure and function of nature. Structure includes the distribution and abundance of organisms as influenced by the biotic and abiotic elements of the environment; and function includes all aspects of the growth and interaction of populations, including competition, predation, parasitism, mutualism, and transfer of nutrients and energy among them."

Due to the generally more quantitative oriented bio-scientific definition of *ecology*, I prefer to use the more holistic term *environment*. The Encyclopaedia Britannica (www.britannica.com) defines *environment* as: "the complex of physical, chemical, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival."

For a brief discussion on the choice of terminology also see Berkes (1999, p. 6) and Nadasdy (1999, p. 3-5).

[2] For more debate on the choice of terminology see Johnson (1992), Berkes (1999), and Stevenson (1999).

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environment, create classifications, ceremonies, structure their economy, and use their resources. Traditional environmental knowledge is deeply rooted within this complex indigenous knowledge system and cannot be completely understood without reference to all the interrelated knowledge-shaping factors.

What is *traditional*? Berkes (1992) provides the following outlook:

> In the dictionary sense, "traditional" usually refers to cultural continuity transmitted in the form of social attitudes, beliefs, principles and conventions of behaviour and practice derived from historical experience. However, societies change through time, constantly adopting new practices and technologies, making it difficult to define just how much and what kind of change would affect labelling of a practice as "traditional."

It becomes clear that the use of the term *traditional* in traditional environmental knowledge is somewhat problematic (Morrow and Hensel 1992, Berkes 1992, Berkes 1999). In many discussions with Canadians, even with colleagues in my Department, people hold the opinion that if Native Americans want to exercise their Treaty rights to harvest animals for subsistence or even commercial purposes they should do this in a *traditional* way. What my discussion partners mean by this is that Natives should use canoes instead of boats with outboard motors, dog teams instead of skidoos, bows and arrows instead of rifles, and so on. To them the idea of exercising a traditional Native lifestyle is defined to the state of culture present at the time of pre-European or early European contact. Morrow and Hensel (1992) point out that this interpretation of tradition is dangerous because it gives non-native decision-makers the power to decide what kind of aboriginal practices are considered "authentic" (see also Nadasdy 1999).

It is interesting to note that Westerners generally do not apply the same museum views when it comes to their own culture. People of Western European decent, for example, generally regard Christmas as a traditional celebration. A hundred years ago families would get an evergreen tree from the forest, decorate it with straw stars, gingerbread men, ribbons, and wax candles. Today, people use plastic trees, glass and plastic ornaments, and electric lights. In their eyes, their Christmas celebration is nevertheless as traditional as the one a hundred years ago. Although the physical characteristics of a Christmas celebration have changed, the core values of the feast nevertheless still centre around family, happiness and harmony. The term *traditional* as used in this thesis should be viewed with the same flexibility that defines the core values of a contemporary "traditional" Christmas celebration.

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Indigenous Knowledge (IK) / Traditional Ecological Knowledge (TEK)

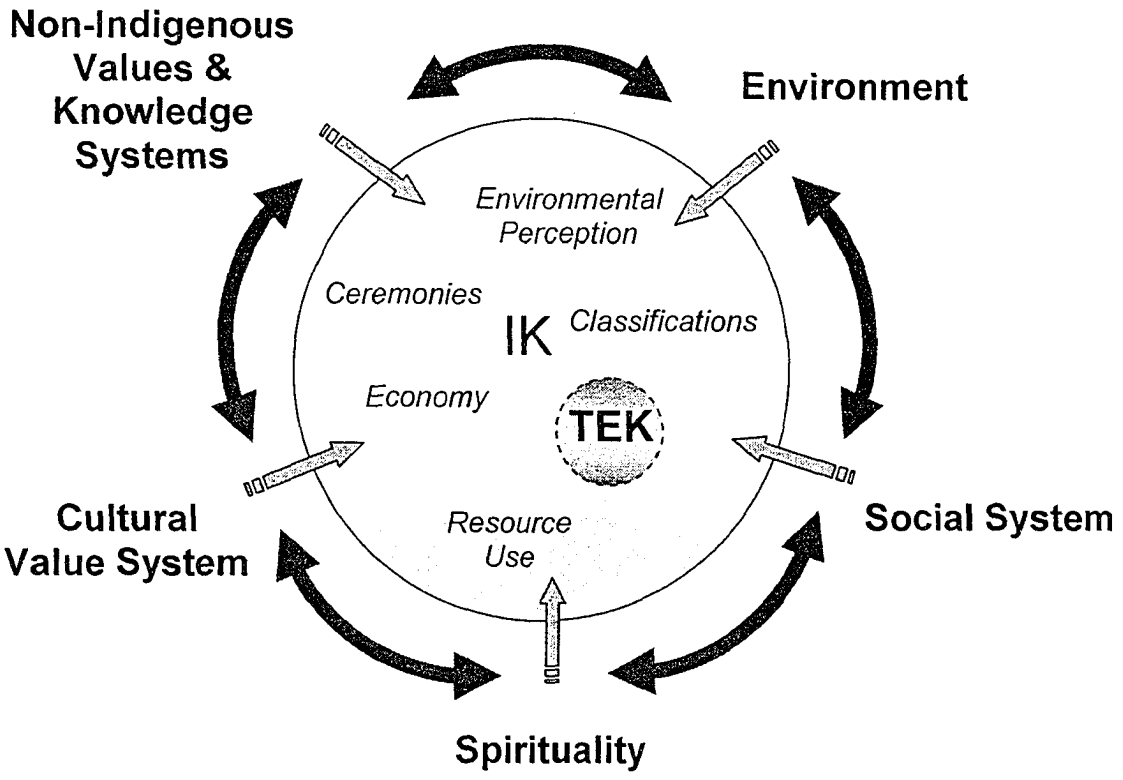

Figure 2.1: Relationship of Indigenous Knowledge (IK) and Traditional Environmental Knowledge (TEK)[3]

[3] Although developed independently, this diagram shares some similarities with Stevenson's (1998) diagram on the structural components of indigenous knowledge.

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TEK, Science, and Environmental Management

It is common practice in the Western scientific tradition to thoroughly define the terms a scientist uses. Several scholars have developed definitions for *traditional environmental/ecological knowledge*, but none of the definitions has become a common standard. Berkes (1999), for example, defines traditional ecological knowledge as:

> A cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.

The definition I prefer, and refer to most frequently, is from Johnson (1992, p. 4):

> Traditional environmental knowledge, or TEK, can generally be defined as a body of knowledge built up by a group of people through generations of living in close contact with nature. It includes a system of classification, a set of empirical observations about the local environment, and a system of self-management that governs resource use. The quality and quantity of traditional environmental knowledge varies among community members, depending upon gender, age, social status, intellectual capability, and profession (hunter, spiritual leader, healer, etc.). With its roots firmly in the past, traditional environmental knowledge is both cumulative and dynamic, building upon the experience of earlier generations and adapting to the new technological and socioeconomic changes of the present.

The approach of defining TEK, however, is not without criticism. A growing number of indigenous scholars (e.g., McGregor 2000, Battiste and Henderson 2000, Henderson 2000, Simpson 2001) are pointing out that the term TEK has been shaped and defined by non-indigenous scientists and that the whole concept of TEK was developed out of the western scientific tradition.[4] Anishinaabe scholar Deborah McGregor (2000, p. 439) argues:

> The notion of TEK is a construct of modern western society, created in an attempt to define and capture another culture's knowledge. The chasm between the representation and represented is common in cross-cultural interactions, particularly where power imbalances characterize the relationship between two societies. The more powerful society can, and does, project its own version of the world onto the less powerful. Thus, one of the fundamental underlying problems with TEK is that although it claims to represent Aboriginal knowledge, it is itself not an Aboriginal concept.

She continues to explain (McGregor 2000, p. 442-443):

> Words such as *environmental* or *ecological* (constructs of western society) do not generally exist in Indigenous languages and are barely, if at all, translatable. Some Native people therefore feel it entirely inappropriate to attempt to separate out specifically environmental knowledge along the conceptual lines defined by non-Native people [...].

[4] See also Nadasdy (1999).

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Given this criticism, Figure 2.1 needs to be seen as a diagram describing indigenous and traditional environmental knowledge as understood by a non-indigenous researcher, using scientifically developed concepts to speak to a predominantly scientific audience.

Battiste and Henderson (2000, p. 36) see a need to decolonize the Eurocentic need for definitions[5]:

> Using their artificial tools of classification, the colonizers attempt to Europeanize all knowledge and heritage, even when they are extending beyond their knowledge into the unknown.

They conclude (p. 38):

> Eurocentric thought must allow Indigenous knowledge to remain outside itself, outside its representation, and outside its disciplines. It cannot attempt to capture an incommensurable knowledge system in its web of purposes. Eurocentric context cannot do justice to the exteriority of Indigenous knowledge.

Anishinaabe researcher Leanne Simpson (2001) also contributes to the discussion:

> Most often, definitions reflect what the dominant society sees as important. The ecological component of our knowledge is emphasized rather than its spiritual foundations. TEK "data" or factual information is at the fore, rather than seeing our knowledge as worldviews, values, and processes (AFN/NAFA, 1995). In a sense, constructing Aboriginal knowledge into "TEK", has been a process of "scientizing" our knowledge for use in and the consumption of Euro-Canadian society (Stevenson, 1998; Stevenson, 1997).

Simpson's statement identifies one of the central problems that is created when TEK is separated from the holistic concept of Indigenous Knowledge. In contrast to Indigenous knowledge, Western science refuses to accept spirituality as a legitimate source of knowledge (e.g., in the form of dreams and visions), and it likewise denies spirituality any role in the interpretation of any natural phenomena. Spirituality, however, is an integral part of IK and TEK.[6]

The above quotes indicate that the study of TEK and IK not only reflect a quest for knowledge by Western scientists but also includes notions of power and control derived from the way TEK is

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[5] For a detailed discussion on the colonization of knowledge please see Maori scholar Linda Tuhiwai Smith's (1999) book 'Decolonizing Methodologies'.

[6] Additional to the role of spirituality in TEK, Pierotti and Wildcat (2000, p. 1333) also argue that despite dislocations and forced removals the TEK of Native Americans is also spatially oriented:

> TEK is strongly tied to specific physical localities; therefore, all aspects of the physical space can be considered part of the community, including animals, plants, and landforms. As a consequence, native worldviews can be considered to be spatially oriented, in contrast to the temporal orientation of Western political and historical thought.

This interconnectedness of people, plants, animals and place, and the role of spirituality all influence the relationship of Native North Americans with their environment and the way they use resources (see Chapter 5 for more details).

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utilized. This becomes clearer when we look at the history of TEK research in Canada. For a long time, oral knowledge research on environmental issues was the specialized domain of anthropology (Johnson 1992). About 20 -30 years ago, however, biologists started to show interest in traditional environmental knowledge. In Canada, however, much of the early traditional environmental knowledge research was conducted in connection to land claims processes that required traditional land use and occupancy studies (Nadasdy 1999). Freeman's (1976) report prepared for Inuit Tapirisat provided much of the background research for the Nunavut land claim, which lead to the proclamation of the Territory of Nunavut in 1999. Berkes' (1979) and Feit's (1973) early work coincided with the time of the formation of the James Bay land claim agreement. Brody (1981) documented the traditional land use of the Beaver people in British Columbia and discussed related natural resource conflicts of the region. Other TEK and wildlife research resulted out of the creation of wildlife co-management boards such as the Beverly-Qamanirjuaq Co-management Board.[7] Over the last decade, more TEK and wildlife research was initiated because local communities or resource boards saw a strong need to document this knowledge for the benefit of future generations and for the integration in resource planning and management. As part of the Gwich'in land claim and the mandate of the Gwich'in Renewable Resource Board, for example, the Nation has been very active in documenting its elders' knowledge on different wildlife species, as well as hunting and trapping techniques (Gwich'in Renewable Resource Board 1997, Gwich'in Elders 2001). Focussing on the overall local environment and its changes, McDonald et al.'s (1997) publication of Inuit and Cree TEK from the Hudson Bay region includes some wildlife information (e.g., observations on migration and population dynamics of different species). Born out of the need to assist Northern communities, agencies and interest groups of the Kitikmeot region in decision-making, Thorpe et al. (2001) published an insightful and sensitive collection of Inuit traditional knowledge[8] on the Bathurst caribou from the Kitikmeot region of Nunavut.

There are considerable differences in how TEK studies on wildlife are conducted. Some community-initiated studies tend to be more qualitative in nature with the aim to present the knowledge through the use of story telling and direct quotes (e.g., Gwich'in Renewable Resource Board 1997, Gwich'in Elders 2001, Thorpe et al. 2001). Other studies are designed by biologists with the aim to fill perceived bio-scientific knowledge gaps. These studies tend to be quantitative

[7] See Spak (2001) for a discussion on the use of TEK by the Beverly-Qamanirjuaq Co-management Board.
[8] It is interesting to note that Thorpe et al. (2001, p. 4) did not use the term *traditional knowledge* but rather chose to use the term Inuit *Qaujimajatuqangit*, which translates as *what has always been known* or *what [Inuit] must or have to know.*

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and often analytical about the creditability of TEK informants. Tsuji's (1996) study on the validity of Cree TEK of the sharp-tailed grouse is an example for this category of studies. Less extreme studies that aim to advance scientific knowledge through the use of TEK are Nakashima's (1988) research on the common eider, and Huntington's (1998a, 1998b) research on Beluga Whales. A variety of projects were primarily initiated by communities and scientists to provide solid foundations for wildlife management decision-making.[9] Over the years, the literature on the use of TEK in environmental management has grown considerably. Freeman (1985, 1995), Feit (1988), Berkes (1998, 1999), Stevenson (1996, 1999) and Nadasdy (1999) are some of the authors who have contributed to the debate on TEK in environmental management in Canada. As their studies indicate, the integration of TEK in environmental management has been one of the greatest challenges.

There are a variety of problems tied to TEK research and the integration of TEK in environmental management. As pointed out earlier, TEK in itself is not an Aboriginal concept (McGregor 2000). TEK research was born out of the interest of Western scientists and a need for information by politicians and natural resource managers working on land claims or issues of resource management. Most TEK research therefore tends to focus on the documentation of specific knowledge (Nadasdy 1999), predominantly information on single animal species (e.g., Tsuji 1996, Nakashima 1988, Ferguson and Messier 1997, Huntington 1998b). Nadasdy (1999, p. 6) writes:

> This focus on individual species conforms not to the views of native elders and hunters, but to the needs and specifications of the scientists and government officials who are managing these populations in an established institutionalized setting.

By singling out three ungulate species and their critical habitat, the present study adopts a scientific format in the way its data and results are presented. Given that the Little Red River Cree Nation initiated this research in order to use it in the environmental management process, the current format was adopted to aid the Nation in the process, which is dominated by the format implemented by government and industry. The study, however, achieves a more complete representation of Little Red River Cree TEK by presenting the results from different angels and by providing necessary background information.

[9] E.g. TEK on reindeer in the Belcher Islands by McDonald Fleming (1992), and TEK on caribou on Baffin Island by Ferguson and Messier (1997) and Ferguson et al. (1998).

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The selection of one particular aspect of traditional knowledge for the purpose of informing decision-making on specific management issues means that traditional knowledge tends to be expropriated, objectified and commodified (Stevenson 1998). Nadasdy (1999) points out that TEK studies tend to compartmentalize indigenous knowledge, which is an approach contrary to the holistic way in which Aboriginal people place their knowledge. In the following process of distilling TEK into a format palatable for resource managers and government officials (usually the quantification of TEK) the whole cultural and individual context of how the knowledge is constructed is lost (Nadasdy 1999). In the end, the distilled, quantified version of traditional knowledge as interpreted by scientists is used to inform decision-making. Nadasdy (1999, p. 12) concludes: "Rather than empowering local communities, as many people hope, this process actually concentrates power in the centres of calculation at the expense of local people".

The disempowerment of communities, and the concentration of power in the centres of calculation are valid concern in regard to TEK studies, especially when they are not initiated by the Aboriginal communities, which inform them. TEK studies, however, can also empower Aboriginal communities, if they initiate the research, the methods are developed jointly, data ownership is defined, and the community possesses negotiation powers.

Another obstacle in the quest to integrate traditional knowledge and science in resource management is the choice of terminology used in the management process. Morrow and Hensel (1992) found that many terms used in environmental management (e.g. subsistence, conservation) do not have equivalents in the languages of Aboriginal representatives participating in management processes (see also McGregor 2000). The use of specific terminology, however, includes cultural concepts of resource use that are often foreign to Aboriginal people. Terms and concepts such as *harvesting*, *resource management* or *wilderness* were developed in Western agricultural societies, which tend to separate themselves from nature and claim superiority over it (see also Notzke 1994, Klein 1994, Freeman 1999, Stevenson 1999). Instead of managing resources, Aboriginal people of the arctic and subarctic tend to feel more comfortable in describing that they manage "relationships with the natural world and the resources upon which they depend" (Stevenson 1999, p. 166).

The decontextualization of TEK and the framing of resource management by using specific terminology show that TEK research can be a tool for disempowerment of Aboriginal people. The success of integrating TEK and science in environmental management depends on how

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power over decision-making is distributed. It seems that the integration of TEK in resource management can be classified in two models, both usually referred to as co-management or co-operative management. In the first model, decision-making powers are held by government officials, whose decisions are informed by science and science-filtered TEK. In the second model, Aboriginal people share powers in the resource management process, which enables them to bring their knowledge embedded in their own culture and value system to the bargaining table. The variations between the two models are fluid (for more details see Berkes 1994). Spak (2001) who studied the integration of indigenous knowledge in the decision-making processes of the Beverly - Qamanirjuaq Management Board and the Gwich'in Renewable Resource Board found that indigenous knowledge was better integrated where Aboriginal people shared decision-making powers (in contrast to having only a consultative status). The sharing of power allows Aboriginal people to shift the focus from integrating certain aspects of their knowledge to finding ways to incorporate their own traditional management systems in order to secure their way of life (Stevenson 1998, 1999, Feit 1988).

To better understand how traditional knowledge is learned and taught in Native communities it is helpful to take a closer look into the epistemology[10] of TEK.

Some Thoughts on the Epistemology of TEK

The epistemologist Carl Popper (1963, p. 27) proposes the following thesis:

> (1) There are no ultimate sources of knowledge. Every source, every suggestion, is welcome; and every source, every suggestion, is open to critical examination. Except in history, we usually examine the facts themselves rather than the sources of our information.

Interpreting Popper's thesis, Traditional Knowledge is as valid a source of knowledge as other sources (e.g., science). This dissertation shares the view of Augustine (1997, p. 2) that TK (traditional knowledge) is a knowledge system in its own right:

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[10] A dictionary definition of the term is:
Epistemology (Greek *episteme*, "knowledge"; *logos*, "theory"), branch of philosophy that addresses the philosophical problems surrounding the theory of knowledge. Epistemology is concerned with the definition of knowledge and related concepts, the sources and criteria of knowledge, the kinds of knowledge possible and the degree to which each is certain, and the exact relation between the one who knows and the object known.
(Encyclopaedia Encarta: http://encarta.msn.com/find/Concise.asp?z=1&pg=2&ti=0543E000#5)

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> In the same way that occidental science does not define itself in relation to TK, TK needs not authenticate itself according to the criteria of occidental science. TK exists in its own right, and its intrinsic validity stems directly from survival techniques used by generations of Native Americans. These techniques have been used in harmony with the land and other living entities, and have avoided creating serious ecological damage.

As a legitimate source of knowledge existing in its own right, traditional knowledge contributes new and different suggestions and perspectives to the global pool of knowledge. Applying Popper's argument, its contributions need to be critically examined like all other knowledge sources. He deepens the argument by proposing a second thesis (Popper 1963, p. 27):

> (2) The proper epistemological question is not one about sources; rather, we ask whether the assertion made is true – that is to say, whether it agrees with the facts. (...) And we try to find this out, as well as we can, by examining or testing the assertion itself; either in a direct way, or by examining or testing its consequences.

Popper's second thesis can easily be interpreted as proposing to evaluate the contributions of traditional knowledge with scientific methods (e.g., testing of hypothesis). However, like traditional knowledge, Western science is also constructed within the philosophies, assumptions, histories and cultures of the countries that created it. As such it can provide tools in the evaluation of knowledge but it is, in itself, not the ultimate objective source of knowledge.

The approach taken in this dissertation is to document traditional knowledge and to discuss its contributions in reference to other knowledge contributions (e.g. from wildlife research, history, ecology). The documentation of indigenous or traditional knowledge is not without challenges. A look at a summary by Erica-Irene Daes (1994), Special Rapporteur to the United Nations, on the topic of indigenous heritage and knowledge, provides insight into the difficulties:

> In developing the principals and guidelines, the Special Rapporteur found it useful to bear in mind that the heritage of an indigenous people is not merely a collection of objects, stories and ceremonies, but a complete knowledge system with its own concepts of epistemology, philosophy, and scientific and logical validity. The diverse elements of an indigenous people's heritage can only be duly learned or understood by means of the pedagogy traditionally employed by these people themselves, including apprenticeship, ceremonies and practice. Simply recording words or images fails to capture the whole context and meaning of songs, rituals, arts or scientific and medical wisdom. This also underscores the central role of indigenous peoples' own languages, through which each people's heritage has traditionally been recorded and transmitted from generation to generation.

As Daes' summary explains, learning IK/TEK in a culturally appropriate way is a process that involves indigenous methods of teaching and learning, most of which demand long-term commitment, personal involvement, and mastering of the local language. An outside researcher will hardly ever be able to fulfill these conditions, primarily due to financial and time constraints, language proficiency, but also because he or she has missed early initiation processes necessary

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to be able to access higher levels of local knowledge. Consequently, the methods of knowledge documentation that Western scientists choose to use in their documentation of TEK will always only capture a fraction of the actual knowledge present in an indigenous community.

Being aware of this problem, the next best option for me as a female, Western, non-Cree speaking researcher in her 30s, with financial and time constraints, was to seek the advice of Little Red River Cree TEK experts on how I could most appropriately document their knowledge within the limitations of my study. To plan the summer field season and to start working on the development of my methodology, I visited the communities of John D'Or and Fox Lake from May 4-7, 1999. In meetings with Chief Johnsen Sewepagaham and the late band administrator Richard Dumaine I was referred to one key elder for each of the communities. As key elders, Alexis Meneen from Fox Lake and Malcolm Auger from John D'Or Prairie were identified. Asked about his opinion on how I can best learn about his knowledge of the land and the animals, Mr. Meneen[11] gave the following answer:

> *To go in the bush is the good way - you learn of the animals.*
> *Birds, the way they raise their young is the same as humans. Both eat berries. It is important to be out there on the land.*
> *Here we are in a building. I can tell you or him [referring to our liaison] something, but that would not be very beneficial for all of us. In the bush you have the connection to mother earth.*
> *The language will be more powerful and knowledgeable when we are on the land.*

Mr. Auger[12] answered the same question as follows:

> *You have to be there [on the land] to learn this. Are you busy right now?*
> *[I answered: "No"]*
> *Then let's start the right way.*[13]

In both meetings, the elders were very clear in pointing out that the best way for me to learn from them was to accompany them on the land. As some of the quotations below show, many other participants in this study shared the same opinion.

During my field season with the Little Red River Cree, I continued the approach of asking for advice on how to learn the knowledge of the experts I was working with. Learning by doing[14], and learning through experience and shared lifestyle were often given as recommendations for

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[11] Meeting at Fox Lake, May 05, 1999, translation by Leslie Jo Laboucan.
[12] Meeting in John D'Or Prairie, May 06, 1999.
[13] At this point the more formal meeting in the office was over and plans were made to visit Mr. Auger's trapline in the afternoon.
[14] The same approach to learning local knowledge was also previously identified by Cynthia Pye (1998) in her work on traditional knowledge and moose hunting in Garden River.

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learning expert knowledge from traditional knowledge experts. Clifford Ribbonleg[15], for example explained to me how he learned the names of the local birds in his childhood:

> *I used to be able and name them all when I was small, because when I was small I used to be hunting with my little bow and arrow and go out hunting. And I come back with my little packsack and grandma would sit with me. And we would name all the little... pick all the birds out of my packsack, name them all, you know? And I was following her. And that's how I learned all my birds. And later on all the ducks, and everything. But the kids nowadays don't know everything. They probably know a robin or a whisky jack, maybe, that's all they know. Or a chickadee. But the other birds they don't know. It's strange. There is so many birds, and it's strange not knowing them.*

Talking about learning traditional knowledge and skills, local Cree teacher Florence Nanooch[16] said the following:

> *The land has to be respect[ed]. But that's hard, like... when you try...The only way a person can learn is: live on the land, with the land, learn from the land. But hearing it is a different thing, like... two different things.* [...]
>
> *F.N.: A lot of times the white people, they have the education, they have the paper but there is a lot of people out there in [a] native way that have education too, with the land.*
> *T.S.: They just don't have the paper.*
> *F.N.: Yeah, they just don't have the paper. And if a person doesn't have the paper, well, then you're not... he didn't go through university. There is two ways that you go to university: you go to school in the white man's way and there's a native way that you go to university. That you learn.* [...]
>
> *I guess if a person that really want to learn to live with the land, how the native people do, a person has to at least live with those family, with a person, and learn. Just then you see things with your eyes, and not just hearing stories. 'Cause when you hear stories it could be a fairytale, or... I don't know... does this really happen? But I think that a person that really wants to learn how to live with the native land, with the native people, how they respect all the animals and what..., they have to kind of live together, spent time together a lot. And that's how a lot of these white people I talk to, like if they live with... married somebody the native way, that's the first thing they will say: "I never used to believe it. But now I do because I've been living here for a long time and I learn."*

During the interview, Mrs. Nanooch also pointed out that observations of weather, animals and nature in general used to be important ways of learning. She further referred to her grandmother, who used story telling to educate her grandchildren. Apart from learning through observation and storytelling, she recalls learning by doing, as well as learning information from experienced people. For an outside person, she strongly emphasizes the need of learning through the experience of living with native people.

When I asked elder Paul Tallcree[17] what would be the best way to learn about the animals and the local relationship between people and animals, he answered:

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[15] Interview in Fox Lake, August 18, 1999.
[16] Interview in John D'Or Prairie, July 02, 1999.

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Go with a trapper or a guy that knows the bush. Go with him, stay with him. You'll learn. Oh yeah, you'll learn. One day you'll learn, but not as much. Better, stay with him for a week or so, maybe a month or so. Then you'll be able to know how the trapper lives in the bush.

To an outside researcher, Mr. Tallcree emphasizes in this interview passage the importance of learning from an experienced person by staying with the person in his or her environment.

An article by Ann Charter (1996. p. 57) underlines the cultural sensitivity of knowledge communication, and includes a selection of concepts characteristic of Aboriginal teaching and learning approaches:

> Fundamental to Aboriginal teaching philosophy is the concept that each person in turn is both teacher and a student. [...] Life transitions are linked to seasons where there are observable transitions that can be connected to daily living. The life cycle is apparent through the reproductive, birth and death cycles of plants and animals. [...] Children, adolescents, adults, and elders can share new methods or concepts with each other by listening to the experiences of others or by observing, assessing, questioning, and testing new approaches. Observation and close scrutiny of the environment lead to learning experiences; for example the development of patience may be linked to a rock and its exposure to the elements. Knowledge is meant to be shared - not owned and not imposed. It is expected that information or skills will be shared and given freely - if asked for. Advice is not normally offered unless it is requested because this would conflict with the value of non-interference and the individual's life choice and independence. [...] Elders are respected for their accumulation of knowledge and wisdom. However, an individual does not have to be elderly to be wise. [...] Traditional Aboriginal people identify and accept the fact that people cannot teach what they have not experienced and do not understand.

The synthesis report from the TK component of the Northern River Basins Study (NRBS) gives additional insight into teaching and learning principles of the Little Red River Cree (Bill et al. 1996):

> The traditional knowledge of these communities was unique in nature because of the way their information was presented through the interviews. During the review it was evident that there was a historical way of transferring information that did not come through in the other interviews. The elders were very grateful for the opportunity to share their views in a traditional way. Those that agreed to participate had experienced a way of traditional knowledge acquisition that is no longer being used. That is, to sit in a circle and listen to elders speak of their knowledge and how it is applied to daily life. The process of offering a gift of tobacco was an intrinsic principle they had known and to be approached in this manner meant a great deal to these elders, such as was done throughout this community research process. Traditional knowledge was not just learning how to hunt and trap but included child rearing, community responsibility, interaction, and the relationship to the self and the environment.

Many of the Little Red River Cree participants in the NRBS stated that they were primarily taught by family members, specifically parents, grandparents, and other relatives. Bill et al. (1996) further noted:

[17] Interview at Paul Tallcree's trapline near Garden River, August 07, 1999.

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The elders of the Little Red River First Nations communities gave vivid descriptions of teaching practices which involved their grandfathers and grandmothers as teachers. Several concepts were identified as important to learn for a traditional way of living:

1. The community members, particularly the elders, were responsible for teaching and advising the young people.

2. The youth were expected to seek guidance from the elders.

3. Everyone was taught to share and work together, and this practice is demonstrated through the sharing of food and harvests from the land.

4. The principle of respect for territory and property were taught.

5. Learning survival skills such as drying meat, fish, berries and identification of herbs which were used for health and healing.

6. Other survival skills such as birch tree tapping, as well as moose hide tanning to make garments, implements, and snowshoes.

7. It was important to understand about how to build lodges for protection and for ceremonies, and knowledge of which trees and mosses to use when building these dwellings.

8. Botanical knowledge as it pertained to the uses of willow bark and the roots of birch and spruce to make rope, nets, and binding for the canoes were included in the teaching. Willow bark was gathered in the spring.

9. It was important to learn and accept the responsibility for certain ceremonies that were used to express gratitude and acknowledgment of the gifts of the land and the role and importance of the elders as advisers at these ceremonies. The elders at this time gave advice to the community on living a peaceful life and also spoke of premonitions or messages they needed to share with the community about the future.

10. Calm and peaceful disciplinary methods for children were emphasized rather than physical discipline.

Elements of all ten LRRC teaching and learning concepts identified by Bill et al. (1996) also emerged in the interviews and informal talks conducted during my field season with the Little Red River Cree. It underlines the previously made statement that IK and TEK are truly holistic knowledge systems that need to be seen in their cultural and social framework that generates them. The next chapter explains the methods used in this project to learn about and document traditional knowledge.

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3 METHODS

Research in Aboriginal and First Nation communities differs in some ways from related research in mainstream Western societies. Issues of patience, cultural awareness, and knowledge of the proper protocol make a significant difference in the success of a project. Generally, this type of research requires a lot of time, both in the planning and in the fieldwork stage.

One of the first goals of this project was to develop a culturally-sensitive methodology for the documentation of Little Red River Cree TEK, in co-operation with the current keepers of this knowledge. Based on the view that TEK is a knowledge system existing in its own right (see Chapter 2, p. 17) that utilizes its own preferred methods of knowledge communication, the study required an open approach towards identifying the appropriate methodologies. By reviewing available TEK studies, it becomes apparent that there are two common approaches to traditional ecological knowledge research methods. The first approach includes studies that are almost completely designed from within a conventional Western scientific methods approach (e.g. Tsuji 1996, Huntington 1998a, Urquhart 1994, and Richard and Pike 1993). This research is often designed by biologists who want to supplement their field data with information from local hunters and trappers. In this type of research design, the scientist either assumes that knowledge is communicated the same way in TEK research as it is in Western scientific research, or the researcher is only interested in information that is directly transferable into the Western scientific framework. Generally, these research projects tend not to be community initiated, but rather are government, industry, or university instigated. The second group of studies is mostly initiated by a community. This type of research differs from the first in that the methodology generally is developed in partnership with local elders and informants (e.g. McDonald et al. 1997, Thorpe et al. 2001).

In my thesis research, the parties involved in the research design distanced themselves from the first mentioned approach. Rather, we agreed that the development of a methodology that treats both traditional environmental knowledge and Western scientific knowledge as equal knowledge systems required an open approach that was not centred around Western scientific methodology. I assumed that TEK experts have their own preferred methods of communicating knowledge, and that a true TEK study needs to incorporate these methods in the research design. In order to allow for local input in the development of the methodology I refused to label my methodological

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approach in classic academic terms (e.g. ethnography). I, however, predicted that some local methods of knowledge communication would be compatible with established qualitative social science methods.

In the following sections I will provide background information necessary to understand the process under which the methods were developed. This will be followed by a description of the fieldwork and data collection and the problems encountered. Finally, I will explain the process of data analysis that I used in my research and refer to the nature of the data I collected.

Development of the Project Methodology: A Partnership Approach

In the summer of 1998 the Little Red River Cree Nation indicated their interest in a TEK and critical wildlife habitat study for the Caribou Mountains. During this time, Sustainable Forest Management Network (SFMN) Aboriginal co-ordinator Dr. Marc Stevenson became aware of my search for a suitable dissertation project. Dr. Stevenson subsequently facilitated meetings involving representatives of the LRRCN, my co-supervisor Dr. Krogman, and myself. We submitted a seed-proposal to SFMN in September 1998, which was granted in November 1998. In April 1999 our project was integrated into the regular SFMN funding cycle.

Negotiating Entry

Since the Little Red River Cree Nation initially requested this research project, obtaining First Nation consent was never an obstacle. Prior to the beginning of this research project, Dr. Krogman had already started another research project that also involved the Little Red River Cree Nation, which meant that an initial contact was already established. To the advantage of our research project, the highest level of band administration (chief, political advisor, and band administrator) was involved in all planning stages from the beginning. This allowed for transparency and fast communication.

Towards a Partnership Approach

On March 19, 1999 Dr. Krogman and I attended a meeting hosted by the Little Red River Cree Nation in Fox Lake. The meeting involved Chief Johnsen Sewepagaham, elders, councillors,

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consultants, liaisons, other interested community members, as well as SFMN representatives and researchers. At this meeting, we introduced the project and asked advice on how we could best develop the research in partnership with traditional knowledge experts. We were subsequently introduced to community liaisons who would assist us in contacting elders for methodology development and fieldwork.

At the meeting we explained the ungulate and TEK focus of the study. As a response, community members expressed concerns about the practices of outside trophy hunters, who hunt bears and bison, and the impact of logging on the environment. To local trappers the small fur-bearers were also of concern. Consequently, we decided to integrate issues of local concern into the data collection. The impacts of human activities like hunting and logging were also incorporated.

At this meeting, we also discussed the location of the research project. It was already evident that the Little Red River Cree Nation agreed to be the principal host Nation. Although the original proposal was focused on the Caribou Mountains, it was decided that the study should incorporate all traditional lands of the Little Red River Cree with a special focus on the Caribou Mountains[1]. At the end of the Fox Lake meeting, Chief Johnsen Sewepagaham expressed a verbal invitation to commence our research at any time.

To plan the summer field season and to start to work on the methodology, I visited the communities of John D'Or Prairie and Fox Lake from May 4-7, 1999. Meetings were held with Chief Johnsen Sewepagaham and the late Richard Dumaine (band administrator), who were central in identifying knowledgeable elders. They also suggested potential future local community liaisons. The role of the liaison would be to help identify knowledgeable elders, hunters and trappers, and to establish the contact between the researcher and the elders in accordance with local protocol. Further, the liaison would be available as translator where necessary.

[1] Traditionally, the Little Red River Cree settled, hunted, and fished along the lower Peace River and its tributaries. The Caribou Mountains were predominantly visited by hunters who had their traplines there. Many elders, hunters, and trappers who are expert informants for TEK do not necessarily hunt or trap in the Caribou Mountains. Informants from Garden River, for example, often centre their hunting around the Peace River and to the east of Garden River. They are still very active on the land and provide important cultural information. People in Fox Lake tend to hunt on the lands to the south of the Peace River. Fox Lake, however, is the largest and most isolated of the three communities. This community has very strong spiritual and cultural bonds to the land. To exclude informants from Garden River and Fox Lake because they might not contribute specific knowledge on the Caribou Mountains would deny the study of the very elements that define TEK with the local Little Red River Cree.

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In order to plan the research approach, I was referred to one key elder for each of the communities of John D'Or Prairie and Fox Lake. As key elders, Alexis Meneen from Fox Lake and Malcolm Auger from John D'Or Prairie were identified. Meetings were held individually with each elder in an office in their respective residential community. Both elders have many years of experience on the land. In the past, Mr. Meneen was active as councilor for the band's environment portfolio. Mr. Auger is still active as the LRR Cree bison monitor on his trapline. Each elder contributed different aspects and perspectives on how to approach the project. At the beginning of each meeting with an elder, I presented a gift of tobacco in accordance with traditional local protocol. One meeting was held in English, the other was held in Cree, involving the liaison as translator. At these meetings I would ask the elder about his opinion on how I can best learn about his knowledge of the land and the animals. Both elders were very clear in pointing out that the best way for me to learn from them was to accompany them on the land (see also quotes in Chapter 2, p. 19). At the end of the office meeting with Mr. Auger, he invited me to see hide racks and to explain to me how to cure hides. In the afternoon we visited his trapline and discussed a broad variety of ecological issues. Although I did not achieve my aim to formally discuss the project methodology in the second meeting, the action of Mr. Auger made a clear statement on how to approach this research. Discussing traditional knowledge in a somewhat formal setting was apparently not a way he wanted to communicate his knowledge. I accepted this and left the initiative to him. In this case I was rewarded with rich information on tanning, the use of hides, animal diseases, impacts of forestry on habitat change, and the failures of reforestation attempts.

Project Modifications

The original plan for this study was to centre the documentation of critical wildlife habitat around three important ungulate species found on the traditional lands of the LRR/TC First Nations: moose (*Alces alces andersoni*), woodland caribou (*Rangifer tarandus caribou*) and bison (*Bison bison athabascae*). After conceptual meetings with Little Red River Cree elders it soon became clear that the ungulate approach to the documentation of critical habitat was somewhat restrictive. This is due to three reasons:

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1. The local people hold a very holistic philosophy on nature that emphasizes the interconnectedness of all animate and inanimate components of the environment.[2]
2. Although hunting is now of particular importance, most of the elders with knowledge of the land are, or have been, active trappers. Trapping used to be a vital part of the local subsistence economy. Consequently, changes in furbearer habitat are of central importance to these participants.
3. The influence of forestry industry and oil and gas development activities, as well as outside hunters, are of major concern to local elders who pointed out that these activities are closely linked to their environmental and wildlife observations.

To approach the critical habitat documentation from a restricted ungulate perspective would have excluded a vast pool of knowledge derived from personal interest of the individual elders. Instead of focusing only on three ungulate species I preferred to use an ecosystem approach that allowed me to utilize the different dimensions of information in an applied way. Critical ungulate habitat is still at the centre of this approach. However, other issues like furbearer habitat, the effects of forestry, and oil and gas development, play major roles in such habitat and have relevance to inform decision-making on land use in this region.

Issues of Ethics, Consent, and Confidentiality

Before beginning my fieldwork, the research project had to undergo the ethics review by the University of Alberta's Faculty of Agriculture, Forestry, and Home Economics' *Human Ethics Committee*, and was formally approved in June 1999[3].

The individual participants and informants were given the option to be identified or to remain anonymous in subsequent outcome documents. The policy of some community-based studies is to keep the identity of the informants confidential (e.g. Lewis 1982, Pyc 1998, Gates et al. 2001a). Standard human ethics procedures often protect the identity of study participants. In this study, confidentiality of identities was not the aim. TEK research inhibits the danger of interfering with long established social structures by turning individual knowledge into common knowledge. If

[2] In the context of forestry Alexis Meneen explained that the LRRC do not only see the tree, but when speaking of the tree they see the deer that comes by and the squirrel that lives in the tree (Personal minutes, Fox Lake, March 19, 1999).
[3] Please see Appendix 1 and 2 for consent form and information sheet.

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individually held knowledge becomes publicly accessible without consultation with the original knowledge keeper, this person can be faced with a situation of disempowerment and a reduction of local status. In my thesis, original knowledge on wildlife and critical habitat is credited to the person who provided it, if the person agreed to be identified. I believe that by identifying and crediting the original keepers of TEK I decreased this risk and supported the position of the knowledge keepers by publicly acknowledging their knowledge and contribution. In the last decade, researchers such as Cruikshank (1991) and Fienup-Riordan (1990) used a form of publication that credits the elders and community members involved as original knowledge keepers. Freeman (1976) and Freeman et al. (1998) also identified the need to give credit to the original keepers of traditional knowledge. A number of current traditional knowledge studies (e.g. Nakashima 1990, Beardy and Coutts 1996, Gwich'in Renewable Resources Board 1997, McDonald et al. 1997, and Thorpe et al. 2001) all include direct quotes crediting the informants.

In a few cases I felt that a person's identity needed to be protected (e.g. around politically sensitive issues or personal comments), thus I chose to use a coded interview number rather than identify the person. All transcripts were treated confidentially, however, I asked each participant for permission to use all information shared and to explicitly identify special situations where the individual participant wanted the knowledge to be kept confidential. On several occasions participants asked me to stop the tape-recorder when sensitive information was given. Research like this is centred on a trust relationship between the researcher and the community. The researcher needs to be committed to not use any information that would harm individuals or the community or is considered too sensitive for inclusion in a study. In situations of doubt, I asked the participant to confirm how I should treat the shared knowledge.

Applied Methods and Encountered Problems

The selection of participants can be described as purposive. The community liaisons were essential in identifying and contacting potential informants. I asked the liaisons to suggest knowledgeable experts on the basis of their traditional lifestyle on the land, knowledge and practice of hunting and trapping, and/or experience at communicating traditional knowledge. About half of the participants were over 55 years old, with the majority being over 60; the younger participants were at least 35 years old, with the majority being in their mid- to late 40s.

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Overall, the data collection became a combination of knowledge sharing and transfer out-on-the-land where possible, and indoor interviews where necessary or convenient. Many traditional knowledge experts and liaisons were experienced in working with researchers who preferred conducting indoor interviews. TEK experts and liaisons therefore seemed to expect that I, like other researchers, would prefer this approach to data collection. Consequently, participants often chose the indoor interview situation rather than the out-on-the-land option. Most of the data collection was conducted in the following way: A liaison would contact an elder and inform him or her about the research. The elder then was asked if he or she would be willing to participate. Several elders chose not to participate. If the elder was interested, the liaison would provide more details about the type of knowledge I was seeking. On many occasions the liaison arranged for an opportunity for me to introduce myself to the elder before the interview. We would arrange to meet with the elder a few days later, which gave the participant time to prepare for the interview. Generally, most interviews were open-ended and unstructured. The trips on the land, all of which were arranged specifically for the purpose of explaining certain habitat concepts to me, can be described as a combination of participant observation and unstructured open-ended interviews. In this collection of interviews on critical wildlife habitat, traditional knowledge experts contributed detailed observations on specific animal species, their behaviour, food choices, and habitat preferences. TEK experts also guided me to related issues. For example, many interviews contain interesting details about the relationship of people with the land and the animals, as well as environmental changes and their attributed causes such as forestry and other human activities.

In total, I spent three months in the Little Red River Communities, from June 15 - September 14, 1999. During this time, 20 traditional knowledge experts were actively involved and contributed their knowledge. Transcripts were made of 24 interviews, out of which 15 were recorded on tape and nine were documented by taking written notes. The transcription of each tape took on average nine to ten hours. All together it added up to over 185 pages of written interview transcripts. Many participants also marked areas of critical wildlife habitat on map overlays. These overlays contain observations of animal sightings and tracks at certain times of the year, and preferred hunting areas for certain species. In total 15 map overlays were collected.

Several field trips were made into the southern and south-eastern edges of the Caribou Mountains, as well as a fieldtrip from Garden River to Big Slough and one fieldtrip to the area south-west of Garden River. In total, I spent nine days with TEK experts on the land.

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On August 2, 2001 Dr. Krogman and I held a workshop at Fox Lake, where eleven elders, hunters and trappers participated. After informing the participants about the progress of the project, we were able to clarify our understanding of the traditional knowledge map data and to gather more in-depth information on ungulate distribution and habitat use in the region. The results of this workshop became an important tool for triangulation of previously gathered interview data.

An open and flexible approach to methodology allowed me to reach my data collection goals despite a variety of problems that I encountered. The first challenge was to adjust the project to a reduced budget. The reduced budget primarily affected my mapping component, which changed from a field mapping approach to an interview-based mapping approach. I focused on gaining a qualitative set of map data through the accounts of the traditional knowledge experts.

Chief Johnsen Sewepagaham and the late band manager Richard Dumaine recommended excellent local liaisons to us. The liaison is central for the success of this kind of work. A liaison introduces the researcher to the participant in a culturally-appropriate way and mediates between the researcher and the participant. The liaison is also crucial as a translator for the researcher to communicate with predominantly Cree-speaking informants. Given I paid the liaisons on an hourly basis, they had to juggle accommodating my interests to meet with TEK experts within their own work schedules.

The choice of field season provided the next major challenge. In the boreal forest regions, the summer can be a difficult season to conduct fieldwork if the budget does not provide for expensive and reliable means of transportation. Traditionally, Native trappers and hunters visited the Caribou Mountains during late fall, winter and early spring – partly because it is very difficult to access during summer, and partly because all the trapping takes place during the cold months. I would have liked to include field mapping in the eastern part of the Caribou Mountains, however, this region is difficult to reach during the summer because the area contains many creeks and is dominated by muskeg. During the summer season of 1999, the Caribou Mountains had unusually high precipitation, which made it impossible to access the site by quad (ATV). The tight budget did not allow for alternative transportation such as helicopter or airplane transportation. Transportation over land was challenging during most of the field season because of the rainy summer. After three hours of rain, the road from John D'Or Prairie to Garden River would become so muddy that it was impossible to drive it with my two-wheel-drive truck. I sometimes had the opportunity to use band-chartered air transportation. However, sometimes the rain soaked

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the airstrips so thoroughly that I had to stay one or two days longer in the community I had planned to leave.

The summer is also a season where it can be difficult to contact and reach people. Many activities take place that require extensive travelling. It is the season where the whole family can travel because the children are not in school. During my field season in 1999 a variety of events interfered with the fieldwork. There was the Treaty Eight Centennial at Grouard, and the local Treaty Eight Centennial at Little Red River. Also, may people participated in the annual Lac St. Anne Pilgrimage, and the Pilgrimage at Little Red River. Each event was three to seven days long and required a few days of preparation ahead as well as time for travelling. It is easier to contact and meet with people during the winter. Figure 4.1 provides an overview of seasonal Little Red River Cree activities. The diagram includes information derived from interviews, personal communication with local residents, and personal observations. Also, elder Malcolm Auger was involved in the design of this diagram. At the workshop in Fox Lake, the diagram (and all following ungulate cycle diagrams) was presented to the elders, who confirmed their accuracy.

Physical relocation of the computer that contained the Little Red River/Tallcree *Lighthouse Database* (an integrated data management system), and a band decision to abandon *Lighthouse* in favour for *ArcView* (a Geographic Information System) was responsible for some delays in planning the mapping component. On September 17, 2001 Dr. Naomi Krogman and I met with Little Red River representatives Jim Webb, Tim Gautier, and Ron Leframbois to discuss the digitization of map data. We were granted access to LRR Cree forestry inventory data through Timberline Forest Inventory Consultants. An arrangement was made in which Little Red River Cree intern Ramona Sewepagaham assisted in the digitization of the map overlays. The digitization and transfer of electronic data commenced in early October and lasted for two weeks. The final analysis and completion of maps was done in the University of Alberta Renewable Resources' Spatial Information Systems laboratory between November 2001 and April 2002.

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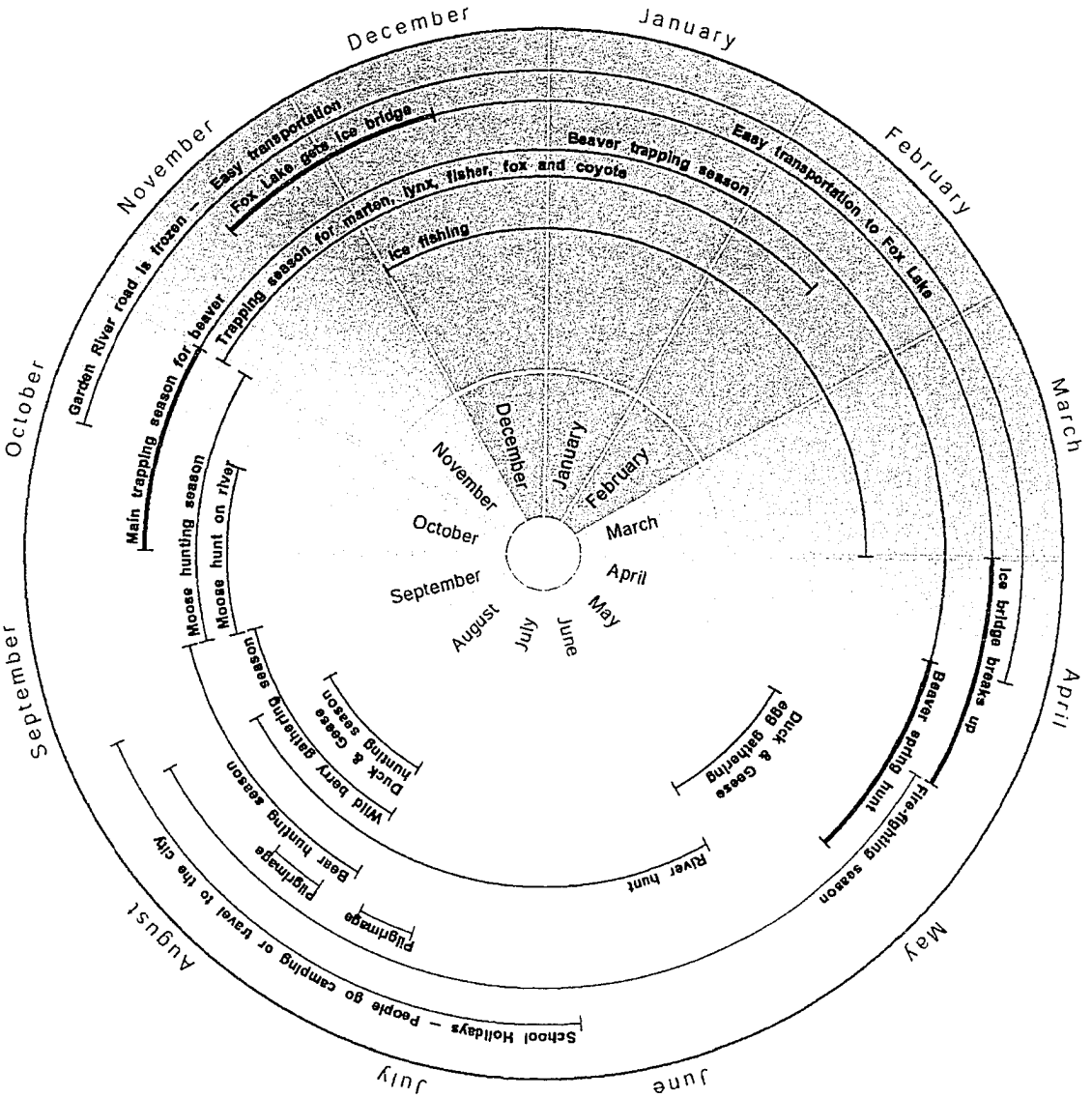

Figure 3.1: Little Red River Cree seasonal activities

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Data Analysis

For the analysis of my data I chose two different approaches:

1. An analysis of interview transcripts with the help of the qualitative data analysis program *QSR NUD*IST*, and
2. An analysis of interview data and map overlay data with the help of the Geographic Information System (GIS) *ArcView*.

Working with QSR NUD*IST

For the first part of the data analysis I used the qualitative data analysis program QSR NUD*IST (Non-numerical Unstructured Data Indexing Searching and Theorizing). I developed a coding system based on two theme groups: 1) Wildlife, and 2) Free Categories. The wildlife theme group holds data on ten specific animals, three animal pairs, and one category with rarely mentioned species. The wildlife theme contains all information on specific animals, including habitat and behavioural information, as well as Aboriginal use of particular species. The Free Categories include all major theme groups (12 in total) that emerged from the interviews, like human-animal relationships, specific resource conflicts, human/natural disturbance, and predator/prey relationships. I applied this coding system to all 24 transcripts, with multiple codings being the standard. An interview passage on wolf predation on bison, for example, was placed in the 'bison' and 'wolf' folders as well as into the 'predator-prey' folder.

Since ungulates were of particular interest in this study, the largest amount of data is on caribou (1079 text units), followed by bison and moose. The data-amount on wolves is comparatively large due to their importance as a predator species for all three ungulate species.

The transcripts contain considerable information on environmental and ecological relationships, resource conflicts, human and natural disturbance, and human-environment relationships. The 'lifestyle' category is the largest because it contains all the background information that participants contributed in order for me to better understand their affiliation with the land and its resources (e.g., location of traplines and camps, or changes in the subsistence economy). 'Learning' is the second largest category in the Free Categories theme group because the First Nation participants spent some time explaining how TEK knowledge transfer takes place. The next category contains data on local human-animal relationships. This is an important category

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because it explains how local traditional environmental knowledge relates to critical wildlife habitat. The following example provides insight into issues arising from this category: In bio-sciences, humans are generally regarded as predators, which means that a prey species such as moose will try to avoid the human predator as a survival strategy. However, many Little Red River Cree hunters mentioned that they were given a moose or bear by the Creator in order to feed their families. During the hunt the animal might have been in a situation to escape but chose not to do so. This information is extremely important because it shows that traditional knowledge experts and biologists do not always share the same assumptions and that therefore traditional knowledge has to be interpreted in accordance with the cultural values within which it is presented.

Following the coding process, the interview information of each ungulate category was condensed to its essential information. These condensed data sheets were reviewed by several wildlife specialists to ensure that new and unusual information would not be overlooked.

During my analysis I worked extensively with QSR NUD*IST. The program made the analysis of the different interviews much more efficient. My coded theme groups (categories) granted me quick access to original interview data on specific topics and the use of the search option became a favourite tool.

Working with ArcView

Timberline Forest Inventory Consultants were able to provide two digital data sets. The first data set (referred to as the Footner data set) contains information about Forest Management Units F2, F5, and F7; the second data set (referred to as the Little Red River data set) contains information for F3, F4, F6, and parts of F2 and F5 (see Figure 3). No data were available for F10 and Wood Buffalo National Park. Both data sets contained Alberta Vegetation Inventory data, as well as data on rivers, lakes, administrative boundaries, and more. The data sets, however, were not organized in the same way and thus finding relevant data was a tedious undertaking. Figure 4.2 shows a simplified model of existing data sets and their availability for analysis. The circle represents the area covered by my own data. The uneven boundaries on the maps resulted from the data limitations of the two digital data sets.

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At Timberline, my map overlays were digitized in *ArcInfo* according to ungulate species. My data include information on F10 and Wood Buffalo National Park. I chose to include this information because the data will return to the band, and the band may wish to complete the maps once AVI data for F10 is available and comparable data for Wood Buffalo National Park is accessible.[4]

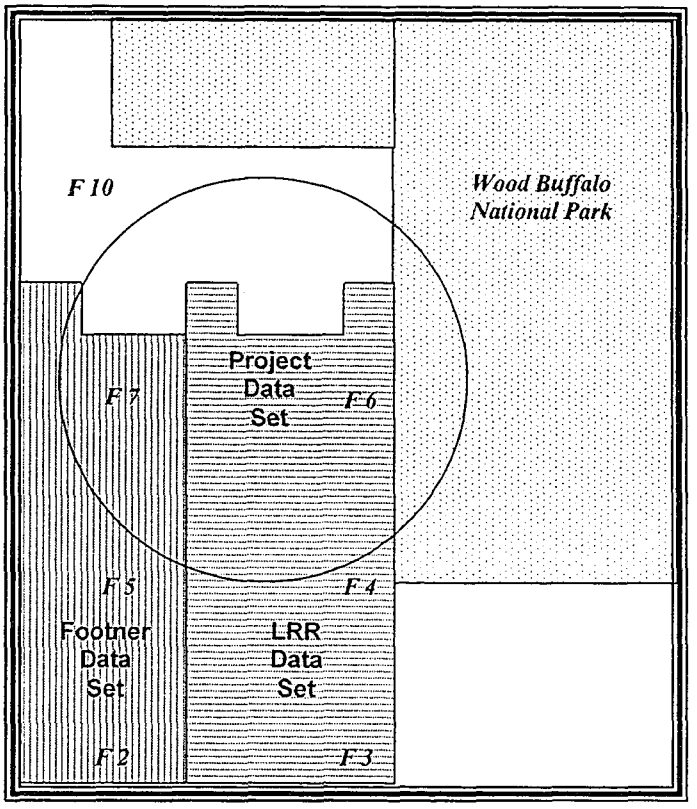

Figure 3.2: Simplified model of data sets

In the GIS analysis, I combined the Footner/LRR (forest inventory) data sets with information from my interviews and my map overlays in order to produce maps that visually explain the information the traditional knowledge experts gave to me. Five ungulate maps were produced: two caribou maps, two bison maps, and one moose map. The reason for the uneven number is that caribou and bison are herd animals that live in definable territories, which made it easy for participants to draw herd information on map overlays. Moose, in contrast, travel alone or in

[4] The Park possesses three digital data sets: Landsat MSS vegetation map, WBNP Biophysical Inventory, and Timberbeth 408. The Timberberth 408 data set seems to be the most compatible to the ones used in this study. Information on Wood Buffalo National Park digital data sets was provided by Christina Kaeser (e-mail correspondence April 30, 2002).

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pairs, and do not stay in a particular territory. I consequently gathered fewer map overlay data on moose.

In a first step, I created maps that are based on the map overlay data. These maps contain lines and polygons that show the distribution of herds, as well as single events. In a second step I produced maps that contain some information of the first set, added by information that was provided in the interviews. In the field situation, participants drew polygons on map overlays that identified particular general or seasonal habitat. On other occasions they chose not to draw the information – mainly when it was a generalized observation that covered a large range. For example, the information that caribou cows stay close to the lakes on the plateau in summer was clear without needing to be marked on the map overlays. In the GIS laboratory, I included this information by creating a buffer zone around the plateau lakes.

In the analysis I compared the Footner/LRR (forest inventory) data sets with information from my interviews and my map overlays. Spatial information that participants had related to me during the drawing of the map overlays reappeared in the forest inventory sets. Participants, for example, who had marked the critical spring habitat for woodland caribou in the Caribou Mountains on a map overlay, had linked the information to the presence of arboreal lichen on spruce trees along the southern rim of the escarpment. The forest inventory data confirmed the presence of spruce trees in the zone identified by the elders. During the analysis for all three ungulate species the two data sets complimented each other. Access to the forest inventory data on human and natural disturbances proved to be particularly helpful.

Nature of the Data

Traditional knowledge studies like this provide a 'snapshot' in time and should not be used as final and ultimate results. The reason lies in the dynamic nature of the data, which changes as the knowledge keepers and the environment change.

Traditional environmental knowledge data are primarily observational. People constantly observe wildlife movements and changes in the environment, whether they are travelling, hunting, or working. Certain biases are attached to these data. These biases are related to travel routes, preferred hunting seasons, access to lands, as well as the age, lifestyle and occupation of the

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observer. In the Caribou Mountains, for example, seasonality of observations has changed somewhat due to changes in lifestyle. In the past, trappers used to stay in their cabins on their traplines during fall, winter, and early spring, mainly because the pelt of furbearers is in prime condition then. The Caribou Mountains are difficult to access in summer, thus most trappers do not stay there during summer months. With the introduction of fire fighting in the Caribou Mountains, local fire fighters now gain access to the region during summer and increase their summer observations. Also, observations are linked to human travel corridors and activity. Consequently, much of the knowledge is derived from traveling by boat on major rivers and creeks, driving a vehicle on a road, or using a skidoo or quad on a seismic line.

The knowledge on particular subjects varies across the communities. Participants who have herd animals such as bison and caribou on their traplines tend to know the most about these species. I found that participants were comfortable admitting if they had no particular detailed knowledge about a particular animal. These participants would refer me to people who they considered experts on the issue. During the field season, a number of names were frequently mentioned. These experts tended to provide very detailed observations. The peer recognition increased my confidence in the observations of these experts. The varying levels of expertise and the fact that not all experts were able to participate prompted me to refrain from any attempts to quantify interview data. This differs from the approach taken by Gates et al. (2001a) in their study of local knowledge of bison movement and distribution in Northern Canada. In their map on movement corridors and water crossings, Gates et al. treated information provided by each participant with the same weight. They used a color code where the same information provided by five informants was assigned the darkest shade, and information provided by just one participant had the lightest shade. I believe that such a quantitative approach does not take into consideration the differences in expertise and knowledge depth between participants. Gates et al.'s (2001a) approach assumes that knowledge contributions are generally more powerful if stated repeatedly. In my study I found that very knowledgeable individuals held unique knowledge on specific issues that no other participant was able to confirm or provide. I do, however, particularly trust these unique knowledge contributions because the informants who shared them are viewed as experts within their communities.

Access to land limits the ability of individuals to gather information. This is particularly evident along the border to Wood Buffalo National Park. Generally, only hereditary LRR Cree residents, mainly from Garden River, are allowed to hunt and trap in the Park. Most LRR residents from

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Fox Lake and John D'Or Prairie, even though they are also descendants of the original inhabitants of the region, are excluded from this privilege. As a result, information on animal movements often end along the border – which becomes visible on my map overlay data.

There are many people with particular knowledge in the three communities. However, not every knowledge keeper is willing to talk to a researcher. During the beginning of the field season some residents of Garden River were concerned that I might be an environmental activist and chose to not participate in the study, due to their perceived impact that environmental activists had on the fur market in the early 1980s. Near the end of the field season, this perception seemed to change. However, inclement weather conditions made it impossible to return to the community. Consequently, this project includes limited data on the region west and north of Garden River.

Limitations and Strengths of Methodology

The methods applied in this study show strengths and limitations like most other research projects. Many bio-scientists may perceive the lack of quantitative data gathered from this research as a point to be criticized. Bio-scientists, who are used to working with set protocols for gaining observational data or who use experiments in reductive approaches may find the methods, analysis and organizational structure of this study 'unscientific'. The preference of an interview style that leaves the choice of direction to both participant and interviewer (unstructured, open-ended) has the disadvantage that not all aspects of wildlife and habitat information will be covered in each interview, hence the choice of structured or semi-structured questionnaires by most bio-scientific researchers involved in TEK research. This study, however, was concerned with the documentation of ungulate knowledge that TEK experts considered important. Incorporating a quantitative approach to interview questions would have disrupted the flow of the interview and led away from the topics important to TEK experts. The interview style chosen in this project had the advantage that participants felt comfortable sharing important background information that could lead to new or different explanations of observations and phenomena. It also provided the researcher with more detail about TEK as a knowledge system and the forms in which it is communicated.

The change from a field-mapping component to an interview-based mapping component for the documentation of critical habitat is a disadvantage that arose from monetary and logistical

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constraints. Nonetheless, the interview based map data show remarkable precision in correspondence with vegetation, geographical or other features (e.g. the southern limit for woodland caribou habitat corresponds with the white spruce zone in the southern Caribou Mountains, and the site of a large fire drawn by hand by an elder on a map overlay corresponds well with the limits for the same site provided in one of the digital AVI data sets – see caribou maps 6.1 and 6.2).

Dissemination of Information

The results of this project are distributed in a variety of ways. Two project reports (Schramm and Krogman 2001, Schramm 2002) containing preliminary and final results and maps were prepared for the Sustainable Forest Management Network (SFMN) and are available on the SFMN web page[5]. The research and its results was also presented at several conferences (e.g. Schramm et al. 2000, Schramm and Krogman 2000 and 2002). Additionally, I plan to publish the results in relevant wildlife, environmental, and social scientific journals (e.g., Journal for Wildlife Management, Rangifer, Northern Perspectives). The cycle diagrams could be suitable for use in local schools. Posters of the cycle diagrams for the schools in John D'Or Prairie, Fox Lake, and Garden River is another way I may disseminate information from this research.

All digitized original map data, together with digital files generated during the GIS analysis (in ArcView format), the final ungulate habitat maps, ungulate cycle diagrams, and transcripts of the interviews were forwarded to the Little Red River Cree Nation. Further, SFMN sent copies of the latest project report (Schramm 2002) and copies of the cycle diagrams to all participants.

[5] http://sfm-1.biology.ualberta.ca/

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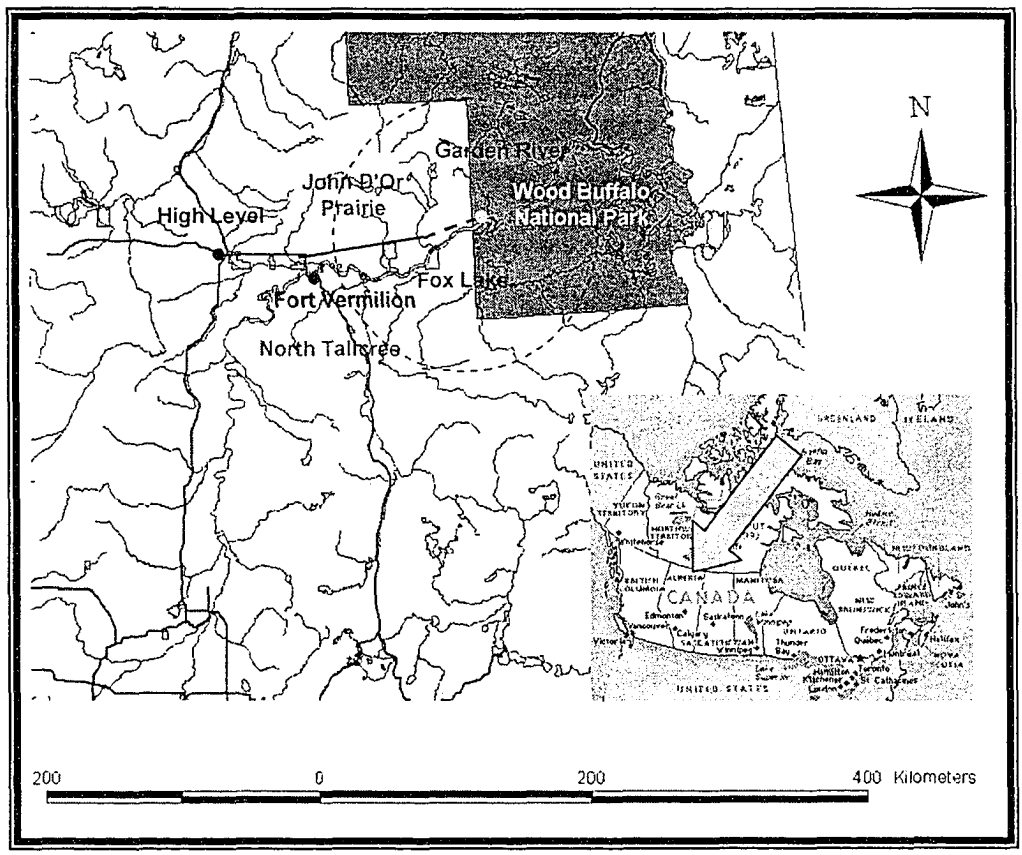
4 RESEARCH SETTING

The Little Red River Cree Nation (LRRCN), as host nation, suggested that the focus of this research should be on the traditional lands[1] of the Little Red River Cree, situated in north-central Alberta, about 770 km north of Edmonton. To the north of the Peace River these traditional lands reach approximately from John D'Or Prairie in the west to Jackfish River Settlement in Wood Buffalo National Park in the east, and include the central and western parts of the southern Caribou Mountains. South of the Peace River, local people traditionally use the lands from the Wabasca River in the west to Jackfish River Settlement in the east in Wood Buffalo National Park. To the south the traditional lands reach approximately to Harper Creek/Birch River.[2]



Map 4.1: Little Red River Cree traditional lands

[1] In this study the term *traditional lands* refers to territory used and occupied by the Little Red River Cree people for several generations. As Don Aubrey (2002, pers. com.), Wood Buffalo National Park, points out, it is a term that also carries a political notion and as such it is not accepted by Parks Canada. The Park chooses the term *Group Trapping Area* when referring to territory used and occupied by LRRC people inside Wood Buffalo National Park.

[2] 59°90'N to 57°80' N - 115°50'W to 113°W

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The creation of Wood Buffalo National Park disrupted the former access of all LRRCN members to resources in the Park. Trappers from Garden River, however, hold Group Trapping Areas in the south-western parts of the Park[3]. In terms of Forest Management Units[4] (FMUs) the Little Red River Cree Nation, together with the Tallcree First Nation, is currently involved in the planning and management of FMUs F2, F3, F4, F5, F6, F7, and parts of F10 and A9.

Portrait of the Host Nation and Project Region

The Little Red River Cree and Tallcree are Nehiyaw sakawiyiniwak[5], who share their language, the Cree Y-dialect[6], with the Plains Cree of central Alberta and Saskatchewan. In the anthropological literature the Cree people of northern Alberta are referred to as Woodland Cree (Dempsey 1997), and Strongwoods Cree/ Bois Fort Cree (Smith 1981). When referring to themselves in the English language, many northern Alberta Cree people choose the term Bush Cree. Recently, Sinclair (1999), Candler (1999) and Mader (1996) have chosen to use this term in their dissertations. In this work I mainly use the term Woodland Cree, although I refer to Strongwoods Cree when the term is used in an original source.

History of the Region

Between 10,000 to 13,000 years ago the large glaciers of the last ice age disappeared from northern Alberta. It is possible that the first humans reached the project region during this time period. The shape of stone tools found in the Birch Mountains indicates that humans were present in the region in the early prehistoric period, about 10,000 years ago (Ives 1993). The earliest evidence for human occupation in the project region was found at the south side of Wentzel Lake in the Caribou Mountains. Radiocarbon dating indicates that humans used the site 5200 years ago (Ives 1993). The other major archaeological site is at Peace Point in Wood Buffalo National Park

[3] For details please see subchapter on Wood Buffalo National Park in Chapter 3.
[4] Forest Management Unit (FMU) is: "A defined area of forest land located in the Green Area and designated by the government to be managed."
Government of Alberta http://www3.gov.ab.ca/srd/forests/fmd/directives/glossary.html [last accessed October 28, 2004].
[5] Local elder Malcolm Auger translates the term as *Indian bush people.*
[6] There are five major Cree dialects: Plains Cree (Y-dialect) – Southern Saskatchewan and Alberta, Woods Cree (Th-dialect) – Northern Saskatchewan and some areas of Manitoba, Swampy Cree (N-dialect) – Northern Ontario and Saskatchewan and the interior of Manitoba, Moose Cree (L-dialect) – Moose Factory and Hudson Bay area, and Atihkamek Cree (R-dialect) – Quebec.

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(Stevenson 1986). This site yielded 16 layers with stone and bone fragments associated with human occupation, the oldest layer (Level 1) indicating habitation from 2210 ± 155 to 2190 ± 270 B.P., the youngest reaching into historic times. Many layers yielded bones of animals not present in the region today. Level 1, for example, contained wapiti (*Cervus elaphus*) bones, and a test pit at Level 11 contained the upper jaw of a grizzly bear (*Ursus arctos*, 1370 ± 90 B.P.), both indicating a more open parkland environment than today. With the exception of Levels 2, 4, 8, 10, and 15 artiodactyla (even-toed hoofed mammal) bones were present in all other levels. Bison, elk and moose bones were present in the oldest level; a caribou bone was only identified once, in Level 12 (1365 ± 90 to 1370 ± 90 B.P) (Stevenson 1986).

Many studies on Cree pre-European history assume that the Cree came to western Canada in the wake of the expanding fur trade (e.g., Bryan 1969, Buckley 1992, Ray 1974). This assumption is largely based on interpretations of Mackenzie's account of his journeys to the Arctic Ocean in 1789 and to the Pacific Ocean in 1793 (Gillespie 1981). The eastern Cree had been involved early with the fur trade and, according to many scientists, had early access to modern weapons that allowed them to drive a successful expansion to the West (e.g. Ray 1974, Bryan 1969). James Smith (1981) points out that there is evidence that the Strongwoods Cree had long been present in the west, and that it apparently was merely the name *Cree* that traveled westward in the late eighteenth and early nineteenth century. Archaeological evidence supports the view that Cree people had already settled in western Saskatchewan and eastern Alberta at least since A.D. 1400 (J. Smith 1987). It might be likely that the western Cree were historically not identified as Cree because of their cultural and linguistic differences from their Eastern counterparts. James Smith (1981) states that the Strongwoods Cree have generally been known to settle in the boreal forest of Alberta and Saskatchewan north of the Saskatchewan River. Following the smallpox epidemic of 1781, which greatly affected the Western Cree, Strongwoods Cree seem to have temporarily moved south towards the Saskatchewan River drainage. From the north it appears that the Chipewyan (today's Woodland Cree neighbours to the north and west) moved into the abandoned regions in the boreal forest of northern Saskatchewan and north-eastern Alberta (J. Smith 1981).

Historical documents state that the area along the Peace River around Wood Buffalo National Park had over time been claimed by and was fought for by the Woodland Cree as well as the Dunne-za (Beaver), Dene Thaa (Slavey), and Chipewyan. In 1792, Alexander Mackenzie described the history of Peace Point in Wood Buffalo National Park (Mackenzie 1971). According to his version, the Cree invaded the country that was formerly occupied by Beaver

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Indians and neighbouring Slaveys. The Cree drove the Slaveys downstream of the Peace River and the Beaver upstream and, at the subsequent peace treaty, Peace Point was determined to be the boundary. Some research suggests (e.g. Ferguson 1999) that the Vermilion Chutes provided a natural boundary between the Beaver to the north-west and the Woodland Cree to the south-east. Angel's (1990) research on the fur trade relations between the Beaver Indians and the trading post at Fort Vermilion between 1821-1846 show that Beaver hunting territories reached into the south-western Caribou Mountains and included the region between the Wabasca and Mikkwa Rivers south of Fort Vermilion. Cindy Pyc quotes a Garden River resident (Pyc 1998, p. 9 First Nation Interview #04 and FN2, Personal Communication. Brackets added.)

> Several families had traveled northwest together to find land suitable for hunting and trapping. The Beaver and Chipewyan met them and a battle took place. The Cree were losing and some people were sent for aid. "Old Sewepagaham" brought his families to help and the Beaver and Chipewan *[Chipewyan]*were defeated. We still live between the Dene *[Beaver, to the east]* and the Chipewan *[to the west]*.

Until the height of the fur trade, the north-western Woodland Cree lived a seasonal nomadic lifestyle in small family groups. The fur trade reached the region when the Northwest Company established a trading post at Lake Athabasca in 1788. The location was later moved closer to the Peace River Delta and became the present day Fort Chipewyan. In 1798 Fort Vermilion I was founded by the Northwest Company and moved downstream a few years later to the present site of Fort Vermilion. In the early years of fur trade in the region, Fort Vermilion was mainly a Beaver Indian trading post.

Diseases heavily impacted human populations of the region. In 1781, smallpox reached Athabasca and decimated the Cree population to the south-east (Angel 1990). In the years before 1822, district reports from the Fort Vermilion region reveal that the population of Beaver Indians had dramatically declined, which was attributed to the presence of 'a consumption'. In 1835 several leaders of Beaver Indian hunting bands died from influenza, leading to starvation of their family members (Angel 1990). Epidemics continued to affect Native communities until the first third of the 20th century. Influenza epidemics in the Wood Buffalo National Park region are recorded for 1921-22 and 1928, and a measles epidemic affected the region in 1935 (Wein 1989). Between 1887-88, Wein (1989) further notes a period of starvation due to over-hunting and over-trapping. In 1938 the region also experienced a severe food shortage, leading many people to rely on squirrel.

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Many of the current Little Red River families, like the Nanoochs, Sewepagahams, Laboucans, Blesses, and others have lived in the area for many generations. Many families had traditional areas where they lived and trapped and some geographic features carry their names (e.g., Nanuche Lake). Daniel Loonskin from Fox Lake[7] explains where some LRR Cree families used to live and how local place names indicate their connection to the land:

> *You know, in my time we used to live in Big Island, in the forties.* [...] *[W]ithin that Big Island in that area, there most of the people used to live around this area* [Daniel Loonskin points to the area on a map]. *Mostly people from Garden River. All the Nanoochs and Sewepagahams, and Grandjambes, Blesses, they all lived throughout that area. We used to live here in Fisheries* [Little Fishery, on the Peace River east of Garden River] *when people used to live here. Yeah, this is where we used to live. And the store* [5th Meridian store] *used to be here. This used to be a full* [or four?] *day trip to go down here - by dogs. And you're probably looking at a couple of days by paddling with the canoe. There was no such thing as an outboard in those days.* [...]*There is trails in here with names, we named, you know, in a native way. In a certain place, you know, whether somebody killed a moose or somebody lost a dog, or whatever, you know. There's a road through here that's got a name just about at every stop. Probably one stop in a certain area where they stayed over night* [...?].

In the past, some of the above mentioned families, who occupied what is now the western part of Wood Buffalo National Park and the region south of Fox Lake traded at Fort Chipewayan. Other families, like the Augers, joined the Little Red River Band from the south and recall that their grandparents or great-grandparents came from the Wabasca or Lesser Slave Lake regions around the early 1900s.[8] These families are still closely related to the Cree people of Tallcree, Trout Lake, and Wabasca. Ferguson (1999, p. 4) documents, that:

> The migration of Cree into the area was a gradual process. During the 1830-40s, parties of Cree occasionally passed through the region, travelling down Loon River (now called Wabasca River) on their way to Fort Chipewyan. Frequent and longer visits were paid by two brothers, Baptiste and Alexis Auger, to the Fort Vermilion and Fort Dunvegan areas during these decades. These two brothers were described as being from the head of the Loon River, and were undoubtedly representatives of the Auger family at Trout Lakes. Such visits turned into a migration north from Trout Lakes. By the mid 1870s, a permanent group of Cree occupied the lower Loon River and Little Red River area.

From 1871 to the mid 1880s the Hudson's Bay Company maintained a small trading post at the mouth of the Little Red River. During this time the Woodland Cree who regularly traded at this post formed into a trading post band known as the Little Red River Cree (Lore 1990). Smaller trading posts were also built at Fifth Meridian, Garden River, Big Slough, Little Fishery, and at the Jackfish River Settlement.

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[7] Interview at Fox Lake, August 24, 1999

[8] Malcolm Auger, personal communication May 2, 2001.

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In 1899 the Treaty 8 commission visited the region. The headman Kuis Kuis Kow Ca Poohoo of the Tallcree signed Treaty at Fort Vermilion on the 8th of July, 1899. Likewise, the headman[9] of the Little Red River Cree also signed an adhesion to Treaty 8[10] on the 8th of July, 1899, together with 65 other members of the band at Little Red River. Bishop Grouard's account documents that the signing of the Treaty was not an easy decision for the local Little Red River Cree headman (Grouard 1923)[11]:

> At the Little River, I had to resolve a case of conscience of a new kind. The Cree chief for this place, recently converted, and in the fervour of his new faith, had some qualms dealing with the treaty. He said he was waiting for the bishop, so that he could consult him before signing. This is how he explained to me his predicament:
> "The government is proposing that we give up our land, and in return they are offering us money. However, I have not created this land, it was the Good Lord who created the sky and the earth. So, if I receive this money, I will be guilty of theft, because I have sold something that did not belong to me."
> Is this not a great delicacy of conscience on the part of a poor Indian? I explained to him that this money was compensation. He understood, and without hesitation he accepted the offers made, signing the treaty.

The Little Red River settlement gained some importance when steam ships were introduced on the Peace-Athabasca route. Strategically located at the foot of the Vermilion Chutes, Little Red River was the westernmost settlement on this transportation route (Wetherell & Kmet 2000). Apart from this advantage, Little Red River was a seasonal settlement with otherwise little economic purpose (Wetherell & Kmet 2000).

In the late 19th and early 20th century, the lifestyle of most Woodland Cree continued to be semi-nomadic. Nuclear and extended families were the main social units. During late fall, winter, and early spring most families would stay on their traplines. By then, most families had log cabins on their traplines. In spring, people would visit the trading posts to sell the fur they trapped throughout the season. The summer months were often spent in fishing camps along the large rivers, where people stayed in tipis and tents. It was a time of gatherings, where several families would camp in one location. The late summer and early fall was spent securing supplies for the winter. Hunting game, fishing, preparing dry meat and dry fish, gathering berries, drying them,

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[9] In the *Statement of Indians Paid* as part of the documents of Treaty 8 (Mair 1908) it is documented that payments were made to 66 'Other Indians' at Little Red River. Although the accounts by Bishop Grouard (1923) and Charles Mair (1908) clearly document the signing of Treaty 8 by a headman of the Little Red River Cree, the *Statement of Indians Paid* does not document any transfer of payments to a headman ($22 for a headman, $12 for any other Treaty Indian). Instead the Treaty commission lists the band as part of the "Cree Band at Fort Vermilion" (Mair 1908, p. 184) – the Tallcree band, who's headman already had received the $22.

[10] For more details about Treaty 8 see subchapter on Land and Natural Resources.

[11] Translated from French into English by Theresa Morcos, Department of Renewable Resources, University of Alberta.

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and gathering herbs were important occupations. Before moving back to the traplines in the fall, the people would usually visit the trading posts to get supplies for the winter. Due to its location at the Peace River and its fur-rich hinterland, Fort Vermilion was the main Hudson's Bay Company post on the Peace River in the 1890s. During this period, it produced the company's highest fur returns in the Athabasca District (Wetherell and Kmet 2000). A depletion of wildlife, however, became more and more evident and ushered in the introduction of game laws in the late 1800s. At the turn of the century, tensions arose because large numbers of non-native trappers started to infiltrate the region. Having no long-standing personal affiliation with a particular territory, these trappers tended to move into a region and 'clean out' its furbearer populations, only to move into a new region when resources were depleted (Fumoleau 1973). This, in turn, led to times of personal hardship for local Native families, who were deprived of their livelihood.

Many Little Red River Cree families continued to live a fairly traditional lifestyle of hunting and trapping until the late 1950s and early 1960s. A decline in fur prices led to the allocation of family allowance funds to trapping families starting in the mid-1940s, and these were more intensely relied upon in the 1950s when severe trapping restrictions were imposed (1951-53). Families moved into settlements during this period (Wetherell and Kmet 2000, Little Red River Cree Nation and Institute of the Environment, University of Ottawa 2000). Additionally, it was government policy to strongly encourage aboriginal peoples to move to settlements on newly established reserves. In 1958, Fox Lake was founded as a reserve community; in 1969 John D'Or Prairie was created as a reserve on land suitable for agriculture to encourage people to undertake farming. Following the founding of a sawmill, Garden River was established as a tolerated settlement within Wood Buffalo Park (Pyc 1998) in the late 1960s, however, the community has no reserve status. The changes in location brought about a major change in lifestyle where people had to adapt from an independent family unit lifestyle where they lived in a remote place and made decisions quite freely within their own family structure[12], to a more restrictive community lifestyle where decisions were often mediated by a modern administration.

[12] The Treaty commissioners for Treaty 8, Laird, Ross, and McKenna note in their 1900 Report of Commissioners: "None of the tribes appear to have any very definite organization. They are held together mainly by the language bond. The chiefs and headmen are simply the most efficient hunters and trappers. They are not law-makers and leaders in the sense that the chiefs and headmen of the plains and of old Canada were. [...] It may be pointed out that hunting in the North differs from hunting as it was on the plains in that the Indians hunt in a wooded country and instead of moving in bands [they] go individually or in family groups." (Mair 1908, p. 180).

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Although school attendance for native children had been compulsory since 1894, it was not ensured until 1920 when all Native children between the age of seven and fifteen were required to attend school. In reality, this was a difficult task since most northern communities had no schools. Ten years later, in 1930, compulsory school attendance was reinforced through the Indian Act, which provided legislation for children to be committed to residential schools (Dickason 1996). In remote areas like northern Alberta, Native parents were forced to send their children to far away residential schools, often administered by the dominant regional church. Most Little Red River Cree children attended the Catholic residential school in Fort Vermilion, over 100 km away from their traditional lands. In residential schools, like the ones in Fort Vermilion and Grouard, the children were alienated from their own cultures and prohibited from speaking their languages. Many Little Red River community members recount times of personal hardship when they were forced to attended residential school in their early childhood. Recalling the context of language education and racism Florence Nanooch[13] shared her residential school experience:

> *[W]hen we used to be in the mission the sisters would* [...] *throw us in a tub with hot water and they'll just scrub us with [a] boar brush. Little brushes they used to use with soap, and they just scrub our skin. But the colour stays the same, it can't turn white.*

Clifford Ribbonleg[14] also shared his experience:

> *I was in the residential school for eleven years. But I totally lost my Cree. I came back when I was seventeen. I had to relearn my language. Relearn the whole thing. We were only allowed to speak Cree on Saturdays and Sundays. Totally, totally lost. We utter one Cree word, while we were at school, like Monday to Friday, we were punished, we were put in the corner for it. And it's our language.*

With the formation of Fox Lake and John D'Or Prairie, schools were established in Little Red River communities. The residential schools, however, left the legacy where one to two generations were forced to live away from their families and their culture during their childhood. Although many traditions and much of the traditional knowledge are still alive in the LRR communities, the knowledge transfer between the generations was greatly disrupted. There are now considerable differences in lifestyle between the generations. The majority of the grandparent generation (60 and older) grew up on the trapline, often without school education, and spent a large part of their lives on the land. Their grandchildren in contrast grew up in a reserve community with satellite television and moderate modern comfort. Changes in lifestyles coincided with the collapse of the fur market in the late 1970s, leading to a situation where many

[13] Interview in John D'Or, July 02, 1999
[14] Interview in Fox Lake, August 18, 1999

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families almost instantly shifted from a trapping lifestyle on the land to welfare dependency on the reserve. As Pyc's (1998) and Wein's (1989) research indicates, values and priorities are starting to change from one generation to the next. The younger generation does not consume as many different country foods, moose hunting strategies have changed, and younger people rarely stay on the land for longer periods of time. Although many young people try to uphold various values of the older generation, they do not have as strong a relationship with the land as the older generations (LRRCN and IE 2000).

Early British and Canadian Politics

In order to understand some of the current conflicts over natural resources in the project region it is important to mention the major historical events that led to today's distribution of power over land use decision-making.

In the seventeenth and eighteenth century European hat-fashion created a strong demand for beaver pelts. The exploitation of this wildlife resource in the vast interior of Canada became a race between English and French trading companies. The Company of Adventurers of England trading into Hudson Bay (commonly known as ***Hudson's Bay Company***[15] or HBC) was founded in ***1670***. A ***charter*** signed by ***Charles II of England*** granted the HBC a monopoly of commerce in all lands drained by the rivers flowing into Hudson and James Bays (Miller 1991). Furthermore, the Company was declared 'true and absolute Lordes and Proprietors' over these lands (Friesen 1987, p. 50). By dictating with whom the Native people of the western plains and boreal forest were to trade, this charter became the first step in the acquisition of power over natural resources by Euro-Canadians. At this time the French fur trade was already well established along the interior lakes. The ***1713 Treaty of Utrecht*** between England and France gave the English permanent control over land held by the French without consulting the local Indian Nations. In 1763, the ***Treaty of Paris***, in which the French signed over all their North American territories to the British, officially ended a seven-year war between the two nations. Following the treaty, King George III signed the ***Royal Proclamation of 1763***, probably the most important early document to acknowledge Aboriginal rights. The Royal Proclamation recognized Indian title to lands not already colonized. It reserved to the British government the right to buy Indian lands and to negotiate treaties, and excluded private individuals and other nations from this right. The Proclamation further established a procedure for the Crown to obtain lands, which had

[15] The use of 'bold' and 'italics' is intended as a sub-heading in this and the following sub-chapters.

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to be surrendered or purchased through a formal process and could not simply be taken or claimed. Further, the Proclamation used the term *Nation* or *Tribe of Indians*, indicating that the British recognized a Nation-to-Nation relationship (Brizinski 1993). The unilateral Royal Proclamation became the basis of the ***Treaty of Niagara*** in 1764, a peace and friendship treaty between the British Crown and at least 24 Nations, which affirmed First Nation sovereignty in the exchange of a Wampum Belt (Borrows 1997).

In ***1821***, the ***Hudson's Bay Company*** (HBC) and North West Company amalgamated and established a ***trade monopoly***, which lasted until the 1860s, when free traders emerged in the region. Previously, Native hunters and trappers had the opportunity to obtain the best prices for their furs and meat supplies. Under the monopoly, Native People had little choice but to trade under the conditions set by the HBC, leading to frustration and tensions at most trading posts. The ***British North America Act*** of ***1867*** was the charter of Confederation of British North America (including Ontario, Quebec, Nova Scotia, and New Brunswick), creating the ***Dominion of Canada***. This act granted the federal government the right and responsibility to administer Indian lands and affairs, and to create legislation for Aboriginal people (Brizinski 1993). Three years later, the Hudson's Bay Company sold Rupertsland and the North-West Territories to the Federal Government under the ***Rupertsland and North-West Territories Order*** of ***1870***.

In the mid 1800's the large plains bison herds of the past had been decimated to mere fragments. Their main food source depleted, the plains Nations faced starvation. Word of the Indian wars south of the United States border and the threat of similar treatment in Canada further created fear in the First Nations of the Canadian prairies. The visible increase in white settlers encroaching on their traditional lands put additional pressure on the plains people. The British Crown, under responsibility to fulfill the obligation of the Royal Proclamation of 1763, sent out delegations to negotiate ***Treaties*** that would pressure the First Nations of the plains to surrender their lands to the Crown. In 1876 the Cree Nations of the prairies signed Treaty Six, followed by the Blackfoot Confederacy, which signed Treaty Seven in 1877. The Treaties guaranteed traditional hunting and fishing rights on unoccupied Crown land, agricultural implements, money, ammunition, and reserves for exclusive settlement for First Nations. As a response to the demands of centralization that arose with Confederation, the ***Indian Act of 1876*** was created

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(Dickason 1996). One of the main goals of the Indian Act was to provide a tool for Amerindian assimilation. The Act defined terms such as 'band', 'member of a band', and 'reserve'.[16]

In 1897, gold was discovered in the Yukon and triggered the Klondike gold rush. Many of the fortune seekers chose to reach their destination by travelling the Peace-Athabasca route. The travellers relied heavily on northern resources: wildlife for food, trees for shelter, fire, and for rafts. Additionally, word of the good agricultural lands along the Peace River, and the abundance of wildlife lured an increasing number of settlers and white trappers into the Peace River country. The discovery of oil near Fort McMurray and the presence of other natural resources further pressured the Crown into seeking a formal settlement over land issues. The English Secretary of the Half-breed Commission, Charles Mair, who documented the journey of the ***Treaty Eight*** commission, later claimed that the Treaty was established primarily to protect Native people from the newcomers and their rough manners (Mair 1908)[17]. The First Nation delegations involved in Treaty negotiations at Lesser Slave Lake and the amendment locations vehemently negotiated for the protection of their hunting, trapping and fishing rights. The relevant passage in Treaty Eight reads as follows (Mair 1908, p. 157):

> And Her Majesty the Queen HEREBY AGREES with the said Indians that they shall have the right to pursue their usual vocations of hunting, trapping and fishing throughout the tract surrendered as heretofore described, subject to such regulations as may from time to time be made by the Government of the county, acting under the authority of Her Majesty, and saving and excepting such tracts as may be required or taken up from time to time for settlement, mining, lumbering, trading or other purposes.
> And Her Majesty the Queen hereby agrees and undertakes to lay aside reserves for such bands as desire reserves [...].

The accompanying Report of Commissioners for Treaty No. 8 has more details about the provisions for hunting, trapping and fishing (Mair 1908, p 175):

> Our chief difficulty was the apprehension that hunting and fishing privileges were to be curtailed. The provision in the treaty under which ammunition and twine is to be furnished went far in the direction of quietening the fears of the Indians, for they admitted that it would be unreasonable to furnish the means of hunting and fishing so restricted as to render it impossible to make a

[16] "According to the Act, a band is a body of Amerindians for whom the government has set aside lands for their common use and benefit; for whom the government is holding money for their common use and benefit; or which has been declared a band by the governor-in-council for the purpose of the act. [...] A reserve, within the meaning of the Act, is a tract of land, the legal title to which is vested in the Crown, that has been set aside for the use and benefit of a band." (Dickason 1996, p. 284)

[17] Mair (1908, p. 7) notes on the impact of the gold rush: "It was this inroad which led to the entrance of the authority of the Queen – the Kitchi Okemasquay – not so much to preserve order, where, without the law, the natives had not unwisely governed themselves, as to prepare them for the incoming world, and to protect them from a new aggressor with whom their rude tribunals were incompetent to deal."

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> livelihood by such pursuits. But over and above such provisions we had to solemnly assure them that only such laws as to hunting and fishing as were in the interest of the Indians and were found necessary in order to protect the fish and fur-bearing animals would be made, and they would be as free to hunt and fish after the treaty as they would be if they never entered into it.
> We assured them that the treaty would not lead to any forced interference with their mode of life, that it did not open the way to the imposition of any tax, and that there was no fear of enforced military service.

From Mair's journal it seems evident, that during treaty negotiations the Treaty Commission emphasized the continuation of the freedom to hunt, fish, and trap (as a livelihood), and that laws and regulations curtailing this freedom were the exception rather than the rule. At Lesser Slave Lake, for example, Commissioner Laird said: "Indians have been told that if they make a treaty they will not be allowed to hunt and fish as they do now. This is not true. Indians who take treaty will be just as free to hunt and fish all over as they now are." (Mair 1908, p. 58)

In the written version of the Treaty, the signing First Nations surrendered their rights, titles and privileges over their lands to the Queen and the Dominion of Canada. However, many Treaty Eight Nations claim that the oral negotiations did not include surrender of title, but that the signatory chiefs were convinced that they were signing a 'Peace and Friendship' treaty in which they agreed to share the land and its resources. The ambiguity over the treaty versions continues to influence today's debate over First Nation rights over natural resources and access to land.

The Creation of Wood Buffalo National Park

Early explorers like Samuel Hearne, who crossed Great Slave Lake in the winter of 1771-72, and Alexander Mackenzie, who travelled along Slave River in 1792-93, reported seeing large herds of bison and considered them plentiful (Lothian 1973). These wood bison were larger, heavier, and darker in colour than the bison of the plains. Between 1840 and 1870 a decline in numbers and regional disappearance of the wood bison was observed. In 1894, even before the signing of Treaty 8, the Federal Government had passed ***An Act for the Preservation of Game in the Unorganized Portions of the Northwest Territories of Canada.*** This game legislation had made it illegal to hunt bison and musk oxen. It further banned the use of poison bait and established annual closed seasons for hunting by non-residents (Wetherell and Kmet 2000). In 1897, the ***North West Mounted Police*** was sent to the region to enforce the law, thereby establishing the first Canadian administrative presence in the region.

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In an effort to protect the last wild bison of North America, Wood Buffalo Park was created by Order in Council, under the authority of the ***Dominion Forest Reserves and Parks Act***. "The Order in Council explained that the new park formed the original habitat of the wood buffalo in the vicinity of Fort Smith and that unless the area was reserved for the preservation of the species, great danger existed that the only remaining herd in its native wild state would become extinct."[18] The original Park encompassed 26,800 km^2. Between 1925 and 1928, 6673 plains bison from Wainwright, Alberta were shipped to Wood Buffalo Park and released near Hay Camp. In 1926, some of these introduced bison had started to migrate south and crossed the Peace River. In order to protect this new range, another 17,408 km^2 were added to the Park in the south in 1926.

In contrast to the first Canadian National Parks in Banff and Jasper, which prohibited First Nation people from continuing to live within their boundaries, the creation of Wood Buffalo Park[19] recognized Aboriginal hunting and trapping rights. At first, members of Treaty 8 were generally granted hunting and trapping rights, regulated under Parks Game Regulations, as well as Alberta and Northwest Territories game laws. By the late 1920s, access was restricted to only those people who had hunted and trapped in the region before the Park was established (Wetherell and Kmet 2000). These people and their sons were granted hunting and trapping rights under a permit system (Lothian 1974, Scace 1974). First Nation people, who could not prove a pre-Park hunting and trapping affiliation within the Park territory, were denied this right. The regulations over access to the Park divided many families in the region. Generally, people who held rights in the Park were in a better position since the Park granted longer open seasons for muskrat trapping, and competition was not as high since white trappers were ultimately excluded from the Park. In contrast, the pressure on wildlife resources outside the Park increased considerably, leading to tensions in the region (Wetherell and Kmet 2000). In 1949, the Park established its own distinct game regulations, solving the confusion over previously three different game regulations applied in Wood Buffalo Park (i.e, Alberta, Northwest Territories and Park regulations).

The aboriginal residents, however, still had to be familiar with at least two sets of regulations. They had to know the Park regulations within the Park, and the regulations for the neighbouring Province or Territory if they chose to hunt outside the Park. This situation continues to today. Any direct descendant of someone who holds or held a permit or license in the Park and lives within an 80 km radius of the Park can obtain a General Hunting Permit (Parks Canada 1985).

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[18] Lothian (1973, p. 5).

[19] Wood Buffalo did not get National Park status until 1964, hence the name Wood Buffalo Park in the early years.

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Today, however, mainly Little Red River Cree residents of Garden River continue to hold hunting and trapping permits in the western part of the Park. Wood Buffalo National Park is divided into Group-Trapping Areas, out of which the Little Red River Cree hold three[20] (Parks Canada 1985). Generally, any hunting and trapping activity in the Park is limited to permit holders and their immediate family. Building a trappers' cabin, which is considered a temporary residence, requires a permit and fulfillment of building requirements set by the Park. Big game animal hunting is regulated with no bag limit for bears (except for female bears with cubs under one year of age), and one moose per permit per year. The hunting or possession of all other traditionally hunted big game species (bison, elk, mule deer, whitetail deer and woodland caribou) is prohibited (Parks Canada 1985).

Resource exploitation in the form of logging was incorporated in the Park's management plan in 1951. The valleys of the lower Peace and Athabasca Rivers contained exceptional stands of old-growth white spruce. In the mid 1950s, timber berths in the Peace Delta, on Big Island, and on the Athabasca River were designated for logging. By 1970, the Swanson Lumber Company, who had gradually acquired all cutting rights in this region, operated three mills in the region, two in the Park (one at Sweetgrass and one near Garden River), and one just west of the boundary (Lothian 1974). In 1992, logging was finally terminated in the Park due to public pressure and a change in Park management (Timoney et al. 1997). By then, 75% of the riverine forest formerly present in the Park had been logged (Timoney and Robinson 1996). The forty years of logging saw large-scale clearcutting without any provisions for reforestation or management towards the restoration of a white spruce forest. Instead, natural succession is now dominated by balsam poplar or Alaska birch-aspen-balsam poplar growth (Timoney et al. 1997). The logging of these old-growth white spruce stands greatly affected local aboriginal trappers. At times, trapping regulation in the Park dictated a bag limit on beaver, and a closed season on other fur-bearers (e.g. lynx and marten). Squirrels, which rely on old-growth spruce forests, were among the species trappers were still able to trap. The clear-cut logging of these spruce stands lead to a decline in marten and squirrel populations.[21] Logging also affected social structures in the local Cree community. Garden River resident Lester Nanooch explained that at a time when people still used to live at Big Island, its forest used to be set aside as a trapping ground for elders in order to allow them to continue this

[20] Group-Trapping Area 1202, 1203, and 1208.
[21] Interview with Paul Tallcree, Garden River, August 7, 1999.

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traditional pursuit without having to travel very far.[22] The logging put an end to this form of Native land management.

The establishment of the Park and the hereditary rights to resource use within the Park granted only to certain families continues to divide the Little Red River Cree Nation into families with the privilege to hunt inside the Park and families without access to these resources. Certain regulations lead to an increased hunting pressure outside the Park. The Park regulation, for example, that grants one moose per licensed hunter per year, is not enough to supply the subsistence needs for the residents of the remote Garden River community. Consequently, Garden River residents have to meet their subsistence needs outside of the Park. The closest Crown land accessible to Garden River residents by road is in the Caribou Mountains region[23], an area that is also important to John D'Or Prairie residents to provide for their subsistence needs. The Caribou Mountains further have become attractive for outside outfitters and trophy hunters, who annually establish bear and bison hunting camps near the Wentzel River. Garden River residents can also leave the Park on the Peace River by boat, sharing the hunting territory with Fox Lake residents, who do not have the privilege to hunt in the Park.

Regulations over Access to Resources in Northern Alberta

Generally, Canada's and Alberta's regulations that regulate access to and use of natural resources are strongly influenced by old-world concepts and philosophies. This becomes particularly evident in the history of game legislation.

The ***Province of Alberta***, was officially proclaimed in 1905. Based on North American wildlife policies that were derived from concepts like democracy and state ownership (Tober, 1981), the Province emphasized equal rights of access to resources for all of its citizens. Wetherell and Kmet (2000, p. 363- 392) provide a detailed and insightful overview of hunting and trapping issues, the influx of white trappers, and the gradual restriction of Native hunting and trapping rights during the first half of the 20th century in northern Alberta.

In 1907, the ***Alberta Game Act*** also included the prohibition of bison hunting. The ***Migratory Birds Convention Act*** from 1916, signed between Great Britain (on behalf of Canada) and the

[22] Lester Nanooch, personal communication, Garden River, August 4, 1999.
[23] Pyc (1998) also identifies this area as Garden River hunting territory.

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United States of America, started to show its effects on northern Alberta's Aboriginal people by further limiting access to a vital food source. The Act regulated hunting of ducks and geese by establishing relatively short open seasons. It further limited hunting of insectivorous and non-game birds, swans and cranes. In 1922, the Province of Alberta banned market hunting, thereby ending a centuries old trading system closely tied to the fur trade. The Province continued to allow all residents (Native and non-Native alike) north of 55 degrees to kill game for food, with the exception of protected species.

Under Alberta's policy of equal access to wildlife resources, single white trappers were in a position of advantage over Indian family groups who relied on their traditional hunting and trapping territories. White trappers usually had the capital to afford good and efficient equipment, and they were highly mobile. The Department of Indian Affairs commented on the situation in the Provinces of the North-West in 1929:

> The condition of the Indians in the northerly and outlying districts who are still dependent on the chase for their livelihood has become a matter of grave concern to the department.
>
> During recent years there has been an alarming increase in the number of white trappers who are encroaching upon hunting grounds in the northern parts of the various provinces, which were formerly used by Indians only. White trappers are using poison extensively, and this illegal and vicious practice is becoming a grave menace to game conservation. Not a single instance of the use of poison by any Indian trapper anywhere in Canada has ever come to the attention of the department. It is felt that unless some protection is afforded, the Indian trappers in the northern region, where other means of livelihood are not available, may become dependent, owing to the depletion of the game.
>
> Hunting and fishing are the aboriginal vocations of the primitive Indians. By immemorial usage the Indians are conservationists of the game and the fish, and may be expected to continue so, if protected; on the other hand, if whites are allowed to deplete the fish and game on Indian hunting grounds, the Indians themselves will naturally take all they can, and there is grave danger that such a situation may bring about intensive competition between whites and Indians, ending in the virtual extermination of valuable species. Indian families, in most cases, are permanent residents, and their hunting grounds are recognized among themselves, and handed down from one generation to another, whereas white trappers are frequently of the itinerant class, whose practice is to trap out an area and then move elsewhere.[24]

With the signing of the ***Natural Resource Transfer Agreement*** (NRTA) in 1930 the Federal Government gave the Prairie Provinces control over their natural resources. In this agreement, Canada and Alberta agreed that provincial game laws would apply to First Nations people, "provided however, that the said Indians shall have the right, which the Province hereby assures to them, of hunting, trapping and fishing game and fish for food at all seasons of the year on all unoccupied Crown lands and on any other lands to which the said Indians may have a right of

[24] DIAND, Annual Report, 31 March, 1929, pp. 7-8. (Quoted from Madill 1986, p. 98).

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access" (McNeil 1983, p. 20). Thirty years after the signing of Treaty Eight, the NRTA officially curtailed Aboriginal hunting, trapping, and fishing rights as they existed at the time of treaty signing by only assuring the right to hunt, trap and fish for food, and excluding the right to commercial use of fish and wildlife resources. In addition, the Alberta government's interpretation of provisions in regard to unoccupied Crown lands were that "once land was allocated to competing land use or a surface lease was granted, the land in question ceased to be unoccupied" (Pratt and Urquhart 1994, p. 106).

In 1939 Alberta implemented a ***registered trapline system***, which meant geographical restriction and the implementation of registration fees. Under the new regulation, traplines were allocated to an individual, who alone had the right to trap there. Wetherell and Kmet (2000, p. 382-383) summarize:

> By curtailing open access to fur areas and individualizing resource use, it attempted to replace older communal and flexible methods of resource use with private ones mediated by the state. And by granting proprietary rights, it also served to legitimize the presence of white trappers in fur-bearing areas, further restricting Native use of wildlife on unoccupied crown land.

In addition, Alberta regarded registered traplines as 'occupied land' where Indians could not hunt for food under the terms of the NRTA (Wetherell and Kmet 2000).

Currently, Alberta Environment and Energy regulates Alberta's natural resources, as well as environment and wildlife. Wildlife continues to be regulated under Alberta's Wildlife Act and Wildlife Regulations administered by the Fish and Wildlife Division. The Fish and Wildlife Division further administers hunting and fishing regulations and licenses as well as trapping permits. Treaty Indians have subsistence rights to hunt and fish and do not require hunting or fishing licences. However, they have to comply with most of the hunting regulations. Treaty Indians also require trapping permits and have to pay fees for the registration of their traplines. Some other Provincial and Federal regulations that directly and indirectly affect Aboriginal hunting rights and traditional uses of the land are firearm registration, boating regulations, and fire regulations. Treaty Indians are not exempt from the firearm registration and now need to register their firearms and pay a registration fee in order to be able to purchase ammunition. Boating regulations require swimming vests for all passengers and other equipment, which lead to extra expenses. Traditional hunting and camp activities can also be interrupted by fire regulations (e.g., fire bans).

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The involvement of Aboriginal people in the management of wildlife and other natural resources varies considerably in Canada. Through co-management agreements, Inuit and First Nations in Canada's North secured powers in the decision-making process over natural resource management in all recent land claim settlements. The situation in Alberta is quite different. Based on the view that Alberta's Native residents surrendered all title to the lands with the signing of the numbered Treaties, the Alberta Government reserves the right over decision-making in natural resource management but allows First Nations to inform the process through cooperative management (for more information see Natcher 1999 and Honda-McNeil 2000). Since 1995 the Little Red River Cree Nation (LRRCN) and the Tallcree First Nation (TCFN) have been actively involved in the management of resources through cooperative management. Both first Nations see the co-management process as a "strategy for regaining control of their traditional territory" (Treseder 2000, p. 24). The Little Red River Cree Nation has the following definition of cooperative management (Little Red River Cree Nation 1998, p. 4):

> An interim measure which leaves the larger Treaty/Constitutional issues undisturbed, and concentrates on use of existing consultation, planning, management and resource-tenure processes to implement pragmatic initiatives for self-reliance and self-determination *[emphasis in original]*.

The first cooperative management board, which operated between 1995 and 1997, was established through a Memorandum of Understanding (MOU) between the First Nations and the Alberta Government. A new MOU was signed in 1999, and the ***Cooperative Management Planning Board*** for the Caribou-Lower Peace Region grew to incorporate a total of 14 voting members: 3 from LRRCN, 2 from TCFN, 1 from each of the First Nation Economic Development Corporations, 3 from the Government of Alberta, 1 from the Municipal District of Mackenzie, 1 each of High Level Forest Products (Tolko Industries Ltd.) and Footner Forest Products Ltd., and 1 from the Canadian Association of Petroleum Producers (Treseder 2000). The Memorandum of Understanding between the Province of Alberta and the LRR Cree Nation has recently expired, and thus the continuation of this Board is at the current time uncertain.

On July 24, 2001, the Province of Alberta designated the ***Caribou Mountains Wildland Park***. The Wildland Park protects 591,008 hectares (1,767,009 acres) covering most of the north-eastern parts of the Caribou Mountains (see Map 3.2). A Government of Alberta web page[25] provides the following information about the Park:

[25] http://www.cd.gov.ab.ca/preserving/parks/sp_places/regional.asp#borealforest

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> **Caribou Mountains Wildland Provincial Park** (5,910.08 km^2) is the largest area protected under the Special Places initiative and represents the diversity of the Subarctic Subregion of the Boreal Forest. A rich bird environment, the Caribou Mountains provide habitat for species found much further north including gray-cheeked thrush, red-necked phalarope, red-throated loon, American tree sparrow, mew gull, pacific loon, and surf scoter. The wildland includes about 80% of the range of an important population of woodland caribou, a threatened species in Alberta. A population of up to 120 wood bison, an endangered species, lives in the Wentzel Lake area in small groups of up to 15 animals. Polar reed grass found in this area is believed to have been introduced by the bison. Wetlands are an integral part of the Caribou Mountains. The Peat Plateau Bog and the Northern Ribbed Fens are unique environments of provincial significance. The wildland is located on the southern boundary of Wood Buffalo National Park north of Fort Vermillion.

Another Alberta Government web page provides details about the status of a provincial Wildland Park[26]:

> **Wildland Parks** encompass large areas of natural landscape that cater to ecotourism and adventure travel. Interference with natural processes are minimized. Wildland Parks similar to Willmore Wilderness Park accommodate hunting, fishing, and the use of horses, all of which are important to the economic viability of Alberta's guiding and outfitting industry.

The Wildland Park status shelters the protected areas from commercial resource extraction such as forestry, oil and gas exploration, and mining. However it does not protect local wildlife from outside trophy hunters and commercial outfitters.

[26] http://www.cd.gov.ab.ca/preserving/parks/sp_places/classes.asp

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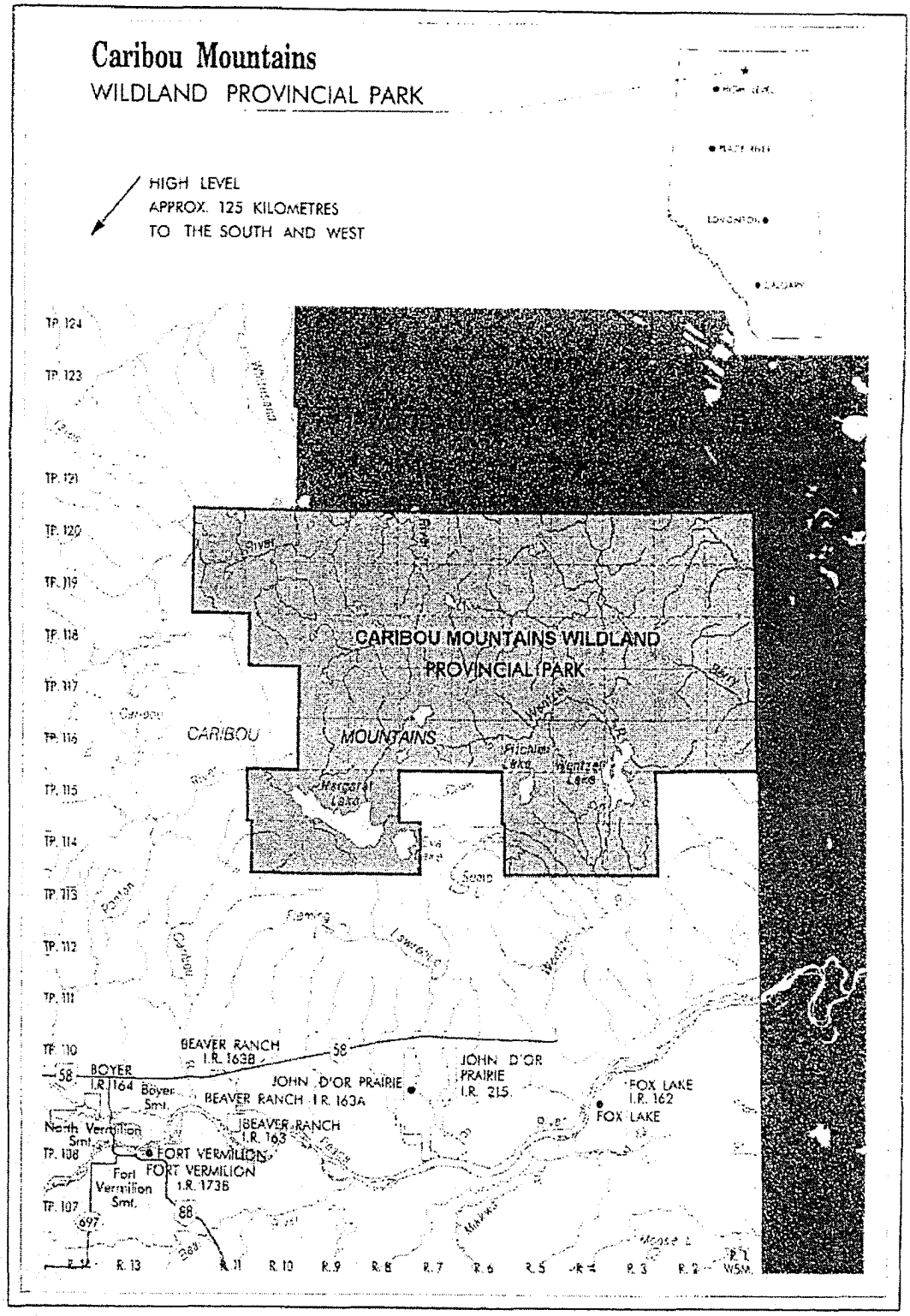

Map 4.2: Caribou Mountains Wildland Park
Source: Government of Alberta http://www.gov.ab.ca/acn/200107/11045.html

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Social and Economic Background

The Little Red River Cree are divided into three communities: John D'Or Prairie (with a population of 875[27]), Fox Lake (Population ca. 1404), and Garden River (Population ca. 390). The first two communities are situated on reserve lands north and south of the Peace River, whereas Garden River is located in Wood Buffalo National Park and has no reserve status. The three communities differ in remoteness. John D'Or is accessible all year round through an all-weather gravel road. Garden River is linked to this road by a logging road that is reliable in winter but often impassable during rainy summer periods. Situated on the south side of the river, Fox Lake is the most isolated community. In summer, a barge transports vehicles to reach the north-side gravel road; in winter, an ice bridge links the community to the road system. During winter freeze-up and spring break-up Fox Lake is only accessible by plane.

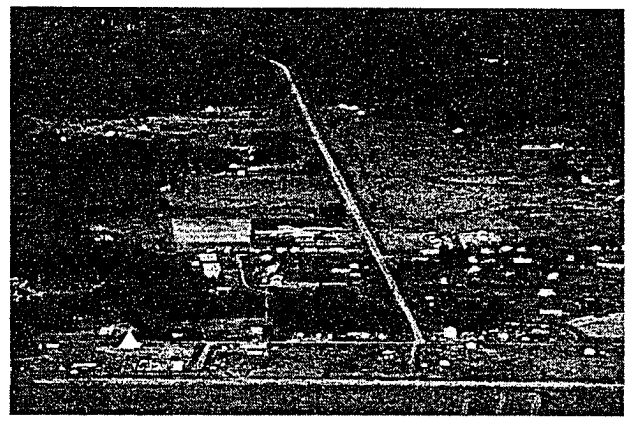

Photo 4.1: Arial view of John D'Or Prairie

Mainly due to their remoteness, Garden River and Fox Lake are the most traditional of the Little Red River communities, both in practicing a subsistence lifestyle and for culturally related ceremonies. Most children in these two communities speak Cree as their first language. In John D'Or Prairie, however, many children are beginning to speak English as their first language, which is considered a cultural loss by many in the community, and is attributed to the easy outside access of this community. Malcolm Auger (pers. com. May 2002) explains that people in John D'Or Prairie are more exposed to primarily English-speaking people. In order to give their children an advantage at school, some parents have chosen to include English as a language also spoken at home. In all LRR communities people of the older generation generally prefer to communicate in Cree. In all three communities the population is very young with more than 50% being 19 years old and younger. Twenty percent of the population is under the age of five (KPMG 1998).

[27] Population numbers based on 1996 census. The total population number then was 2669 (Little Red River Cree and IE, University of Ottawa 2000). Meanwhile, the population has increased.

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Since the introduction of family allowance as an incentive to move to reserves (Buckley 1992), family allowance and welfare have been a continuous part of many families' income, with 65 – 68% of the population receiving social assistance or other income support (KPMG 1998).[28] Unemployment can be as high as 85% in winter and 65% in summer. Seasonal summer jobs are found in fire fighting, tree thinning, tree planting, carpentry, and in community maintenance projects. In the LRR communities a total of 131 permanent jobs are provided in band administration and education departments. There is otherwise no on-reserve cash economy. Alcoholism and regular alcohol consumption by some on paydays and days when social assistance cheques are distributed are major factors that disrupt a healthy family and community environment. A lack of advanced education[29] makes it difficult for younger men to find permanent employment. Men above the age of 45 grew up on the land and are often active as hunters and trappers (Little Red River Cree Nation and Institute of the Environment 2000).

The Little Red River Cree Nation communities have a mixed economy where subsistence still plays an important economic role. Moose is the preferred hunted animal. Ducks, geese, bear, rabbit, beaver, muskrat, spruce grouse, and fish are part of the regular diet of many families. A more traditional diet also includes lynx and squirrels. Trapping is maintained on a small scale, and many people also gather berries, and herbs, like wild mint, at the appropriate seasons. Food and nutrition research in communities near Wood Buffalo National Park and in the Tallcree communities documents the significance that bush food (also termed country food[30]) still has in northern Alberta's Native communities (Wein 1989, Wein and Sabry 1990, Wein et al. 1992). Out of 319 occasions of country food being consumed by 120 Fort Chipewyan and Fort Smith aboriginal households per year, moose was consumed 58 times, caribou 53 times, bison 15 times and bear 2 times (Wein 1989). Other important country foods were berries[31] (consumed on 63 occasions), fish (62 occasions), small mammals (in particular hare, 18 times), waterfowl (19 times), and upland birds (13 times). The high amount of caribou consumption in the study can be attributed to Fort Chipewyan and Fort Smith's location near the migratory route of large herds of barrenground caribou and is not representative for the Little Red River communities. Pyc (1998,

[28] Unemployment insurance was introduced in 1941, family allowance followed in 1944, and in the 1950's First Nation people were awarded old age pensions (Wein 1998).
[29] The majority of school children do not complete high school (personal observation).
[30] The term country food refers to the traditional Native foods from the land, such as wild animals, birds, fish and berries (Wein and Sabry 1990, p,181).
[31] Murray's (2002) research in four Gwich'in communities found that participants collected over 15,000 liters of berries in one year (number of participants not available in the article).

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p. 83) found that moose meat is the most important source of bush protein available to the Little Red River Cree residents of Garden River. It is likely that the amount of caribou meat consumed in Fort Chipewyan and Fort Smith is replaced by moose and bear meat in the Little Red River communities. Wein's (1989) research further revealed that northern residents generally preferred country foods over store-bought foods, and tended to assign higher health values to most country foods when compared to related store-bought foods. Participants in her study expressed concerns about the unknown composition of processed food and about the safety of food additives, preservatives, and agricultural chemicals. Participants perceived country foods as healthier, since their source was known and it was considered to be uncontaminated. Some individuals, however, expressed concern about the effects of industrial waste on country food supplies (Wein 1989, p. 155).

Photo 4.2: Malcolm Auger skinning a rabbit

The importance of the contributions of wild meat, fish, berries, wood, and other non-timber values of the forest to the economy of remote communities of the boreal forest cannot be emphasized enough. Tobias and Kay's (1993) study of bush harvest in the Cree-Metis community of Pinehouse, Saskatchewan, revealed that bush meat, fuelwood, berries, garden produce, and construction materials contributed a total of 17.3 % to the overall gross income to Pinehouse residents. Another 17.8 % were derived from commodities such as fish, fur, and wild rice payments, as well as handicrafts and clothing.

A natural resources and community sustainability study with the LRR Cree Nation (covering about half of the local households) shows that the replacement costs for ungulate, furbearer and birds, as well as eggs and berries would be $747,100 if equivalent foods were bought in High Level, and $ 1,094,100 if bought in Fox Lake (Hickey et al. 2004). The study further finds that bush resources continue to play an important role both in the subsistence economy and in the social and cultural framework of the Little Red River Cree Nation.

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The reference to the local economy and the use of bush resources is necessary in order to understand the importance of the boreal forest, its wildlife, and plants in the daily lives of the local Woodland Cree. It also shows that any resource extraction activity in the region directly affects the subsistence economy of the Little Red River Cree (either directly through the use of resources also used by the Cree, or indirectly by triggering changes such as wildlife leaving an area because of human disturbances).

Physical Environment

Dynamic past and present processes that involve climate, geological structure, topography, and formation of plant and animal communities shape the physical environment of the project region. This subchapter introduces the local climate, natural history, and ecological setting of the study area.

Climate

Generally, the climate of Alberta's boreal forest is influenced by insulation and circulation patterns (Alberta Forestry, Lands and Wildlife 1992). Low net energy inputs due to the high northern latitudes result in low average annual temperatures (near 0°C). In winter and spring, dry Arctic air masses are the dominant circulation pattern, leading to cold winters with low precipitation. Summer and fall are influenced by warmer, wetter westerly winds from the Pacific. The short summers are characterized by long daylight hours. Annual precipitation is relatively low. Regional climate can vary due to local topography.

The mean annual temperature at Fort Vermilion is –1.4° C / 29.5° F (based on records for the period 1941-1970). July is the hottest month with 16.6° C / 61.8° F mean daily temperature (maximum mean daily temperature 23.5°C / 74.3° F), followed by August and July (Powell 1974, p. 28). January is the coldest month with a mean daily temperature of –23.4° C / –10.1°F (minimum mean daily temperature –28.4° C / –19.1°F), followed by February and December. On average, it rains on 53 days a year in Fort Vermilion, out of which 30 days fall within the period between June and August. The mean annual rainfall is 22.7 cm (8.94 inches). Snow was measured on 42 days, with the months of November – February accounting for 30 days. The

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mean annual snowfall is 136.1 cm (53.6 inches). The total annual precipitation is 36 cm (14.18 inches). The annual average evaporation is 43.4 cm (17.1 inches) indicating a slight moisture deficit in the region. Frost occurs on 219 days, mainly between October and April. The first permanent ice cover in the region starts between mid-October and early November, with a complete freeze over between early November and mid-December. Between late March and early May, ice becomes unsafe for traffic, and in the period between mid-May and early June the water bodies become clear of ice.[32]

For warm-season crops, the average growing season is 168 days (base temperature 10° C / 50°F).[33] At Fort Vermilion, April to August have the most hours of bright sunshine, with a maximum of 296 hours in July, and a minimum of 225 in April (in contrast to only 40 hours in December). At Fort Vermilion, spring and fall are the windiest seasons, with highest wind speeds in April and May (7.3 miles / 11.75 km per hour). Calmer conditions tend to apply in mid-winter and summer. The strongest and most persistent winds come from the north-west and prevail in all seasons except summer, when south-westerly winds are strong (Powell 1974).

Although the general trends in Fort Vermilion climate data apply for much of the project region along the Peace River lowlands, exceptions occur for the Caribou and Birch Mountains. Due to their altitudes, the Caribou and Birch Mountains have a higher annual precipitation (e.g. 3.9 inches / 9.9 cm mean precipitation at Foggy Tower/Caribou Mountains in comparison to 2.43 inches / 6.2 cm at Fort Vermilion in July), lower summer and winter temperatures, and longer frost periods (Powell 1974). In addition, the plateau of the Caribou Mountains is affected by discontinuous permafrost (Alberta Forestry, Lands and Wildlife 1992).

The increase in temperature due to global warming will affect the region through an increase in growing season, which will lead to vegetation changes. An expected increase in frost-free days will affect transportation since it will shorten the period where local residents can use ice bridges. The largest impact will likely be in the Caribou Mountains since discontinuous permafrost is very vulnerable to warmer temperatures. Currently, the layer of permafrost prevents seepage of water into the ground, thereby creating the necessary wetland conditions so typical for the plateau. The disappearance of the permafrost layer will increase water drainage and permanently alter local ecosystems.

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[32] Malcom Auger, personal communication, January 2001.
[33] The following paragraphs are based on Powell (1974).

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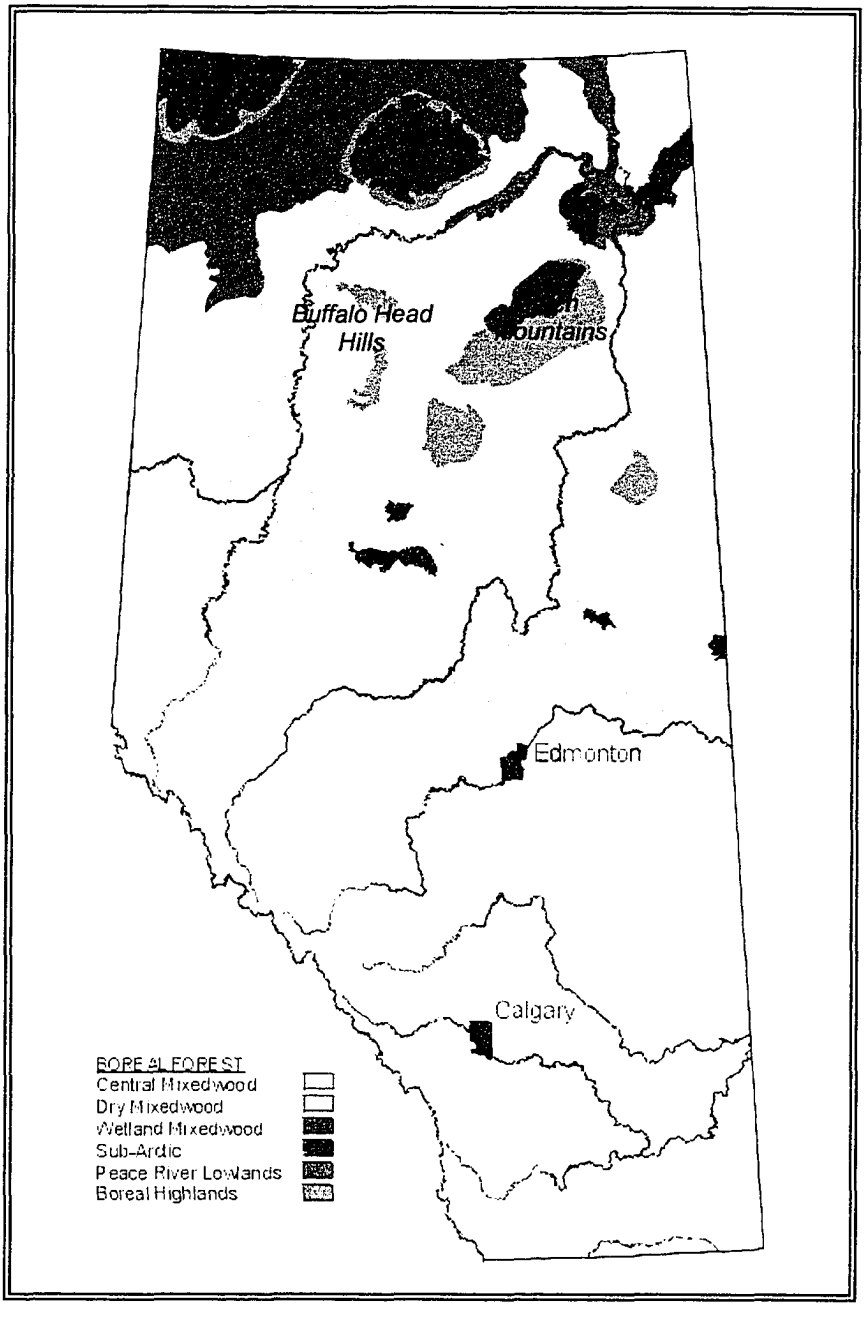

Map 4.3: The Boreal Forest Natural Region of Alberta (Source: http://www.cd.gov.ab.ca/preserving/parks/anhic/northbor.asp)

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Natural History

Four geographic features dominate the landscape of north-central Alberta. The Caribou Mountains form a circular plateau that dominates the northern centre of Alberta (Map 3.3). The Birch Mountains, an oval-shaped upland plateau with south-westerly to north-easterly orientation, is situated to the south-east of the Caribou Mountains. To the south-west lie the Buffalo Head Hills. On the map (Map 3.3), the three upland ranges form a triangle. The two upland ranges to the south are divided from the Caribou Mountains in the north by the fourth major feature in the study area, the Peace River, which flows mainly in an easterly direction. It is joined by the Wabasca and Mikkwa Rivers from the south, and by the Lawrence and Wentzel Rivers from the north. The traditional lands of the Little Red River Cree include the eastern Caribou Mountains, and the zone between the Caribou and Birch Mountains. The traditional lands of the Tallcree are situated between the Buffalo Head Hills and Birch Mountains, and some people hold traplines in the Caribou Mountains.

Geology and Topography

The topography of the region is shaped by the remnant sediments and evaporates of the Devonian and Cretaceous periods, as well as by the glaciations of the Tertiary and Quaternary (Lee et al. 1981, Haglund 1974). Until the end of the last ice-age, northern Alberta was covered by the glaciers of the Wisconsin glaciation. With the melting of the ice approximately 10,500 years ago, a huge glacial lake, Lake McConnell, formed in the region (Bayrock 1962). Today's Great Bear Lake, Great Slave Lake, Lake Athabasca, and Lake Claire are remnants of this glacial lake. As a consequence, much of the traditional lands of the Little Red River Cree are shaped by the processes related to ice-age and post glaciation dynamics. The combination of bedrock material, glaciation impacts, fluvial dynamics, and climate led to a variety of natural and eco-regions formed in the project area. The two most striking geographic features of the region are the Caribou Mountains as well as the Peace River, which ultimately drains into the Arctic Ocean.

The Caribou Mountains are located at the centre of the northern edge of Alberta. The mountains form a plateau that rises 600-700 m above the surrounding area, which covers approximately 975,000 ha. The highest elevation (1030m) is situated in the western part of the plateau. Margaret, Wentzel, Eva, and Pichimi Lakes are the four largest lakes, covering at total of 7,900 ha. The present day Caribou Mountains contain bedrock material from the Palaeozoic (Devonian

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limestones, shales, and dolomites), from the Lower and Upper Cretaceous (sandstones and shales) and occasionally Tertiary gravels in the top layer (Lee et al. 1981, Haglund 1974).

Throughout the region, underlying the Wisconsian glacial deposits are Palaeozoic sediments and evaporites, which frequently lead to karst formations[34] (Haglund 1974). Occasionally, Palaeozoic bedrock is exposed (e.g. Vermilion Chutes, Little Red River Settlement), however, younger glacial moraine, fluvial, lacustrine, and aeolian deposits dominate the landscape.

Vegetation History

Sediment core analysis in the Birch Mountains and Caribou Mountains indicate that ice-free conditions began between 11,000 and 12,000 years ago (Ives 1993). In the pollen analysis from the two uplands, only one tree taxon, *Populus*, was present 11,000 years ago. The rest of the findings yielded pollen from sage (*Artemisia*), grasses (Gramineae), sedges (Cyperaceae), willow (*Salix*), and a variety of herbs, indicating a relatively open vegetation. Between 10,000 –11,000 years ago spruce arrived in north-eastern Alberta, white spruce (*Picea glauca*) at first, followed by black spruce (*Picea mariana*), and birch (*Betula*). Eight thousand years ago lodgepole and jack pine (*Pinus contorta* and *P. banksiana*) as well as alder (*Alnus*) arrived in northern Alberta, and significant peat accumulations started to form 6000-8000 years ago. Around 6000 years ago, a modern mixedwood boreal forest had formed in north-eastern Alberta, interspersed with disjunct grasslands along the middle and lower Peace River (Ives 1993).

Vegetation Zones and Ecoregions

In Alberta, two ecological classification systems coexist. Alberta Forestry, Lands and Wildlife (1992) classifies Alberta into *Ecoregions*, and Alberta Environment (1999) classifies the Province into *Natural Regions* (see Map 3.3). The first classification system identifies four different Ecoregions for the project area (Boreal Subarctic, High Boreal Mixedwood, Mid Boreal Mixedwood, and Low Boreal Mixedwood) the second classification system is more detailed and identifies six natural subregions within the Boreal Forest Natural Region (Sub-Arctic, Boreal Highlands, Dry Mixedwood, Central Mixedwood, Wetland Mixedwood, and Peace River Lowlands). Both classification systems correspond largely with the four dominant geographic features.

[34] Characteristic sinkholes can easily be seen from the air on flights to John D'Or Prairie.

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The Caribou Mountains

Photo 4.3: Clouds over the Caribou Mountains

The Plateau of the Caribou Mountains is classified as *Boreal Subarctic Ecoregion* and as *Sub-Arctic Boreal Forest Natural Region* (Map 3.3, dark green). The plateau contains many lakes and is poorly drained. Halsey et al. (1993) estimate that more than 90 % of the plateau is covered by wetlands, largely dominated by peatlands. Organic soils are widespread and discontinuous permafrost can be found throughout the plateau. Black spruce (*Picea mariana*) is the dominant tree species (Map 3.4, Vegetation Zones[35]). The understory is dominated by Labrador tea (*Ledum palustre* and *L. groenlandicum*), reindeer lichen (*Cladina* spp.), peat moss (*Sphagnum* spp.), cloudberry (*Rubus chamaemorus*), bog cranberry (*Vaccinium vitis-idaea*), and woodland horsetail (*Equisetum sylvaticum*) is also present. According to the digital Alberta Vegetation Inventory (AVI) data used in the GIS analysis of this study, Jack pine (*Pinus banksiana*) stands can be found on well drained soils[36], whereas birch (*Betula* spp.) can be found on poorly drained organic soils. Sites of old forest fires are dominated by heath shrub/lichen vegetation, and, on a rare occasion, a small tamarack stand (*Larix laricina*) can be found.

The circle-shaped hilly escarpment that surrounds the Caribou Mountain plateau is classified as *High Boreal Mixedwood Ecoregion/Boreal Highlands Boreal Forest Natural Region* (Map 3.3, medium green). It is dominated by white spruce (*Picea glauca*) and also contains aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*).[37] The understory of white spruce-aspen mixedwood and aspen forests is diverse and can contain low-bush cranberry (*Viburnum edule*), prickly rose (*Rosa acicularis*), red-osier dogwood (*Cornus stolonifera*), and a variety of other species.

---

[35] The vegetation zones in this map are based on Alberta Vegetation Inventory (AVI) data. The vegetation zones represent the dominant species identified in the AVI for the region (Alberta Environmental Protection (1991).

[36] The vegetation studies reviewed in Lee et al. (1981) emphasize the absence of jack pine in the Caribou Mountains. Instead, *Pinus contorta* – lodgepole pine is described to be present. Discussing the subject with elder Malcolm Auger, he stated that jack pines were present in the Caribou Mountains but not in large stands. It is possible that the classification in the AVI digital data base is based on a misinterpretation of aerial photographs. Ground-truthing of this observation is recommended.

[37] Map 3.4 groups trembling aspen, balsam poplar, and birch into the group 'Deciduous Trees' (orange).

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The *Boreal Forest Natural Region* classification system defines the area north-east of the plateau as Wetland Mixedwood (Map 3.3, dark blue). Although the vegetation is quite similar to that of the Central Mixedwood subregion, it contains more wetlands, peatlands, and willow-sedge complexes.

The Peace River Area

In the Alberta Environment (1999) classification, most of the southern and western Peace River Country is classified as *Dry Mixedwood Subregion* (Map 3.3, light green), a transitional zone between the *Central Mixedwood* and *Central Parkland Subregions*. In the project region, this zone reaches from the west towards John D'Or Prairie, and corresponds roughly with the *Low Boreal Mixedwood Ecoregion* of the Alberta Forestry, Lands and Wildlife (1992) classification. This subregion is dominated by aspen and, in the area around John D'Or Prairie, also contains aspen-white spruce stands and prairie patches. In the understory of this subregion, bluejoint (marsh reed grass *Calamagrostis canadensis*), cream-coloured peavine (*Lathyrus ochroleucus*), prickly rose, bunchberry, willows (*Salix* spp.), and saskatoons (*Amelanchier alnifolia*) are commonly found. According to Alberta Forestry, Lands and Wildlife (1992), this ecoregion is the most productive within the Boreal Ecoprovince for wildlife, and wildlife diversity is generally high.

The *Peace River Lowland Subregion* (Map 3.3, medium blue) is a remnant of a glacial drainage system and consists primarily of fluvial landforms. In the project region this subregion dominates the riparian zone of the Peace River from John D'Or Prairie eastward into the Peace-Athabasca Delta. Before the onset of heavy logging, the Peace River Lowlands contained old-growth white spruce forests (16-23 m tall) on well-drained terraces along the river. Also found are jack pine, green alder (*Alnus crispa*), bog cranberry (*Vaccinium vitis-idaea*), reindeer lichen (*Cladina alpestris*), and feathermosses.

The rest of the study region (north of the Peace River east of the Caribou Mountains into Wood Buffalo National Park, south of the Peace River covering the low lands between the Buffalo Head Hills and the Birch Mountains) is considered as *Central Mixedwood Subregion* (Map 3.3, light blue) or *Boreal Mixedwood Ecoregion*, which is dominated by aspen and balsam poplar. Depending on soil conditions, white spruce, black spruce, willows and sedges also form local stands and patches. The topography is shaped by glacial moraine deposits and aeolian deposits.

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The well-drained sand dunes provide habitat for tamarack, Jack pine and poplar ridges (based on an AVI digital data base held by the LRR Cree Nation). It seems that in the past, prairie patches and sedge meadows used to be frequent in the area between the Mikkwa and Wabasca rivers. Tibeyimisuw (Jimmy Meneen), a North Tallcree elder who passed away in 1990 when he was over 100 years old, remembered 'the land between the Wabasca Lakes and his North Tall Cree Reserve when it "used to look like prairie – there were no trees" ' (Meili 1991, p. 59). Little Red River Cree environmental consultant Vern Neil observed a similar trend when he compared recent and older aerial photographs of the region. He noticed a 40-60% loss of herbaceous habitat to willow succession. Neil attributes the alterations to changes in the local water table, caused by the construction of the Bennett Dam (Vern Neil, personal communication, May 2002).

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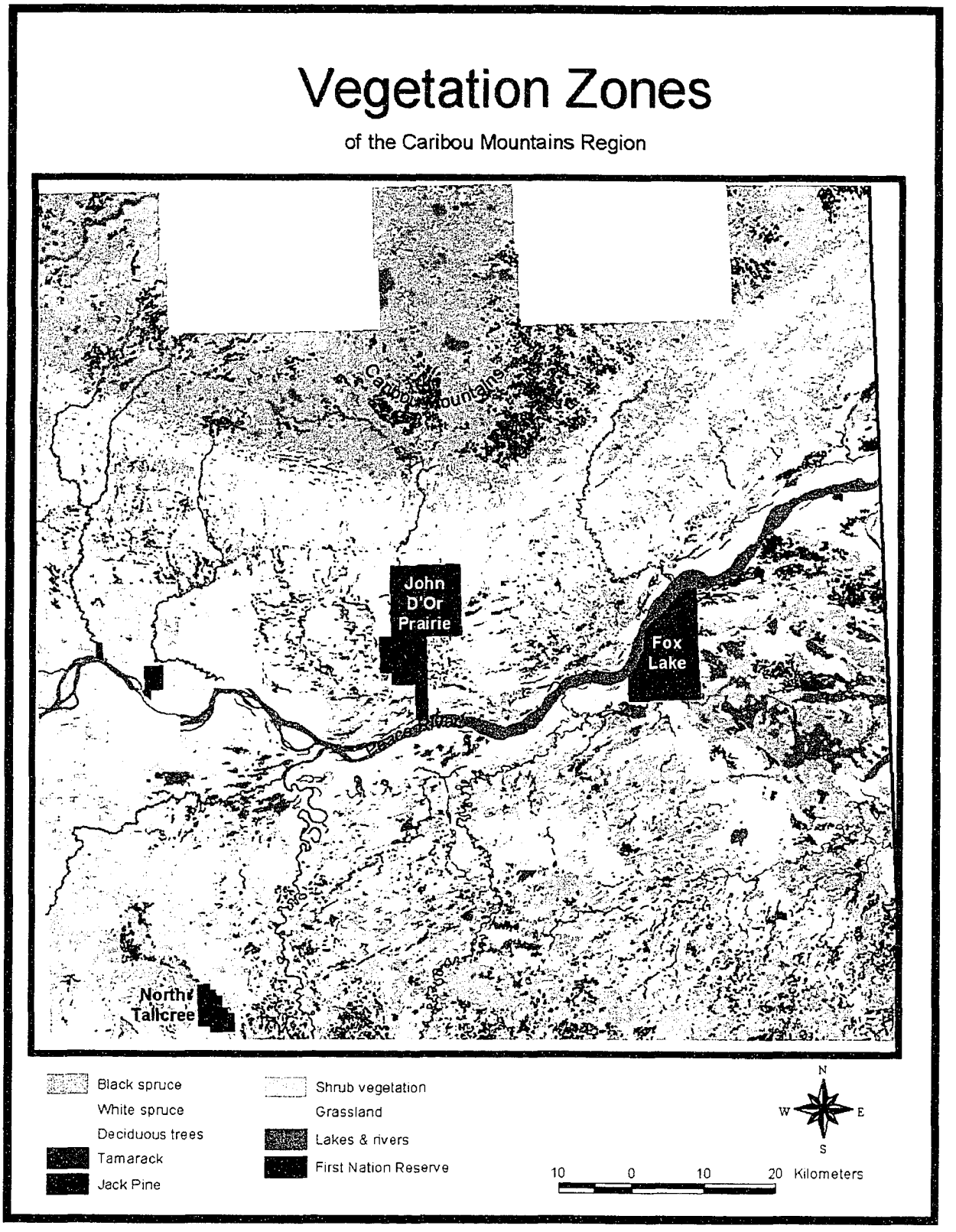

Map 4.4: Vegetation Zones of the project region

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Development Impacts on the Project Region

The cumulative impacts of industrial and agricultural activities along the Peace River have had major impacts on Northern Alberta's natural environments. The development of the pulp and paper industry has impacted the forests and local water quality. Expansion of agriculture has also impacted water quality and the routes of migratory birds; oil and gas exploration and roads have contributed to fragmentation and increased hunting pressure on wildlife; and the construction of the Bennett Dam altered the hydrology of the region and had impacts on local plant and wildlife communities.

The following statistics obtained from Little Red River Cree elders were cited in the Northern River Basins Study, and provide some insight into the concerns local people have in regards to development impacts in their region (Bill et al. 1996, CD-Rom):

> Two-thirds (64%) of the Little Red River (LRRFN) respondents felt the impact of cut lines, seismic lines, pipelines or access roads. Cut line impact alone was experienced by 22%, and logging impact was experienced by 1.3%. A third (35%) of the respondents from LRRFN identified specific types of development near traditional land use areas. Pulp and paper mills (75%), mining (50%), followed by hydro and parks development both at 25%, then farming and tar sands both at 13%. When they were asked how their relationship could be maintained, the LRRFN indicated that the "white man" destroyed their relationship with the land (43%) and also indicated that there was a need to work on the following areas: "tougher government regulations", "aboriginal land use management", and "working on increasing the understanding between users of the land"; 1.4% in each category mentioned.

The study by Bill et al. (1996) used restricted choices in their survey, which allowed for statistical analysis, an approach different to the one used in the present study. Most of the Little Red River Cree concerns mentioned in Bill et al.'s report were also described by participants in this project. The following sub-sections address the major development impacts affecting the project region

Agriculture

Apart from Haines Junction (Yukon Territory) and Palmer (Alaska), La Crete and Fort Vermilion are among the most northerly agricultural communities on the North American continent. The first explorers and fur traders soon discovered the good soil quality of the Peace River country. Fur traders and missionaries planted the first gardens and cleared the first fields. In the late 1800s, Fort Vermilion possessed a small grain mill, which lead to affordable flour prices in the region.

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At the turn of the century, a small number of farms were located along the Peace River. Haden and Ironside (1990) identify three distinct agricultural settlement phases for the Fort Vermilion region. The first phase was led by Ukrainian settlers, who mostly arrived between the late 1920s and early 1930s. These farmers chose to homestead on inland prairie land. In the early 1930s Mennonites from the prairies were drawn to the region. They found sufficient available land to implement their plan to establish colonies for 1,500 people on four to five townships (Wetherell and Kmet 2000). Most Mennonites settled along the Peace River near present-day La Crete and on prairie land at Buffalo Head Prairie. The Mennonite community is now well established with La Crete as its centre. In 1963, the railway reached High Level, triggering a third wave of settlers. Some farmers homesteaded in the region after working for the railway or in the forestry sector. Others were drawn to the region because of the availability of cheap land.

Since 1971, the amount of agricultural land in the Municipal District of McKenzie has tripled (Treseder 2000). Haden's (1993) research showed that between 1984-1988 alone, a total of 36,156.9 hectares of public land was acquired as Farm Development Leases by private farmers in Improvement District No. 23 (now Municipal District of McKenzie). During this time period of four years, Mennonite agricultural expansion[38] accounted for half of the agricultural land expansion. However, farm development leases near the Caribou Mountains were primarily held by non-Mennonite farmers. Additionally, farmers can acquire grazing leases in the Green Zone (i.e., Alberta Government term for undeveloped zone). As of 2001, 1.01 million ha were under grazing lease (totalling 2817 grazing dispositions) north of the North Saskatchewan River (Schneider 2002, AAFRD 2001).

The expansion of farmland into Crown land creates specific conflicts over land in the northern Peace River region, involving farmers, the bison in and around Wood Buffalo National Park, and Aboriginal people. Problems arise, for example, from the conversion of forest covered Crown land into privately held farm leases in the vicinity of the Caribou Mountains. Formerly forest-covered soils are not the best suited for wheat production. Alternatively, farmers tend to focus more on livestock production. Although most farmers produce cattle, the success of bison production in the lower Peace Country has encouraged farmers in the project region to introduce bison operations. The presence of two cattle diseases (brucellosis and tuberculosis) in the wild wood bison herds in and outside of Wood Buffalo National Park creates concern for the livestock

[38] Agricultural land expansion refers to the process where farmers acquire bush-covered land to clear and cultivate it, thereby creating a change in land use (Haden 1993).

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farmers who fear losing the disease free status of Alberta's livestock industry. The political pressure by farmers on the Alberta government is twofold – firstly, farmers would like to continue agricultural expansion eastwards along the Peace River; secondly, regional farmers lobby strongly for the elimination of diseases in the wild bison populations, preferably through bison eradication. The conversion of Crown land into farm leases further limits local Native subsistence pursuits like hunting, trapping, and gathering of berries and herbs.

The results of the Northern Rivers Basin study indicate that agriculture is likely partly responsible for a westward shift of migratory bird routes (Wrona et al. 1996, Bill et al. 1996). Ducks, geese and cranes now feed on grain fields during the fall migration and do not frequent the wetlands of the Peace-Athabasca Delta in the large numbers seen in the past.

Forestry Industry

Based on Alberta Environmental Protection (1998) data for the Boreal Forest Natural Region (BFNR), (which covers approximately 52.35 % of the province, most of it situated in Northern Alberta), a total of 3,360.35 km^2 of forest was logged between 1966 and 1997. Since the 1960s, Alberta's annual logging volume has increased exponentially, with a total of 42,000 ha harvested (producing 19.4 million m^3 of timber) in 1999 alone (Canadian Forest Service 2001, Schneider 2001). This exponential growth can be attributed to Alberta's forest tenure and logging policy, which promotes the expansion of forestry, as well as technological changes, which now allow for the use of aspen in pulp production (Schneider 2001). Provincial investment in road infrastructure and government supported financing for large-scale pulp mills further contributed to the development of the industry (Pratt and Urquhart 1994). Alberta's forest industry is very dependent on exports. In 2000 the USA was the largest trading partner (71% of exported wood products), followed by Japan (11%) (Canadian Forest Service 2001). These basic statistics show that the resource development prioritization of the Alberta Government is strongly influenced by external factors such as international demand for wood and wood products. It should also be noted, that between 1994 and 1999 Government permits for the application of herbicides have risen from almost none to permits for their use on over 32,000 ha (Alberta Environment 2001, Schneider 2002). This policy directly concerns First Nation residents in the boreal forest by affecting the utilization of herbs and berries, as well as potentially contaminating wildlife intended for consummation.

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A large number of samples for contaminant analysis were collected as part of the investigations of the Northern River Basins Study. "On the basis of these results, it is clear that pulp mills are responsible for the presence of several classes of contaminants, namely, dioxins, furans, chlorophenolics, and chlorinated resin acids" (Wrona et al 1996, CD-Rom).

Since the late 1960's, the Peace River has seen the building of seven pulp mills (Wrona et al. 1996), four in B.C and three in Alberta (one each in 1973, 1988 and in 1990). Tolko is the major Forest Management Agreement[39] (FMA) holder in the region, and the second largest in Alberta, holding a total of 39,400 km^2in the Province (Forest Watch Alberta 2001). As part of the cooperative management process established between the Provincial government and the Little Red River and Tallcree First Nations, a Special Management Area (SMA) was established which roughly covers the Caribou Mountains, reaching south to include the region between Wadlin Lake and the Birch River. This SMA covers approximately 30,000 km^2 and includes the Forest Management Units[40] (FMU) F23 (formerly F3, F4, and F6), F24 (formerly F2, F5, and F7), and parts of F10 and A9 (Treseder 2000). In the SMA, tenure over wood supply allocations is held either through a FMA or timber quotas. Tolko Industries Ltd. hold an FMA, Footner Forest Products Ltd. and the Little Red River Cree Nation /Askee Development Cooperation hold timber quotas, and the Little Red River and Tallcree First Nations also hold tenure. At the time of data collection, the total annual allowable cut in the SMA was 959,842m^3, out of which the Little Red River and Tallcree First Nations held 42% (402,083m^3) (Treseder 2000, p.23).

Although the direct involvement of the Little Red River Cree in forestry activities in the region secures the band revenues and a small number of jobs, it also creates a conflict of interest within the band. Talking about the effects of logging on his trapline, one participant explained:

> *So I tried to get after these guys* [the forestry company], *you know. But, you know, the band subcontract these people to do timber. For they have to take timber [...?] every year. And if I do that, I'm going after my band, you know (Interview # 13).*

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[39] A Forest Management Agreement (FMA) is defined as: "A renewable 20 year agreement between the government and a company that grants the company the rights and obligations to manage, grow, and harvest timber on a specific area on a sustained yield basis."
Government of Alberta http://www3.gov.ab.ca/srd/forests/fmd/directives/glossary.html [last accessed October 2004].

[40] Forest Management Unit (FMU) is: "A defined area of forest land located in the Green Area and designated by the government to be managed."
Government of Alberta http://www3.gov.ab.ca/srd/forests/fmd/directives/glossary.html [last accessed October 2004].

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Holders of traplines, who are now directly affected by logging operations planned by the Little Red River Cree Nation, feel that they have little room to take action against the logging because they would be active against their own band. For forestry impacts on the project region please see Map 3.5, p. 81.

Oil, Gas, and Mineral Exploration

The extensive grid of seismic lines that oil, gas, and mineral exploration cuts through the Boreal Forest Natural Region is the largest contributor to habitat fragmentation in the boreal forest of Alberta. Seismic line exploration started in the 1950s. Between 1979 and 1995 a total of 924,016 km of seismic lines were approved in Alberta's Green Area (Alberta Environment 1998). Pratt and Urquhart (1994) give an estimate of 805,000 km of seismic lines on the boreal landscape. It is estimated, that from 1979 to 1995, an estimated 4,971.11 km^2 of boreal forest was cleared for cutlines, in comparison to 3,360.35 km^2 of boreal forest logged in Alberta between 1966 and 1997 (Alberta Environment 1998).

With the exception of its north-western corner, most of Alberta contains oil and gas deposits. A ring of petroleum extraction industries surrounds the project region reaching from oil and gas deposits in the western Peace Country, to the oil fields of Red Earth Creek in the south, to the oil sands near Fort McMurray in the east. By 1997, 88,588 oil and gas industry-related wells had been drilled in the Boreal Forest Natural Region, and as of 1996, a total of 73,102 km of pipelines were covering the region (Alberta Environment 1998). Map 3.5 provides information about the extent of roads and seismic lines in the project region. With the exception of Wood Buffalo National Park, seismic lines extensively impact all traditional lands of the Little Red River Cree. Although the road system is not extensive, the presence of roads allows non-native resource users, such as trophy hunters, an easy access to the region, thereby impacting local Cree residents.

Recent years have also seen the issuing of diamond exploration permits in the Caribou Mountains. The success of the diamond mines of the Northwest Territories, and the fact that one company recovered small diamonds from kimberlite pipe formations in the Buffalo Head Hills (Alberta Environment 1998) makes the unprotected areas of the Caribou Mountains a possible target for exploration.

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Roads

As of 1993 an estimated 14,988 km of low-grade roads were criss-crossing north-west Alberta's landscape, primarily established in the wake of oil and gas development. In addition, 2,509 km of high-grade roads also covers Alberta's north-west. Some estimates calculate that there are 141,740 km of access roads in the boreal forest, equalling 2,126 km^2 (MacCrimmon and Marr-Laing 2000).

The large impact that access corridors such as seismic lines and roads have on the local soils, hydrology, vegetation, wildlife, and cultural resources is reflected in the Environmental Assessment process conducted for a proposed winter road in Wood Buffalo National Park (Parks Canada 2000). Some of the potential impacts include disturbance of sand dunes, bisection of a portion of a bison winter range, wildlife loss to vehicle collisions, and increased hunting pressure. The issue of potential impacts also concerns the project region since Indian and Northern Affairs Canada (INAC) (in partnership with the Little Red River Cree Nation, the Alberta Government and the Municipal District of Mackenzie) in May 2003 announced funding for upgrading the winter road to Garden River into an all-weather road including a new all-weather road connection to Fox Lake.[41]

Bennett Dam

In 1968 the Bennett Dam was completed at the upper Peace River at Hudson Hope in British Columbia. Results from the Northern River Basins Study show that the regulation of water flow has severely impacted the hydrology of the Peace-Athabasca Delta (Wrona et al. 1996). Before the building of the dam, ice jams formed in the Delta on a regular basis during spring break up, leading to backflow of water and flooding of large parts of the Delta. Since the construction of the dam, ice jams rarely occur, leading to a drying of the basin and subsequent changes in plant communities (Wrona et al. 1996). The controlled release of water has altered flow regimes. On the Peace River, winter flows tend to be higher, and summer flows and spring peaks are lower than normal. Changes in channel geomorphology, aquatic vegetation and riparian habitat have also been observed. Comparing pre- to post-Bennett Dam Peace River flow regimes, Wrona et al.

[41] Indian and Northern Affairs Canada (INAC): http://www.ainc-inac.gc.ca/nr/prs/m-a2003/2-02300_e.html [last accessed January 2004].

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further noticed that the flood peak at Peace Point is 15% lower, summer flows are 33 % lower, and winter flows are 2.5 times higher.

Overall, Wrona et al. (1996, CD-Rom) note:

> The public fears river degradation by pulp mills, forestry, agriculture, mining, oil and gas, and municipal wastes. Frequent observations were made about past spills related to PCBs and other substances on the Smoky and Wapiti systems which may impact the Peace River. Observations of fiber, foam, odours, and tainted drinking water have been associated with pulp mills. Increased sediment and dirty ice, likely caused by increased winter flows, leaves an impression of degraded water quality. Changes in wildlife and fish populations are perceived to be linked to development on the river. Apparently uncontrolled agricultural activity, especially the clearing of land right down to the water's edge is a growing concern. Land clearing for forestry is increasing in the tributary watersheds (Notikewin, Cadotte, Buffalo, Wolverine, Ponton, Wabasca and Mikkwa) with concerns expressed about water quality and vulnerability of fish habitat.

They further summarize results from the Traditional Knowledge component of the Northern River Basins Study:

> Delta lakes formerly supporting high densities of wildlife, including muskrat, are now dry. Birds have shifted their migratory patterns westward perhaps in response to improved feeding opportunities in the agricultural areas but also because of the significant reduction in breeding and staging habitat in the delta. The observed decline of wood bison in the PAD [Peace Athabasca Delta] is implicated by the aboriginal people as being a result of drying in the delta. Corresponding successional changes in plant communities resulting in increased willow and forested areas, along with a reduction in sedge meadow habitat, are believed to provide more moose habitat at the expense of bison habitat.

Some of the observations mentioned in the results of the Northern River Basins Study coincide with results of this study. Participants of this study, however, did not necessarily link their observations to the creation of the Bennett Dam.

Cumulative Impacts

Each of the development sectors addressed above has individual impacts on the boreal forest. The cumulative impacts created by overlapping development and resource extraction activity, however, lead to greater fragmentation and long-term changes. The project region has been affected by the cumulative impacts of forestry (both from FMA and FMU leases), road development, oil/gas and mineral exploration (seismic lines), and agricultural expansion.

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Although the Caribou Mountains region appears remote, the cumulative impacts of these activities have severely fragmented the landscape (see Map 3.5).[42]

Attempts to integrate resource management in Alberta are difficult since the different industries are managed by different government agencies (Kennett 2002, Schneider 2002). The annual timber harvest quotas, for example, do not include timber resources lost to exploration or fire, leading to a much higher rate of deforestation than reflected in the harvest quota statistics. In 1999, Alberta Environment founded the Integrated Resource Management Division in an attempt to address cumulative impacts on a regional scale (Fluet 2003). As a pilot project, the division started the Northern East Slopes Sustainable Resources and Environmental Management Strategy (NES Strategy). Fluet (2003), who studied the involvement of Aboriginal groups and environmental organizations in the NES Strategy found that forestry and oil and gas industries had substantially more involvement in the strategy than Aboriginal groups and environmental organizations. Due to their high economic contribution, resource industries in Alberta have much closer ties to the provincial government than environmental organizations and Aboriginal groups, who can hinder economic development. The lack of involvement of environmental organizations seems to arise from a pattern of exclusion of eco-centric perspectives by facilitating governmental institutions (e.g. in cases such as the Alberta Forest Conservation Strategy and Special Places 2000). In her study, Fluet (2003) finds that some of the factors limiting the involvement of Aboriginal groups are outstanding land claims, lack of capacity, lack of clarity over responsibilities for consultation, and inappropriate methods of representation.

Conclusions

This chapter introduced the research setting, which focuses on the Little Red River Cree Nation and its traditional lands. The detailed literature review of this chapter intends to provide the reader with a broad background of the various subjects that influence ungulates, their habitat, the way they are managed, and the conflicts arising from different interests in land use. The first part of this chapter dealt with the history of the region as well as various politics and events affecting the region and the Little Red River Cree Nation. The literature review further described regulations over access to resources and how they affect Aboriginal residents. It also provided

[42] The cumulative effects of human and natural disturbances on wildlife will be addressed in more detail in Chapter 7.

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information on the social and economic situation of the Little Red River Cree Nation. The information in this sub-chapter helps understand some of the political dynamics surrounding natural resource conflicts that emerge in later chapters.

The second part of the chapter introduced the physical environment of the project region, including backgrounds on climate, natural history, and vegetation zones. The understanding of the physical environment with its characteristics (e.g., the unique conditions of the Caribou Mountains Plateau) helps to put into place the information on wildlife and its habitat provided in following chapters.

The third part of this chapter introduced the reader to development impacts on the project region. Agriculture, forest industry, oil, gas and mineral exploration, roads, and the Bennett Dam all impacted the traditional lands of the Little Red River Cree in different ways. The section concluded with an overview over the cumulative impacts of these developments.

While this chapter introduced a variety of topics important to place the research results and discussion of this study into perspective, the next chapter provides more detail on the place of ungulates and the environment in the Woodland Cree culture.

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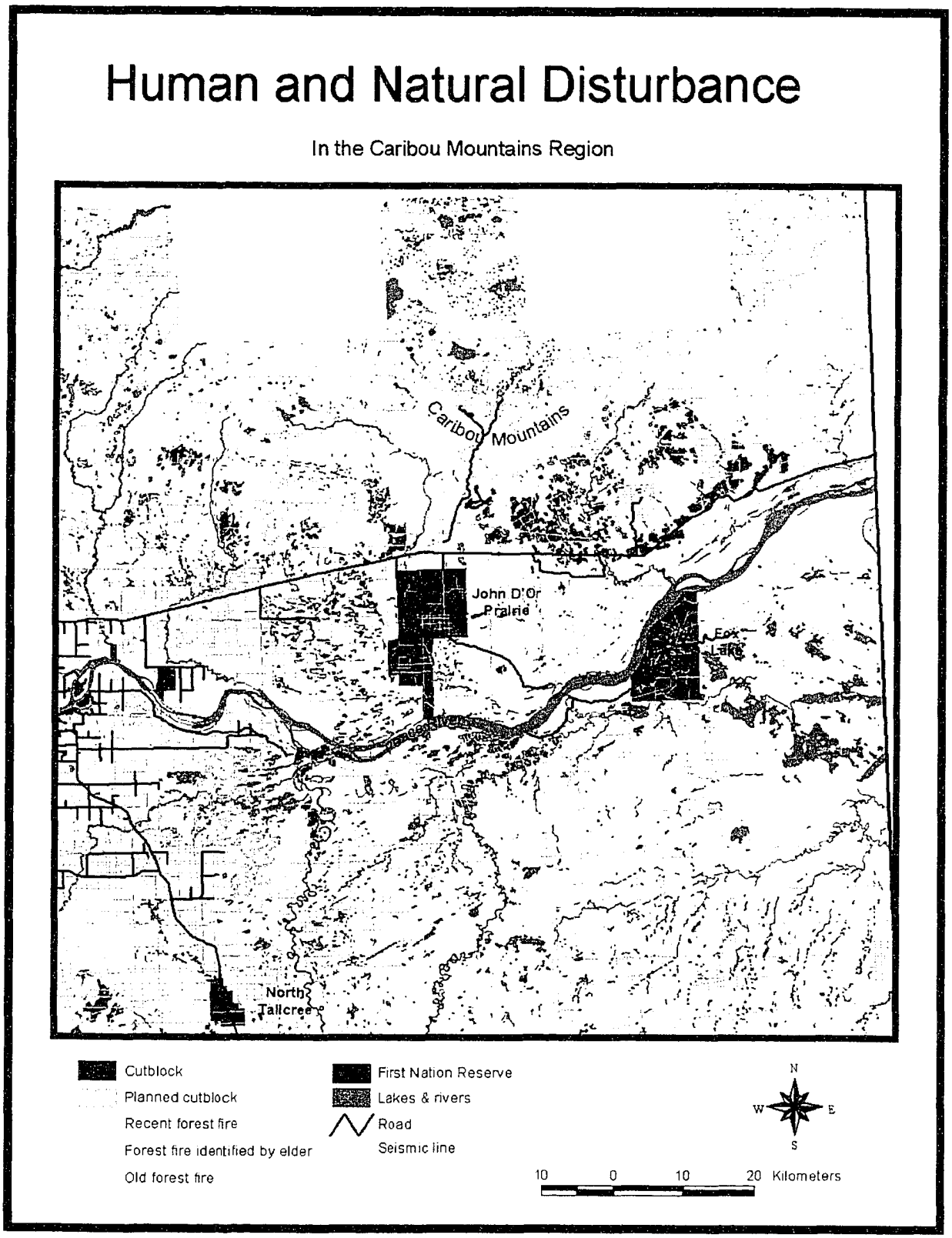

Map 4.5: Human and natural disturbances in the project region

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5 PLACE OF UNGULATES AND THE ENVIRONMENT IN THE LOCAL CREE CULTURE

Over centuries, the Little Red River Cree have formed relationships with the boreal forest environment that surrounds them. This chapter explores some of these relationships and the principles that guide human behaviour in the long-established subsistence economy. In order to better understand the context in which local participants develop their knowledge on ungulates and critical habitat, it is necessary to also describe the important role that ungulates continue to hold in Little Red River Cree society. The chapter closes with a local story about the Cree trickster Wesakychak who teaches the moose to disperse.

This chapter is largely based on the interviews conducted with Little Red River Cree TEK experts during my field research. Currently, no published detailed ethnographic work about northern Alberta's Woodland Cree people is available. Researchers such as Short (1989), Pyc (1998), Sinclair (1999), Candler (1999), Siegfried (1994), and Mader (1996) have worked with Woodland Cree in the region and include introductory ethnographic aspects in their publications, but, with the exception of Pyc (1998), none of these works aimed to research human-environment relationships in great detail. However, the different dimensions of the Eastern Cree relationships with their environment have been researched extensively. Brightman (1993) provides a qualitative theoretical ethnological analysis of Rock Cree human-animal relationships. Tanner (1979) describes the hunting ideology and processing mode of the Mistassini Cree and includes quantitative data in the harvesting and economy sections of his study. Berkes has worked with the James Bay Cree for many years, publishing works on local environmental philosophy, traditional ecological knowledge, and co-management (e.g. Berkes 1988, 1999, and Berkes and Berkes 1999). Feit (1988, 1995) has worked extensively on local resource use and management with Cree people in the James Bay region.

Human – Environment Relationships

As discussed in Chapter 2, IK and TEK are knowledge systems in which spirituality contributes to the construction of worldviews. In my research it soon became evident that it is important to understand the significance of local spirituality because it lies at the heart of Aboriginal human –

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environment relationships, and clarifies the origin of local natural resource conflicts with outside resource users. The vast majority of LRR Cree belong to the Roman-Catholic faith. Although some people are more church oriented, and others are more dedicated towards local Native spirituality, there does not appear to be the deep division between Catholics (or other Christian groups) and Traditionalists sometimes found in reserve communities (pers. observation). In an interview conducted by Steve Simon for a book on Lac Ste. Anne, Little Red River Cree Nation Chief Johnsen Sewepagaham shared his view on the co-existence of Catholicism and Native spirituality (Simon 1995, p. 4):

> The cross and the pipe can come together, it's up to the people to accept that. Of course, there are a lot of people out there who will tell us otherwise. People have told me otherwise. They say that this is Indian spirituality and this is White space; the two cannot mix.
> My feeling to that is, God is one and the same, why can't the two mix? In my opinion, I am not praying to a different God. Even though other people will say, "Well, that is a White man's God." Well, to me, there is no such thing as a White man's God.
> God is God. He is the king of the whole universe, the one that controls everything. For whatever purpose He created us in different nationalities or different languages, for whatever reason He had. That was His way. I'm not going to question that. People can come together in a neutral ground and pray, to the same God that they've always prayed to.

Native spiritual beliefs are still very present and deeply influence the local Cree way of life. For an outside researcher, however, this is a very sensitive issue to write about. Although I was granted personal insight into some aspects of local spirituality, I respect the request of the Little Red River elders at the workshop in Fox Lake to not include sensitive information in my thesis. Generally, I have followed the recommendation of a local community liaison, who advised me with the words, "In order for sacred things to stay sacred they have to be secret."[1] In the following attempt to describe the local Woodland Cree human-environment relationships I have chosen a generalized approach that is based on information readily shared by several different participants in several different interviews.

Spirituality is a key factor in local Cree human-environment relationships – a concept that is very different from mainstream Western human-environment interactions. In Cree culture, environmental components such as animals, plants, and rocks are acknowledged to have spirits. The human interaction with these components takes place on a physical and spiritual level. In the following, I will attempt to explain local human-environment relationships with the help of a

[1] Anonymous, pers. com. July 08, 1999.

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story given to me by Clifford Ribbonleg[2] from Fox Lake, for which Mr. Ribbonleg granted me explicit permission of use.

Story of the Little Tree

By Clifford Ribbonleg

It was about this time of evening, about nine, ten o'clock. I was little then, and visiting with my grandfather. He was raking his yard. A little tree was standing there by itself.

He asked me : "nôsism" - which means: my grandson. "Nôsism," he said, "what do you see on that little tree standing there?"

I looked at him and I said: "Grandpa, all I see is a little lonely tree, standing there. Nothing around it, just a little tree."

And he said: "Mah!" He was surprised that I didn't know. So he said: "Mah! Môco," which means: "You're crazy!"

And I said: "Ok, tell me".

He said: "I see everything in that little tree. You know, that little tree is fighting: human beings, everybody. It's fighting in its own ways and it's fighting back." He continued: "You make paper out of that and that's all. But what comes out of paper? That's law. And the law is written on paper and everybody is getting slammed with it in different ways[3]. So people are suffering now because they don't understand the tree." And then he said: "Building supplies are made out of it. And the only thing that people think about when they make building supplies like lumber - things like that, everything that a house is made out of comes from the tree - the only thing people think about is that little green piece of paper. They don't understand that tree."

I then asked him: "Grandpa, you don't read, but how do you understand what people say"?

He said: "Well, I don't understand radio or TV, but sometimes I see, and that's where I learned from – through seeing. And this is what I saw in that little tree." He continued to explain: "Even the new houses. They are beautiful houses, nice houses, but they are actually just a bunch of matchboxes. You know, pass some three years and they are cold. After three years they have lost the ability to be warm; after that they are cold. No matter how thick the walls are, they just go cold. Because nobody put anything back to Mother Nature. And that's what that little tree is

[2] Interview in Fox Lake August 18, 1999 and Fox Lake Workshop, August 2, 2001.

[3] Clifford Ribbonleg later explained that his grandfather used the Cree word for *pulp – setikamagan*, which also means *to suffer*.

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fighting for. You see, that little tree wants something back, being a tree. But we got lots out of that little tree," he said. "Like us, when we make our log cabin, we go to the bush. We bring tobacco, we put tobacco underneath that spruce tree. And we kneel down and we will ask that tree - that spruce tree, which is a spirit itself – we ask the spirit tree to keep our house warm, to keep the people that are living in there warm, and to keep them from harm from fire. But we ask this before our Creator." And then he said: "Look how long our buildings last when we do that. Just look at the building in Little Red. It's been there a hundred and thirty years, and it's still there. But look at the new houses being built. They last fifteen years and they are already rotten and everything." He concluded: "That's what that little tree wants. For somebody to go and kneel down and say a prayer, because that's how Mother Nature helps everybody."
And that's the way he told it to me. When grandpa was talking about that little tree he finished it off by saying: "There is so much destruction in this world." In Cree he said: "There is so much destruction with Mother Nature's dress in this world. And nothing is being put back. And yet all people get out of it is this..." *[he makes a gesture that symbolizes money]*.

Aha, yeah. But he is right. Mother Nature is losing her dress. And we're having storms, tornadoes, going as far as Edmonton. We would have never heard of it before. Those trees that they grow in the cities were uplifted like nothing. It is because the human being planted them there. And they were just flying around like toothpicks. But these trees, the Creator put them there. And that's what he said. You and I, we put a tree there, and when a big tornado or a big one like that comes, that tree will fall down; but that little tree there, that would never fall down because it was put there by the Great Spirit. And that's how he finished his story.

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Photo 5.1: Old log house at Little Red River

Underlying Clifford Ribbonleg's story are two local key values, which I would like to refer to as *Respect* and *Reason*. There are *respectful ways and good reasons* to take local resources, likewise there are *disrespectful ways and no reason at all* in how people perceive others (or themselves) to use resources. Florence Nanooch[4] voices her concern as follows:

> *I don't agree with that [trophy hunting]. Like, people killing – even the bears and stuff like that, moose, just to take their... throw away all that meat. That's not respect, throw stuff around like that. I don't see very many native people using – like... if they kill something they would use all the meat that they had killed and not just throw away just take the antlers or what ever... hides or... they use all, all the meat that they can use. That's for – to survive. And for the land too, like - the trees are being destroyed. I always often wonder when I look at the mountain now it's been all the logging that they are doing there and... where will the animals go and how – what about the water? And they say that they are polluting the water. I often ask myself, why do people...? There's a lot of people out there that wanna go after the trees, animals and... Why can't they just look at the world and just take whatever they need instead of just trying to be rich and destroy everything in Canada or in other countries? It seems like they can't stand to see living things like trees or animals being alive. They have to get rid of it - and then what?*

In Mr. Ribbonleg's story, trees cut to build houses that became shelter for families were respectfully used. To maintain the respect-relationship people would address the Creator and the spirit tree in a prayer and leave an offering of tobacco behind before they would cut the trees for a house. Many Cree elders in this study held that industrial logging is often offensive to them – partly for its reason (which elders describe as money and greed) and partly for its practices (especially clear cut logging and scarification). Large numbers of trees are cut all at once, removing or significantly disrupting the habitat of local species of animals and herbs. Many elders pointed out, for example, that logging affects squirrels – they are left without food and dens and consequently starve. In the former trapping lifestyle the squirrels were a reliable food source for people and sled dogs. Today's older generation, which benefited from squirrels in the past, does not benefit directly from logging on their traditional lands and is left with its destructive effects. To them industrial logging means that animals die for no reason. It is necessary to point out that many of the elders worked in forestry and on seismic lines in their younger years and therefore have sympathy for younger community members who work in resource extraction for the purpose of feeding their families. However, for elders who want to

[4] Interview in John D'Or Prairie, July 2, 1999.

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spend their retirement years in their cabins in the forest as much as possible, logging activities in their back yard considerably affects their enjoyment of the land. These elders likely do not have the time, motivation, and financial resources to move their cabins to a less disturbed place where they would have to get familiar with finding the resources they are accustomed to harvest.

The same values of respect[5] and reason apply to local hunting ethics and the way wildlife is regarded. In the Woodland Cree culture a good reason to hunt an animal is to feed the family. It is respectful to acknowledge that the animal was given to the hunter by the Creator for this reason, or that the animal chose to give itself to the hunter. Out of respect to the Creator and the animal everything that can be used will be used, and the animal will be shared with others. To maintain this respect-relationship most hunters will leave an offering from the hunted animal behind. In contrast, the hunting practices of most outside non-native hunters are considered offensive and disrespectful by local First Nation's people. In their view, the majority of outside hunters are trophy hunters who are only interested in the trophy and often leave the rest of the carcass behind. In the spring of 2000 and 2001, for example, Malcolm Auger, the local bison monitor, found the carcasses of bison cows (one was nursing, the other carried a fetus) that had been hunted by non-native hunters. Only the head, the coat, and the hindquarters had been taken, the rest was left behind to rot. Many participants voiced the same concerns over trophy hunting for bears. Every spring non-local outfitters establish bear trophy hunting camps in the region. The camp at the Wentzel River is set up for bear baiting, where large amounts of old grease and bacon is used to lure bears. Trophy hunters can sit in the safe location of a high large spruce tree to wait for their trophy. Alberta game laws do not require the proper disposal of bear carcasses and meat; consequently, local Cree hunters come across several rotting bear carcasses each spring. In many First Nation cultures the bison and bear are regarded as powerful sacred animals that deserve particular respect. Hunting bison and bears for the trophies only is considered *no reason at all*; to hunt and leave behind the meat is considered extremely disrespectful. It is important to add that a number of elders also voiced the concern that some of the younger local hunters and trappers do not always follow the traditional principles closely. Some participants, for example, were

[5] Tanner (1979, p. 153) emphasized the importance of respect when he documented human-animal hunting relationships with the Mistassini Cree: "The Cree say that the rites are all intended to show gratitude for the meat, and also to express the hope of extending their good fortune to future hunts; but the expression which best states their central attitude following the kill is the desire and the necessity to show *respect* towards the animal. This is achieved by treating the carcass properly."
Feit (1988) describes the importance of respect in the human-animal hunting relationships with the Waswanipi Cree. Freeman (1999) also emphasizes that respect is important in the relationship between humans and non-human persons (animals) in the Arctic.

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concerned that many hunters do not use tracking as the main hunting strategy but rather tend to go 'crow hunting': driving up and down a road to see a moose and go after it (like a crow waiting for road kill). Some trappers seem to be primarily interested in the fur of a furbearer, like beaver or muskrat, and might not utilize the meat. The concern about disrespectful behavior towards animals becomes even clearer when we look into the ethnographic literature on human-animal interactions for the Eastern Cree (e.g. Tanner 1979, Brightman 1993, Feit 1988, Berkes 1988, 1999). Feit (1988, p. 77)[6] explains:

> For the Waswanipi Cree, for example, the classification of animals involves a hierarchy which links animals to men and both to spirits and to God. Animals are social beings, not cut off from humans as part of a natural order separated from human society. And Waswanipi therefore interpret animal actions as the result of willful choice on the part of the animals. Animals in turn are interpreted as social being capable of interpreting and understanding the actions of men. The Waswanipi hunters say that they only catch an animal when the animal gives itself to them, or is given them by God and the spirits. They are given animals because they respectfully ask for what they need to survive, and their requests are heard. And they are under reciprocal obligation for what they receive, and treat the animals with respect in the way they hunt, butcher, consume and use the animal bodies. This respect is expected and appreciated by the animals, whose souls survive to be reborn again. With the rebirth of animals, respectful and thankful men may find the animals and the food they need to survive for the duration of their own lives, and to raise their children in turn. When hunters act properly, animals souls survive, and animals continue to be reborn, in health and numbers, and humans too lead healthy lives.

From the position of Native spirituality, the actions of trophy hunters who do not utilize an animal carcass in accordance with local Native protocol could potentially affect Native hunters if the animals in the region are offended and their souls are not reborn again.

Principles of Woodland Cree Natural Resource Use

The Woodland Cree, like most indigenous people, have developed a set of principles that regulates access to and use of natural resources. In the Northern River Basins Study (Bill et al. 1996), Little Red River Cree elders identified "don't waste, over-hunt or trap" as the most important land management practices, followed by rotation of traplines and harvest areas. Some participants also mentioned that they had practiced burn-off for land management. Lewis (1982) conducted research on prescribed burning in Alberta's northern boreal forest, including in John D'Or Prairie. Due to a fire suppression policy implemented by the end of World War I, Lewis' informants were already of advanced age in the 1970s and 1980s. Although I witnessed sites of spring burning in and around John D'Or Prairie in the May of 1999, none of the participating elders contributed information on prescribed burning and environmental management to this

[6] Spelling mistakes and grammatical errors are in the original source.

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study. In contrast to Lewis' informants, most of today's elders were familiar with the fire suppression policy and had worked as fire fighters in the region.

In my research, most participants described local ethics and cultural guidelines, which I refer to as *principles*, that determine how people utilize resources from the natural environment. Some of the most prevailing principles[7] that govern the use of wildlife are:

- ***Culturally regulated hunting and trapping within a seasonal cycle.*** Most animal species are hunted or trapped at a particular time of year, usually when they are in prime condition (e.g. bears in early fall, beaver in fall and spring), easier to hunt or trap (moose during mating season, beaver in fall and spring), or very abundant (ducks and geese around their migration times).
- ***To hunt no more than is needed.***[8] This principle is closely linked to the next two principles. To waste no food, hunters will only hunt the number of animals they can safely conserve and distribute in time so that nothing is spoiled. The number of animals taken is related to the season, distance to home, and/or availability of helpers in a hunting camp. Experienced trappers, for example, who were often in the Caribou Mountains without their families, were taught to only take very few caribou as needed to ensure the meat would not get spoiled. In the winter of 1942/43, when large numbers of barrenground caribou migrated through the southern part of Wood Buffalo National Park, hunters brought home more caribou because the herds were close to home and the hunters were able to properly conserve and distribute the meat. When it is warm, bear meat tends to spoil easily. I witnessed a hunter who refrained from hunting an easily huntable bear because he was not able to ensure that he could take the meat home to his freezer in time.
- ***To waste no food.*** In Cree culture, a hunted animal has been given to the hunter by the Creator. It is the responsibility of the hunter to treat this gift appropriately. This includes the proper use of everything that is usable. What might not be useful to the hunter is generally offered to other community members.

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[7] The principles outlined here were derived from interview passages and personal communication contributed by (in alphabetical order): Malcolm Auger, Henry Hamlin, Reverent Paul Hernou, Angela Laboucan, Isadore Laboucan, John Laboucan, Alexis Meneen, Florence Nanooch, Lester Nanooch, Clifford Ribbonleg, Alfred Seeseequon, Dorothy Shupac, and Fred Tallcree. Most of these principles were discussed in Schramm and Krogman (2000).

[8] Elders involved in Tsuji's (1999) study on the sustainability of goose harvesting practices with the Western James Bay Cree also considered this an important rule.

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- ***To share.*** A hunter will not keep an animal just for himself and his immediate family, but will share it with his extended family and friends. This also makes sure that nothing is wasted.
- ***Individual hunting or consuming restrictions.***[9] Many traditional hunters will not hunt every eligible species. Some people, for example, might not hunt bear or bison because of the spiritual significance these animals have to them. Other people might choose not to eat a certain animal or certain parts of the animal out of respect for the animal. Some people might not like the taste of a particular animal and thus refrain from hunting it.
- ***Offerings.*** Participants explained that offerings are important to maintain good relationships with the surrounding environment and its visible and invisible beings. It is a way of paying respect to the Creator and the hunted animal, and a form of sharing with the great-great grandfathers (spirits). It is also an opportunity to ask the ancestors to protect the family.

All these principles have also been described by other researchers (e.g. Feit 1988, and Berkes 1988, 1999) who worked among Cree people. Tanner (1979) and Brightman (1993) contribute particularly detailed insights into how these principles need to be understood in the cultural and spiritual context of human-environment relationships of the Cree Nations they worked with. Many of the cultural principles mentioned above are also used to guide resource use with other Indigenous groups in North America and around the world. Fienup-Riordan (1990), for example, describes the concept of animal rebirth and the related respect-relationships and resource use principles between Yup'ik people and arctic animals in Alaska. The same principles guiding resource use can also be found with the Yolgu people of Northern Australia, who have developed additional principles such as regulation of access through clan ownership, and protection of sacred sites (Schramm 1995).

And the Moose to Us is Like a General Store[10] - The Cultural Importance of Ungulates

Little Red River Cree hunters and trappers hold a multitude of knowledge about ungulates and their critical habitat. This knowledge has developed for generations, since moose, caribou, and bison have long played an important role in the subsistence economy of the local aboriginal

[9] For more details on taboos and environmetal protection see Colding and Folke (1997).
[10] Clifford Ribbonleg, Interview in Fox Lake, August 18, 1999.

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people. Previously described historical and ecological circumstances have lead to a decline in LRR Cree reliance on caribou and bison, and to an increased dependence on moose. Participants, however, remember that caribou and bison were important to ensure the survival of their ancestral families. Angela Laboucan[11], for example, explained that local people used to survive on bison a long time ago. She added that they used to hunt them like moose – indicating that in the past the bison used to be as important as the moose is now. Trappers, who hold or held traplines in the Caribou Mountains, would hunt the occasional caribou during the winter and spring when they stayed in the Mountains for several weeks or months at a time.

Little Red River Cree participants had, and continue to have a variety of specialized uses of particular animal parts. The meat of a hunted animal is always very important. People consume it fresh – cooked as soup or barbequed over the fire. People preserve it by making dry meat (cutting pieces into large thin stripes and letting it dry slowly over a low fire), or they deep-freeze it. Hides are still scraped, tanned and turned into moccasins, mitts, gloves, vests, or parkas. By-products can also be turned into something useful, like a children's toy. Small skin scraps, for example, that are created when scraping a hide, can be used as stuffing for a ball. Malcolm Auger[12] explains that in the past, when people still used dog teams, caribou hide made the best dog packs. He continues to describe how his father made these dog packs:

> *My dad had made one or two. He used caribou - skinned them. He spread out the hide and cut it out, the shape he wanted it, the size. He cut it with a sharp knife. Making [holes] all around. And then he sewed it up, skin inside, hair on the outside. Sew it up with what I call a moose hide string - Sâkânâpi – moose hide string. That's what he used. And then, after he was done sewing that, then he'll stuff it with moss. This moss here. He'll stuff it, just shape it up and let it dry like that, hanging over a stick. It dries like that. Takes about three days, two days to dry. Caribou [hide] - that's how it stays at this shape. That's for a dog pack. Didn't get wet - doesn't soak through because the hair is too thick.*

Caribou hide also made good clothing. Angela Laboucan[13] talked about the importance of the caribou, deer, and bear:

> *Caribou were the best hides for moccasins. It* [the caribou] *provided food, snowshoes, drums. Caribou was an important animal – same thing with deer. Even with bears. They used to have them as "foams" – the bear fur. They used to sleep on them, roll them up. They were also used as carpets.*

[11] Interview in Fox Lake, August 17, 1999, translation: Leslie Joe Laboucan.
[12] Interview in the Caribou Mountains, June 22, 1999.
[13] Interview in Fox Lake, August 17, 1999, translation: Leslie Joe Laboucan.

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As mentioned earlier, bison used to be an important food source in the past. The hair was also used to make warm blankets. Malcolm Auger[14] describes that his mother used to make buffalo hair blankets. She used the shorter hair from a hide, which she would cut off with a knife. She then would stuff a blanked with it; much like is done with eider down.

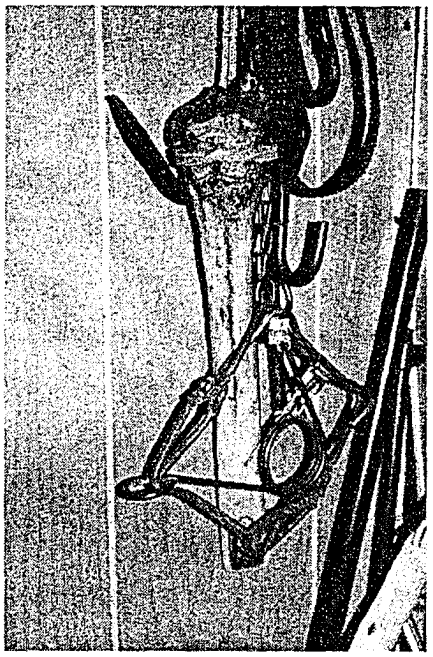

Photo 5.2: Moose bone fleshing tool and beaver conibear trap

To local Cree people the moose continues to be of strong significance. Moose meat is the most important meat source in the Little Red River Cree communities. Tanned moose hide is also still used for clothing, especially moccasins. Moose hair can be used for decoration, as in the craft of tufting. In the past it also was used to stuff dog harnesses. Moose leg bones provide an important fleshing tool for the preparation of hides. Calf rawhide is used to make drums.

Clifford Ribbonleg summarizes how in local Woodland Cree culture the physical importance of the moose is closely linked to community welfare, which in turn is maintained by following ancient rules of conduct like sharing and offering:[15]

And the moose to us is like a general store. That's the best way I could put it. A moose is like a general store for us. Because there is delicacies there, there is things that we use in certain ways for ceremonies and other stuff, there is the moose hide that we use for clothing, there's the antlers we use for making knives, you know? This is my homemade knife - moose horn. Everything. Like I said, the moose is like a general store for us. So it's so special. Let's say, somebody kills the moose. Then he calls all his friends over, and we all would say - one moose, 16 families. Basically that's about what the average one moose feeds - 16 families. Well, 16 families and there is four hindquarters, there is 52 ribs, there is the back, the head. Basically about thirteen hundred pounds a moose, or something like that, maybe [a] ten hundred pound moose, 16 people. Fifty pound of meat, maybe less for everybody. But it's that [thing?] that's there: helping, sharing, caring and loving. It's there. And for us, if we got a piece of meat about that big [he shows the size of the piece of meat], *that's special. Like right now the grunt season is coming. The first person that's gonna kill a moose this year, that's what's gonna happen: About 16 people go for meat. And then from there, the luck just comes from there. Because of what they do. As soon as they kill the moose they cook the head, they cook the tongue, they cook the breast meat - just the softest meat. They cook all that. And four pieces from each of the different sections is put in the fire. All right away, before anybody else touches anything in their mouth. Put in there. And that's why Natives are always [so blessed].*

[14] Personal communication. June 16, 2002.
[15] Interview in Fox Lake, August 18, 1999.

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As the interview passage reveals, hunting success and community welfare strongly depend on following local ethics and the previously outlined principles of resource use. Clifford Ribbonleg, for example, emphasizes that the community hunting success during the moose rut in the fall hunting season strongly depends on the actions of the first hunter who kills a moose. The hunter and his helpers have a special responsibility to properly share the meat and to observe the appropriate offering protocol to help ensure a successful hunting season for the whole community.

The close relationship that local people have with local ungulates is also reflected in the following text passage, where elder Alexis Meneen from Fox Lake[16] explains how he views his relationship with the local bison.

> [The narrator perspective is that of the translator] *[Mr. Meneen] said: "There is a connection there - that we connect the buffalo with our ancestor. 'Cause they too had depended on the same animals for their survival, for food, and they used whatever they could for maybe clothing and tools." He said: "I was born into this land, I was born here as a Native, as an Indian and I grew up living off the land. Depending on any animal that is edible, for my survival. And I could have been anything - I could have been born anyplace, but this is where I was born and these were the values that I was taught. And these are the values that I carry on today, the beliefs that I was taught. Those I still have today. And the buffalo, he too is born here on this continent. And maybe co-incidentally was born in Alberta in the Wentzel River area. [He uses] this land, for food, for his food. And he take his calves or sibling to the best places where the grass or where the feeding is good and it's easy to get at, not very hard to get to the best habitat. And he'd go there to raise his young ones. Even today, there's been many changes in the diet of our young people. I know many people here and other places. And a lot of these kids are eating what we call junk food - potato chips, cheesies, and all those things. We didn't have that in the past." He [Mr. Meneen] seldom [eats] that type of food himself, only once in a while but his preference is the wild food. Where he's happy. And he's happy in the bush in the same way. The animals in this area are happy in the bush. And, I guess, he was happiest when he was moving from place to place, from camp to camp, travelling all over on the river. He had the freedom, got free, he was like an animal. But now, we talked about this before, but now, he's on the reserve. There is boundaries there, that's where we stay. He said that many of the young people are being raised there, keep up boundaries, stay in boundaries. They need special permits or whatever, to go out anyplace, they need permits to do certain things, recreationally maybe, in some areas, in some places. But that was the value that he was taught and the value that he tries passing on to the young people, the younger generation of today. He said, many of those young people are lost and many of our values, cultural values are lost too. Like many of our young people don't know the customs or diets, traditional beliefs, traditional value - I can go down the line. They're weak in certain areas of tradition, like the language.*

In this passage, Mr. Meneen explains the different levels of relationship that he sees between himself and the bison. He relates to the bison from a historical perspective by explaining that his ancestors relied on the same animals for survival. He further points out that he was born to be a

[16] Interview in Fox Lake, August 19, 1999, translated by Celestan Nanooch.

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Native person in Northern Alberta, just as much as the bison were born to be bison in the same part of the continent. Underlying this statement is the notion that both the local native people and the bison are linked in a relationship over time and space. This notion becomes clearer when Mr. Meneen explains that both bison and native people share the same priorities in striving to do what is best for their families. In this pursuit, the freedom to move and to choose is strongly linked to happiness and to the survival of local values.

Good hunting skills and detailed knowledge of animal behaviour and habitat preferences are other factors that are vital to ensure hunting success. Lorne Tallcree[17] explained to me the strategy of moose tracking. In order to confuse potential pursuers, a moose generally leaves a zigzag track, which will lead back in a circle to its older tracks. A hunter will circle around the tracks from the opposite wind direction, occasionally walking towards the tracks to check their direction. In the ideal situation, the hunter will find the moose near the end of its own circle.

The importance of the knowledge about animal behaviour is reflected in the fact that it also has found its way into the local story-telling tradition. I would like to conclude this chapter with a trickster story that was recorded in Fox Lake for the production of *The Grouse's Pouch* series[18], a collection of local Little Red River Cree stories in Cree and English. In the past, Wesakychak[19] stories and hunting stories were shared for entertainment and education. Children would learn valuable knowledge long before they would join their fathers and uncles on hunting trips and on their traplines. The story told by Alexander Laboucan reveals details about Cree behavioural knowledge of moose. It also points out the vulnerability of herd ungulates to hunting, a topic that will re-emerge in the final chapter (Chapter 7).

[17] Interview in John D'Or Prairie, September 08, 1999

[18] The Little Red River Board of Education and the Kayas Cultural Centre (1987): The Grouse's Pouch. Fox Lake.

[19] Wesakychak is the Cree trickster. Much like his Pacific Coast pendant 'Raven', or 'Coyote' in other regions, he creates, destroys, and gets into mischief. A typical element of Wesakychak stories is that he often addresses other animals as 'little brothers', which in turn call him 'big brother'.

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Separate Ways

Told by Alexander Laboucan

Wesakychak taught all the animals what to do while here on Earth. And in the beginning the moose stayed in herds like the buffalo. One day Wesakychak came upon a herd of moose. They were huddled together and shaking from fear.
"What is the trouble my Brothers? Why are you so frightened?" Wesakychak asked.
"We are scared of people, Big Brother, very scared," the moose replied.
"That is not the way to behave," Wesakychak advised, "if you all herd together many will be killed! Just go your separate ways. I will show you how."

Wesakychak travelled through the bush, instructing each of his moose brothers. First Wesakychak taught each moose how to sniff in the direction that the wind was coming from.
"Now you will know if any enemy is coming from that way," he stated. "Also my Brother, this is what you must do if you are going to run away from your future enemies," Wesakychak instructed. "Exercise your legs first. They will not get tired when you run great distances." Our Big Brother then began stamping and kicking the ground with one leg. Wesakychak also began wetting his leg and soon his moosehide pants were frozen with urine. The moose again followed their Brother's example by wetting their legs.

Even today, if you find the stamping and kicking tracks of a moose, you will know the animal has run a great distance. A hunter will never catch that moose, for it has learned Wesakychak's lesson well.
As Wesakychak spoke so it is today. You have to be an expert hunter to kill a moose for they no longer run in herds. If they did, even I would probably kill one.

It is interesting to note, that at the beginning of this story when the moose were staying in herds like the bison, they were particularly vulnerable to human hunting. The dilemma of the moose continues to be the main dilemma of the bison in the project region. Little Red River Cree TEK experts have identified human hunting as the main reason for the Wentzel Lake herd to retreat

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into a smaller and more remote range. The observations of moose behaviour (stamping, kicking, and urinating) and its cultural interpretation (Wesakychak telling the moose to exercise his legs) shows how tightly interwoven human-animal relationships are in the Cree culture. In the beginning, the human-like trickster Wesakychak teaches the moose, in the end, the human hunters learn from the moose. More details on what Little Red River Cree experts know about ungulates, their habitat and behaviour is presented in the following chapter.

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6 KNOWLEDGE OF CRITICAL UNGULATE HABITAT: SCIENTIFIC AND TRADITIONAL ENVIRONMENTAL KNOWLEDGE PERSPECTIVES

The overall aim of this study is to document local traditional ecological knowledge on critical habitat, seasonal patterns of habitat use, and local distribution and movement of moose, woodland caribou, and wood bison. This chapter summarizes results from the scientific literature and presents the results of traditional ecological knowledge that Little Red River Cree participants contributed for the three regionally most important ungulates and their critical habitat. Each ungulate subsection starts with a literature review, followed by a presentation of the results of the analyzed field data of this research project. The results are presented with the help of maps and cycle diagrams. The maps contain critical habitat information derived from interviews and map-overlays. The cycle diagrams show seasonal food and habitat preferences, seasonal environmental changes, and some information on effects of predators and parasites for the particular ungulate species. Elder Malcolm Auger was centrally involved in the development of the cycle diagrams.

The approach of presenting the literature review on ungulate research and the project findings in the same chapter is somewhat unorthodox. Since this dissertation introduces the reader to a large variety of literature review and background information on issues surrounding three ungulate species, I chose this approach to allow the reader to draw their own inferences from the findings provided in this dissertation and by other ungulate research projects. It is not the aim of this arrangement to evaluate the contributions of TEK experts by measuring their information against bio-scientific findings. Rather, this approach should be seen as an opportunity to see the different perspectives that each knowledge system offers to the global pool of knowledge.

Wildlife Research in the Caribou Mountains Region

Few documents on wildlife research in the Caribou Mountains exist. Höhn and Burns (1975, 1976) documented birds and mammals for the plateau region of the Caribou Mountains. The Boreal Caribou Research Program collected radio telemetry data for woodland caribou in the

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Caribou Mountains (Schneider et al. 2000, World Wildlife Fund Canada 1999). Recently, Gates et al. (2001a) completed a report on bison movement and distribution in Northern Alberta, which also includes information on the Caribou Mountains region. University of Toronto M.Sc. student Sarah Derrane[1] studied the effects of logging on caribou and moose population sizes in the region. In the 80's and early 90's, the Province of Alberta conducted province-wide moose surveys during a period of population lows (Alberta Environmental Protection 1994). As part of the Northern River Basins Study (NRBS), Bill et al. (1996) undertook a detailed traditional knowledge study, which included participants from the Little Red River Cree and Tallcree First Nations. The study contains interesting details on many animal species and observations on environmental changes. One of the many culturally-sensitive approaches of Bill et al.'s (1996) study was the acknowledgement of the spiritual element of traditional knowledge. Pyc (1998, 1999) conducted a thorough investigation on traditional knowledge of moose and related management implications with the residents of Garden River in Wood Buffalo National Park.

The trends in wildlife research concerning the three target ungulate species of this study vary with each species. This can be strongly linked to the fact that each animal species has a different status in regard to its abundance in Canada, and in particular in Alberta. The Province of Alberta classifies the woodland caribou as threatened. It is generally believed that habitat fragmentation is a major contributor to the decline in woodland caribou populations (e.g., Fuller and Keith 1981, Bradshaw et al. 1997, 1998, Smith et al. 2000). Until the early 1990s the wood bison was also regarded as threatened. The so-called 'hybridized' wood bison populations outside Wood Buffalo National Park have since been declared 'livestock' in Alberta and do not therefore fall under the regulations and protection of the Fish and Wildlife Division. It is interesting to note, that the federal *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) recently (May 2004) designated the plains bison as *threatened*.[2] Moose populations in Alberta are neither threatened nor endangered, and recreational hunting is regulated through provincially administered tags.

The formulation of research questions and the determination of what type of research is funded by government and industry is often a very political process. In my project region the following three topics dominate the ungulate research debate: declines or extirpation due to industrial activity; the risks associated with diseases in wild ungulate populations; and the ecological

[1] Sarah Derrane, personal communication, May 2002.
[2] http://www.cosewic.gc.ca/ accessed September 2004.

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pressure that an abundant ungulate species could potentially inflict on a declining species. In the last decade, much industrial funding has been invested in woodland caribou research, whereas government funding and some funding from agricultural organizations has been channelled into wood bison disease research. The literature review at the beginning of each ungulate subsection gives a brief overview of local Alberta issues in regard to wood bison, woodland caribou, and moose, and the latest trends in research in regard to the three species, with a particular emphasis on studies applicable to this project. Each literature review is followed by the results of this study.

CARIBOU

Literature Review

Woodland caribou (*Rangifer tarandus caribou*) historically occupied much of Alberta's boreal forest and western foothills. Today, their ranges are fragmented and their numbers have declined (Dzus 2001, Edmonds 1988). Woodland caribou are designated 'threatened' under the Alberta Wildlife Act (2001).

Alberta's woodland caribou can be divided into two ecotypes. The 'mountain ecotype' occupies ranges in west-central Alberta and is primarily characterized by the seasonal migration of herds between forested foothills in winter and alpine mountain habitats in summer. The 'boreal' ecotype lives year round in peatland complexes dominated primarily by black spruce and tamarack (Dzus 2001).

In the last decade much of the woodland caribou research has focused on finding answers for the rapid decline of woodland caribou populations in Canada. In Alberta, two research organizations currently carry out most of the caribou research. The Alberta Mountain Caribou Study (a cooperation between the West-Central Alberta Caribou Standing Committee (WCACSC) and the Department of Renewable Resources/University of Alberta)[3] focuses on mountain caribou in west-central Alberta, whereas the Boreal Caribou Research Program[4] centres their research on

[3] For more information see: www.rr.ualberta.ca/research/caribou/
and: www.rr.ualberta.ca/research/caribou/participants.htm
[4] For more information see: www.deer.rr.ualberta.ca/caribou/bcrp.htm

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boreal caribou, mainly in north-eastern and north-central Alberta. Dzus' (2001) report on the 'Status of the Woodland Caribou in Alberta' is a very good resource that summarizes current knowledge and trends in Alberta's woodland caribou research. Relevant woodland caribou research has also been conducted in other Canadian provinces, such as British Columbia, Saskatchewan, Manitoba, Labrador, or Newfoundland (e.g., Bergerud 1983, Bergerud et al. 1984, Brown and Theberge 1990, Poole et al. 2000, Mahoney et al. 2001). The four most prominent research areas are predator-prey systems, population dynamics, critical habitat research, as well as the effects of human and natural disturbance on woodland caribou.

Woodland Caribou Population Dynamics and Predation

Between 1991 and 2002 the BCRP radio-collared 332 caribou from six caribou ranges in north-central and north-eastern Alberta, including the Caribou Mountains. Results from the research indicate that predation accounted for 52% of mortalities (out of a total of 112 dead animals), 4% of deaths were due to natural causes, 9% were due to hunting/poaching (plus an additional 7% that were suspicious of hunting/poaching). The cause of death for 29% could not be ascertained (McLoughlin et al. 2002a). Although pregnancy rates were high (86- 100%), the actual calf recruitment rate was very low with 20 calves per 100 cows in the six-ranges project region. In 2000/2001 the Caribou Mountains herd had the lowest single-year calf recruitment rate in the project region with 6 calves per 100 cows (McLoughlin et al. 2002a). The low calf recruitment rate provides the main explanation why the Caribou Mountain herd has dramatically declined (Dzus 2001) since the beginning of the BCRP monitoring program.

It has long been suggested that wolf predation is one of the most important factors in the decline of woodland caribou populations (Bergerud 1974). Several publications propose that high wolf populations are primarily maintained through high numbers of moose, and that woodland caribou populations seem to be more stable where caribou are able to spatially separate themselves from moose (Bergerud 1983, Bergerud et al. 1984, Seip 1992). Dispersion is one of the main woodland caribou antipredator strategies. Bergerud (1983), for example, documented woodland caribou dispersion along shorelines, and Bergerud et al. (1984) and Seip (1992) found that mountain caribou dispersed in heterogeneous and rugged mountain terrain. James (1999) found that woodland caribou in north-eastern Alberta select fen/bog complexes whereas moose and wolves select well-drained habitats. This spatial separation also reduces the predation pressure on caribou.

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Edmonds (1988) found that high mortality in adults and low calf survival were responsible for a decline or stabilized status of two woodland caribou herds (one mountain and one boreal ecotype) in west-central Alberta. Predation by wolves accounted for most of the deaths of radio-collared animals, but the high mortality rate was increased through human hunting – which in turn was directly related to increased access (habitat fragmentation). Fuller and Keith (1981) also established that low calf survival and high adult mortality seem to negatively affect a woodland caribou herd in the Birch Mountains in north-eastern Alberta. They were, however, not able to link this observation directly to wolf predation.

McLoughlin et al. (2002b, 2004) researched the genetic diversity of woodland caribou in six ranges in northern Alberta and north-eastern British Columbia. The analysis of microsatellites indicated that genetic impoverishment is not the source of population decline for woodland caribou in western Canada. The analysis further indicates that the Peace River seems to form a natural boundary between the different caribou populations. Woodland caribou in the Caribou Mountains thus are much closer related to caribou in north-eastern British Columbia than to caribou from the Red Earth region.

Woodland Caribou Critical Habitat Research

Generally, critical habitat for woodland caribou is characterized primarily by the abundant presence of lichens (terrestrial and/or arboreal), the most important caribou food source for most of the year. Lichens, which are very slow growing and have limited dispersal mechanisms, are most abundant in relatively old forests (Dzus 2001). Other factors that influence caribou habitat selection are predator avoidance, landscape/ecoregion (mountainous or boreal), differences in snow cover, and human and natural disturbances.

Research in Alberta by Bradshaw et al. (1995) and Stuart-Smith et al. (1997) showed that caribou select lowland habitats over upland regions[5], and particularly prefer treed fens and bogs. Comparing radio telemetry data from several woodland caribou herds in northern Alberta with a

[5] In the geographic setting of the Caribou Mountains, the standard terms *upland* and *lowland* are somewhat confusing. In the scientific literature, lowlands represent peatland habitats dominated by bogs and fens. Uplands are non-peat habitats dominated by tree stands. In the Caribou Mountains, typical lowland habitat can be found on the top of the plateau, whereas upland habitat is found on the lower laying hills and slopes of the Caribou Mountains.

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peatland map for the province, Schneider et al. (2000) confirmed that caribou select peatlands (lowland habitat), and prefer bogs over fens. Generally, caribou avoid non-peatland (upland) habitats. Anderson (1999) studied habitat use by caribou of the Red Earth herd in Alberta using fine-scale peatland inventory data (in comparison to Bradshaw et al. 1995, who used a coarse-scale inventory). Some of the caribou in the region are found in an upland-dominated landscape. Anderson found that caribou generally selected landscapes dominated by treed fens and bogs, which includes peatland habitat patches in upland landscapes.

Snow conditions can affect access to food and caribou seasonal movement. During late winter, woodland caribou in Manitoba are known to migrate onto uplands where the snow is softer and shallower (Stardom 1975). Schaefer's (1990) study from south-eastern Manitoba found however, that jack pine habitats, which are preferred by local caribou in winter, had harder and thicker ground snow conditions than other researched forest habitats. His findings indicate that the woodland caribou in this region chose lichen abundance (which was greatest in jack pine habitat) over easier access to decreased lichen abundance in other habitats. Brown and Theberge's (1990) research on woodland caribou in Labrador indicates that local caribou were well adapted to deep and hard snow conditions, and select feeding sites primarily on the expected presence of forage. Stepaniuk (1997) investigated caribou feeding behaviour in regard to lichen abundance and snow conditions and found that caribou in the Foothill Model Forest region of west-central Alberta also selected feeding sites based on lichen abundance and not by snow conditions. The study further showed that caribou utilize terrestrial lichen in timber stands of a variety of ages. However, Szkorupa (2002), who studied mountain caribou winter habitat selection in west-central Alberta, found that caribou in her study region generally preferred older, denser stands and fed on tree lichen more when snow hardness increased.

The availability of lichen, the preference of lowland habitats over upland regions, and the effects of snow on caribou habitat selection are all important factors affecting the choice of habitat by the Caribou Mountain caribou.

Effects of Human and Natural Disturbances on Woodland Caribou

In recent years an increasing number of studies have focused on the impacts of human and natural disturbance on woodland caribou and their habitat. Three factors caused by human disturbance currently receive particular research attention: habitat fragmentation, noise disturbance, and

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predator advantage through an increase in travel corridors. In Alberta's woodland caribou ranges, habitat fragmentation is primarily caused by oil and gas exploration (creation of seismic lines and development of oil and gas wells) and commercial logging. In Smith et al.'s (2000) study area in the foothills of west-central Alberta, timber harvesting fragmented about 11% of the local caribou winter range. The researchers found that the caribou avoided recently fragmented areas by an average of 1.2 km. Caribou also avoided areas that were actively harvested. Bradshaw et al. (1997) was able to show that caribou respond to noise simulated to resemble that of a seismic exploration, potentially leading to energy losses during the winter season. Bradshaw et al. (1998) modelled the effects of multiple encounters with disturbances caused by petroleum exploration and found that exploration can affect caribou negatively. "Cumulative disturbance can potentially affect female mass loss over winter and possibly calf production and survival" (Bradshaw et al. 1998, p. 1323).[6] James (1999) researched the effects of linear corridors in relation to caribou mortality in north-eastern Alberta. He found that 35 out of 98 radio-collared woodland caribou tended to stay significantly further away from linear corridors in comparison to random points. He also found that caribou near linear corridors seem to be at higher risk of wolf predation since caribou mortalities were closer to linear corridors than were live locations for all caribou. Additionally, the travelling speed of wolves on linear corridors was 2.8 times faster than the average speed of travel in the forest. Oberg (2001) investigated mountain caribou responses to linear features (streams, roads and seismic lines) in west-central Alberta. She found that caribou avoided streams and roads but did not find a significant avoidance or preference for seismic lines. Her results for seismic lines may be attributed to low statistical power, the possible success of current low impact mitigation measures, or to aspects of mountain caribou life history.

Fire is the main natural disturbance factor responsible for the loss of caribou habitat, because it destroys slow growing terrestrial lichen, which is the primary food source of caribou. Thomas et al. (1996) studied the effects of fire on a barren ground caribou winter range in north-central Canada. Their results indicate that total lichen biomass increased with the age of forests to 100-150 years after fire. Some lichen species, however, were able to reach their peak biomass as early as 40-60 years (for *Cladonia* spp.). In two different ranges, caribou lichen (*Cladina* spp. and *Cetraria nivalis*) stabilized after 41-60 years and 61-80 years. Jess Dunford researched the effects of fire on woodland caribou ranges in the Caribou Mountains and in the Red Earth region found that northern Alberta's caribou might respond to fire disturbance differently than caribou in other

[6] The effects of winter mass loss in adult caribou and reindeer females upon reduced calf survival rates have, for example, been researched by Bergerud 1975, Rognmo et al. 1983, Skogland 1984, Adamczewski et al. 1987, and Cameron et al. 1993.

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study regions in that the disturbance caused by fire might not alter local caribou use of the landscape (Dunford 2002).

Habitat fragmentation through seismic lines and forestry, noise, and the effects of fire on the lichen supply all affect the local woodland caribou population in the Caribou Mountains.

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Results: LRR Cree Traditional Environmental Knowledge of Critical Caribou Habitat

During my fieldwork, LRR Cree traditional knowledge experts identified two types of caribou on their traditional lands: *woodland caribou* (Map 6.1, green, grey, and brown information) and *barren ground caribou* (Map 6.1, light purple). Later, to my surprise, elders at the workshop in Fox Lake[7] identified an additional third type – the *large caribou* (Map 6.1, pink diagonal stripes).

The Large Caribou

These caribou are described as being as big as elk or even moose, and they are white-greyish-blue in colour. Very little is known about this type of caribou. Participating elders at the workshop in Fox Lake reported that there used to be a herd of these caribou south-east of Fox Lake, near Birch River (Map 6.1, pink diagonal stripes), however, no hunter has seen them for a long time. The elders noted that hunters still encounter this type of large caribou near Slave Lake[8].

At the Sustainable Forest Management Conference, November 13-15, 2002 in Edmonton, I mentioned this observation in a presentation. John Bartlett, a forest and resource management consultant from Fort Providence, NWT, told me in response that Deh Cho elders had made similar observations in the area of the Horn Plateau near Great Slave Lake, NWT. He referred me to Stanley Sanguez, a Deh Cho from Jean Marie River. When Mr. Sanguez was eight or ten years old (he is now 44 years old), he saw a large caribou that his father had shot at the Jean Marie River up towards Fort Providence (Stanley Sanguez 2003, pers. communication)[9]. He recalls that the caribou was very big and had a large neck diameter. Its general appearance was that of a normal caribou; its size, however, was about the size of an elk or a small moose. Nobody has seen these caribou in a long time and local people now believe that they are extinct. Mr. Sanguez said that "we don't know what happened to them," but adds that many elders think that global warming could have affected local habitats. The large caribou are known by the Deh Cho to have

[7] Elders Workshop, Fox Lake, August 2, 2001. The topic was introduced by Isadore Laboucan from Fox Lake.
[8] During the workshop the elders did not specify if it was Greater or Lesser Slave Lake. Since most of today's Little Red River Cree hunting and traveling activity takes place to the west and south of the reserve, I assumed then that the elders referred to Lesser Slave Lake. After I received information about large caribou in the Horn Plateau region I now assume that the elders spoke of the Greater Slave Lake region.
[9] Telephone conversation, January 3, 2003.

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migrated back and forth from the south-western corner of the Edéhzhie Protected Area in the Horne Plateau into the Mackenzie Valley, passing the Rabbit Skin Area and then south-east towards Trout Lake.

Barren Ground Caribou

Several participants were familiar with barren ground caribou and clearly distinguished them from woodland caribou by size. In the local Cree language the term "atihk" (caribou) refers to the woodland caribou. The term "atihkahos" (the small caribou) is used to describe the barren ground caribou. During interviews, one liaison and I also used the term "tundra caribou". Daniel Loonskin[10] remembers that barren ground caribou migrated through Wood Buffalo National Park when he was a child:

> *D. Loonskin:* [The barren ground caribou] *No, they don't come as far as here. Not as far as Fox Lake. Probably they come as far as the Wentzel Lake. I remember this was in... maybe in the fifties, first part of the fifties. That year they come, when we lived on Big Island. I remember my dad went after them. Those were just the little caribou. But that was the last time they come. That was years ago.*
> *T. Schramm: Did they come in larger numbers?*
> *D. Loonskin: Oh, they were just in herds, in packs. In thirties, forties, fifties. They were small, you know. You can stick about maybe three or four in a toboggan. That's the last time I have heard of them. If they did come, I don't know. Seems like I heard a story before. They* [the caribou] *were on their way and they [people] just sort of chased them back. So, this is the story I heard. That was the last time I remember of these small caribous coming over this way. But it was good.*
> *T. Schramm: They would come from ... ?*
> *D. Loonskin: From Fort Chip*[Chipewyan] *in that area, and Fort Smith. That's the area they came through. And they head quick through, and they come as far as... oh... probably Little Fisheries. But I remember my dad. We didn't see them in Big Island. But we lived there. But I remember him getting ready and says, "I'm going after the caribou." He got some shots in the store and he went after them. But I never did see them. I never had seen a live one, you know. That was the last time I've heard of them. But, you know, it was great for the people. There was a lot of meat, it was there. You didn't have to go out there. They come straight for you and it was good.*

Lorne Tallcree[11] heard that about 50-60 years ago a huge herd of tundra caribou came through the region. The caribou went south to Lake Dene, where his grandfather used to live. His grandfather used to shoot these caribou there. Alexis Meneen also confirmed that barren ground caribou migrated through the Park 50-60 years ago. Mr. Meneen could not provide more details because by then the Park boundary had been established, and he was not allowed to hunt or trap in the Park.

[10] Interview in Fox Lake, August 24, 1999
[11] Interview in John D'Or Prairie, September 08, 1999.

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Although barren ground caribou migration is generally known to occur only as far west as Wood Buffalo National Park[12], two participants provided relevant information that included the Caribou Mountains. John Dumas[13] mentioned regular sightings of barren ground caribou in the south-western part of the Caribou Mountains. He believes that they are in the region every winter. They come to the southern rim of the Caribou Mountains in February and March. At times there are 20-50 animals in a herd (which coincides with Daniel Loonskin's previously quoted information that herd sizes in the Park were 30-50 animals). Mr. Dumas described an event where local people were hunting these caribou near Foggy Tower (Map 6.1, single event No. 2). He has seen both barren ground and woodland caribou in the Caribou Mountains and describes that they are easily distinguishable by size. He has also seen both types in the Manning region. Charles Hemlin[14] from North Tallcree remembered that his father had told stories about the small caribou in the Caribou Mountains. This was before the current trapline boundary system was established.[15] Trappers then would venture much further north into the Caribou Mountains than they do today. Mr. Hemlin understood that his father encountered the caribou further north than "the area here" – where he had his trapline. Since Mr. Hemlin's trapline is located in the south-central part of the plateau of the Caribou Mountains, the encounter probably took place to the north of the central plateau, near the border with the Northwest Territories.

During the interview with Henry Hemlin, when we were on the subject of barren ground caribou, liaison Celestan Nanooch introduced an interesting topic when he asked Mr. Hemlin in Cree if he had encountered the *small wolves*. Mr. Hemlin[16] answered that he had not personally encountered these wolves (he also used the term 'these huskies') but he knew that the wolves, which are noticeably smaller than the resident timber wolves, were from the North and they follow the barren ground caribou. Henry Moberly[17] used the term 'prairie wolf' to refer to the small wolves and described them to be the size of a dog. He further mentioned that the small wolves have a larger colour variation – white, grey, black, and red-brownish, than the resident timber wolves,

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[12] Map data of the Beverly and Qamanirjuaq Caribou Management Board (2002) confirm that the barren ground caribou from the Beverly and Qamanirjuaq herds regularly migrated into north-eastern Alberta. Ondrack (1985) mentions that in the harsh winter of 1942-43 barren ground caribou were seen as far south as Fort McMurray.
[13] Interview in John D'Or Prairie, July 17, 1999.
[14] Interview in North Tallcree, September 02, 1999, translation: Celestan Nanooch.
[15] In 1939 Alberta implemented a registered trapline system, which replaced the informal locally developed trapline system (see Chapter 3).
[16] Interview in North Tallcree, September 02, 1999, translation: Celestan Nanooch.
[17] Interview in John D'Or Prairie, September 09, 1999, translated by Celestan Nanooch.

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which are primarily black and grey. Malcolm Auger[18] did not personally encounter the wolves but also had some knowledge of them. These small wolves are known to form large packs of 20-25 wolves and they seem to be more aggressive than the timber wolves. Many years ago, Mr. Auger heard a first-hand account from a trapper from Fort Vermilion, who had been in the Caribou Mountains in winter, when a pack of about 20 small wolves started to encircle the camp. The people in the camp stayed up all night and kept the fire going. When daylight came, they rushed to reach Fort Vermilion, with the wolves following them all the way.

Woodland Caribou

Most informants described a resident woodland caribou population, which can be found throughout the whole central plateau region of the Caribou Mountains (Map 6.1, brown cross-hatching) with the exception of large burned areas (Map 6.2[19], yellow). Participants mainly observed woodland caribou in the southern and central Caribou Mountains, as far west as the Wentzel River and Wentzel Lake. The eastern and northern boundary of the range is difficult to determine because currently Little Red River Cree hunters and trappers do not generally hunt or trap in those regions. The range boundaries for the eastern and northern woodland caribou range on my map (Map 6.1) tended to be estimates based on information that participants gained from friends, old relatives, and through personal observation during their youth. Although caribou today are confined to the Caribou Mountains, local residents recall that caribou used to come as far south as John D'Or Prairie. Woodland caribou are rarely seen south of the Peace River. However, hunters from Fox Lake recall an incident where a caribou once was observed near Fox Lake (Map 3, single event No. 3).

Generally, the interviews contain little information in regard to regular herd sizes, but provide more details about unusual herd sizes. Malcolm Auger[20] noted that herd sizes are usually between 3-4 animals and up to 7-10 animals on some occasions. Henry Hemlin[21] from North Tallcree, who is now in his 70s, was 14 years old when he saw a herd of about 40 caribou at Margaret Lake

[18] Interview in John D'Or Prairie, September 07, 1999.
[19] The vegetation zones on this map and all following vegetation-based ungulate habitat maps are based on Alberta Vegetation Inventory (AVI) data. The vegetation zones represent the dominant species identified in the AVI for the region (Alberta Environmental Protection (1991). In order to account for caribou preference of older stands, the white spruce zone (light green) only represents white spruce stands older than 60 years.
[20] Interview in the Caribou Mountains, June 24, 1999.
[21] Interview in North Tallcree, September 02, 1999, translation: Celestan Nanooch.

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while spending the holidays with his father and uncle on the trapline. In 1960, while trapping with relatives, Henry Hemlin observed a very large herd, as he describes: "must be thousands of caribou". There were so many of them that they filled the crooked-shaped lake near Eva Lake (Map 6.1, single event No. 1).[22] Mr. Hemlin shot one animal and the herd stampeded off with a very big noise. Mr Hemlin is sure these were woodland caribou – he points out that he would have noticed the difference in size if the herd had been comprised of barren ground caribou. After this sighting he never saw a big herd again. Henry Hemlin obtained information from another trapper (who trapped in the Caribou Mountains for many years but passed away some years ago) who mentioned that this very large herd migrated back and forth to British Columbia.[23] A curious detail of the account is, that this herd never left many traces (e.g., the trapper only found very few antlers and never any bodies of dead caribou). Malcolm Auger[24] also recalls that he saw larger herds of woodland caribou in the late 1940s. In the winter of 1948/49 Mr. Auger was trapping with his father in the Caribou Mountains at Sucker Lake (between Pichimo[25]/Rock Island Lakes and Wentzel Lake). They encountered a herd of 20 woodland caribou there, out of which Mr. Auger's father shot one animal. About a year later they saw a herd of 30 woodland caribou in the same area. Both sightings were unusual because normally, Mr. Auger and his father would only track three or four caribou at a time. Mr. Auger further perceived differences in the migration strategies between the two large herds. To him it seems that the herd of 20 caribou was migrating through the region from the west to the east, whereas the later encountered herd of 30 animals stayed in the region near the lakes, where there was good thick caribou lichen.[26]

Very experienced elders, such as Charles Hemlin, Henry Hemlin, and Malcolm Auger, who started trapping in the central Caribou Mountains between the 1930s and 40s all witnessed a decline in caribou herd sizes and numbers over their lifetime of observations. Henry Hemlin noticed a sudden absence of caribou in about 1970.

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[22] A similar observation of a very large herd was made at Wells Gray Provincial Park in southeastern British Columbia in the early 1900s: "Thicker and thicker they came, until the whole pass was a mass of moving mole-grey forms from which a forest of branched antlers sprouted, clashing and clicking together as they passed onward. ... For two hours and a half we watched them passing us. It was impossible to count them: we could only guess at their hundreds." (Glynn-Ward 1926, quoted from Seip 1992, p. 1494).

[23] This corresponds with radio telemetry data obtained by the Boreal Caribou Research Program, which shows an overlap of telemetry points between North Alberta's mountain caribou and the woodland caribou of the Caribou Mountain herd (Dzus 2001).

[24] Personal communication, June 2002.

[25] Local participants often refer to the lake as Pichimo Lake. On topographic maps it is referred to as Pichimi Lake.

[26] The observation of larger woodland caribou herds in the Caribou Mountains coincides with the hight of wolf control in Alberta in the 1940s (Lu Carbyn, personal communication, December 6, 2004).

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TEK experts identified patterns of caribou seasonal habitat preference. Figure 6.1 depicts the seasonal woodland caribou habitat selection cycle. The blue lines depict the seasonal weather and environmental conditions; the red lines show seasonal habitat preferences of woodland caribou; green represents the primary seasonal forage of caribou, orange depicts the seasonal reproductive activities and physiological changes of caribou; and purple describes particular seasonal vulnerabilities of caribou to predators. Grey arrows link observations that are related or influence each other.

In early spring, woodland caribou migrate from the central plateau to the southern rim of the Caribou Mountains where they stay in the white spruce zone[27] (Map 6.2, light green).[28] The reason is that in late winter to early spring the snow on the plateau is deeper than in the adjacent southern region. Spring melting produces a hard ice crust on top of the snow, which makes foraging and walking difficult for the animals. Lorne Tallcree describes that the snow can be so hard that it cuts the hooves of caribou, causing them to leave blood in their tracks. At the southern rim, the snow tends to be softer and thaws faster, thus allowing the caribou easier access to food. While staying on the south side, spruce tree lichen are a main food source for woodland caribou[29]. In April, they start moving back to the plateau.

The calves are born during May and early June. During summer, the areas around the lakes of the plateau are of particular importance. Cows retreat there with their calves to have an easier escape from wolves. They stay near the water in areas with small willows and caribou lichen (e.g., *Cladina* and *Cladonia spp.*). To visually present this information, I selected a one-kilometre zone[30] ('buffer' in GIS terminology) around the plateau lakes (Map 6.2, purple). In fall and winter, under snow conditions, caribou stay on the plateau around the Eva Lake region and feed on a particular plant from the horsetail family (*Equisetum spp.*).

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[27] Most of the white spruce zone is found at an elevation between 1500-2000 feet.
[28] Based on information by Charles Hemlin, Henry Hemlin, Lorne Tallcree, Alexis Meneen, and Malcolm Auger.
[29] Henry Hemlin referred to lichen in spruce trees. Liaison Celestan Nanooch added "old man's beard" during the interview, which would point toward the *Usnea spp.*
[30] The zone (GIS: buffer) was created after consultations with elder M. Auger who noted that a caribou cow and calf are still able to outrun a pack of wolves over the distance of 1 km.

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Henry Moberly[31] mentioned that his father had told him about woodland caribou calving grounds west of Margaret Lake where the bush is very thick and dominated by small spruce trees and muskeg (Map 6.1, light green, diagonal stripes). During the same season the males feed in an area further to the east from the calving grounds (Map 6.1, light green, horizontal stripes). According to this old account, males and females separate during calving season. None of the contemporary TEK experts were able to confirm the calving grounds. Charles Hemlin, described how female caribou would separate from the main herd during calving season, but they would not use particular calving grounds. Both Charles and Henry Hemlin specified that cows give birth to their calves in bush habitat rather than in the open, and cow and calf will stay near the birth place during the summer.

Woodland Caribou and Predators

In regards to the impact of predators, in particular wolves, different TEK experts contributed differing observations. To my question if there were more wolves now than in the past, Charles Hemlin remembers that the wolves were always present, but not in high numbers. Their population in the central Caribou Mountains was generally stable and independent of the caribou population. Henry Hemlin thinks that wolf numbers on the central plateau have increased since 1980 and that they prey on caribou. In his view, wolves tend to focus on old caribou. They will single out an individual caribou, which they wound and then they wait until it weakens from the wound.[32] John Dumas believes that caribou are the main prey species of wolves in the plateau region. Henry Moberly, who also holds a trapline in the Caribou Mountains, has not seen any significant changes in wolf numbers. I asked Mr. Moberly if caribou avoid areas where moose are present because of wolf predation on moose. Mr. Moberly suggested that caribou select their habitat primarily for the food. He thinks that wolves concentrate their predation efforts on moose and do not pay much attention to caribou because caribou are very fast and the wolf has little chance to catch them. Malcolm Auger answered the same question by agreeing that caribou avoid areas where moose are present because wolves are found where moose are. Several TEK experts (Henry Moberly, Malcolm Auger, and Henry Hemlin) were fascinated by the speed of caribou calves. They contributed stories on how a person was not able to catch a calf after it was three days old. Malcolm Auger, however, believes that caribou in general are not fast enough to escape wolves. When I discussed with him the difference in observations by different TEK experts in regard to caribou speed and vulnerability to wolf predation, he explained that the observations are

[31] Interview in John D'Or Prairie, July 20, 1999

[32] For more details see subchapter on Moose Results: *Moose Diseases and Parasites.*

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not necessarily contradictory. A wolf can outrun a caribou for a short distance; however, in case of a long chase the caribou has more endurance and can outrun wolves. In his view, caribou are more vulnerable to wolf predation in winter, when they cannot escape into the water. Several TEK experts supported the view that escape into water was the main predator avoidance strategy for caribou in summer. Henry Moberly pointed out that caribou are very fast swimmers, which might be due to the round (hollowed-out) shape of their hooves. John Dumas believes that the water provides additional relief from biting insects. Malcolm Auger, in contrast, thinks that caribou are not as vulnerable to biting insects as moose are because of the special properties of caribou hair (i.e., it is very thick).

Only one participant, Henry Hemlin, mentioned another predator other than wolf in relationship to caribou. He thinks that lynx might catch the occasional caribou calf, and there are many lynx in the region.

Impact of Diseases

Participants did not find any signs of diseases in local woodland caribou and had the overall impression that caribou are very healthy animals.

Impact of Natural and Human Disturbances

Caribou habitat is particularly vulnerable to fire. Since the caribou's preferred food source lichen is very slow growing, a fire can destroy prime caribou habitat for many years. The fire of 1995 (Map 6.2, yellow) destroyed large areas of important caribou spring habitat in the white spruce zone of the south-western Caribou Mountains. In regard to caribou response to fire, Henry Moberly explained that caribou would leave a fire area. They return the next year to see if any feeding areas survived the fire. In most cases though, the caribou habitat is altered and it takes many years to regenerate.

In this study, participants pointed out human disturbance rather than wolf predation as the most important factor in the decline of caribou populations. Many informants (e.g., Daniel Loonskin, Lorne Tallcree, Malcolm Auger) observed that caribou left an area after the construction of roads and seismic lines, and logging activities started. Malcolm Auger and Lorne Tallcree reported that caribou also continue to avoid cutblocks long after logging activities ended. Mr. Auger attributes caribou avoidance of cutblocks primarily to the lack of availability of caribou lichen. Logging activities have further destroyed large parts of caribou habitat along the southern and eastern

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slopes of the Caribou Mountains. Currently, the largest white spruce zone still directly connected to the plateau is a small patch north of John D'Or Prairie around Foggy Tower, which due to its composition of old spruce trees, is likely slated for logging in the near future. Loss of this remnant spring habitat will likely force woodland caribou into staying on the plateau during early spring, thereby decreasing the availability of their food resources.

Before John D'Or Prairie became a settlement in the 1960s, and the road to Garden River was built, caribou were occasionally seen near John D'Or Prairie. TEK experts identified noise and human hunting pressure as main factors that caused caribou to retreat into the Caribou Mountains.

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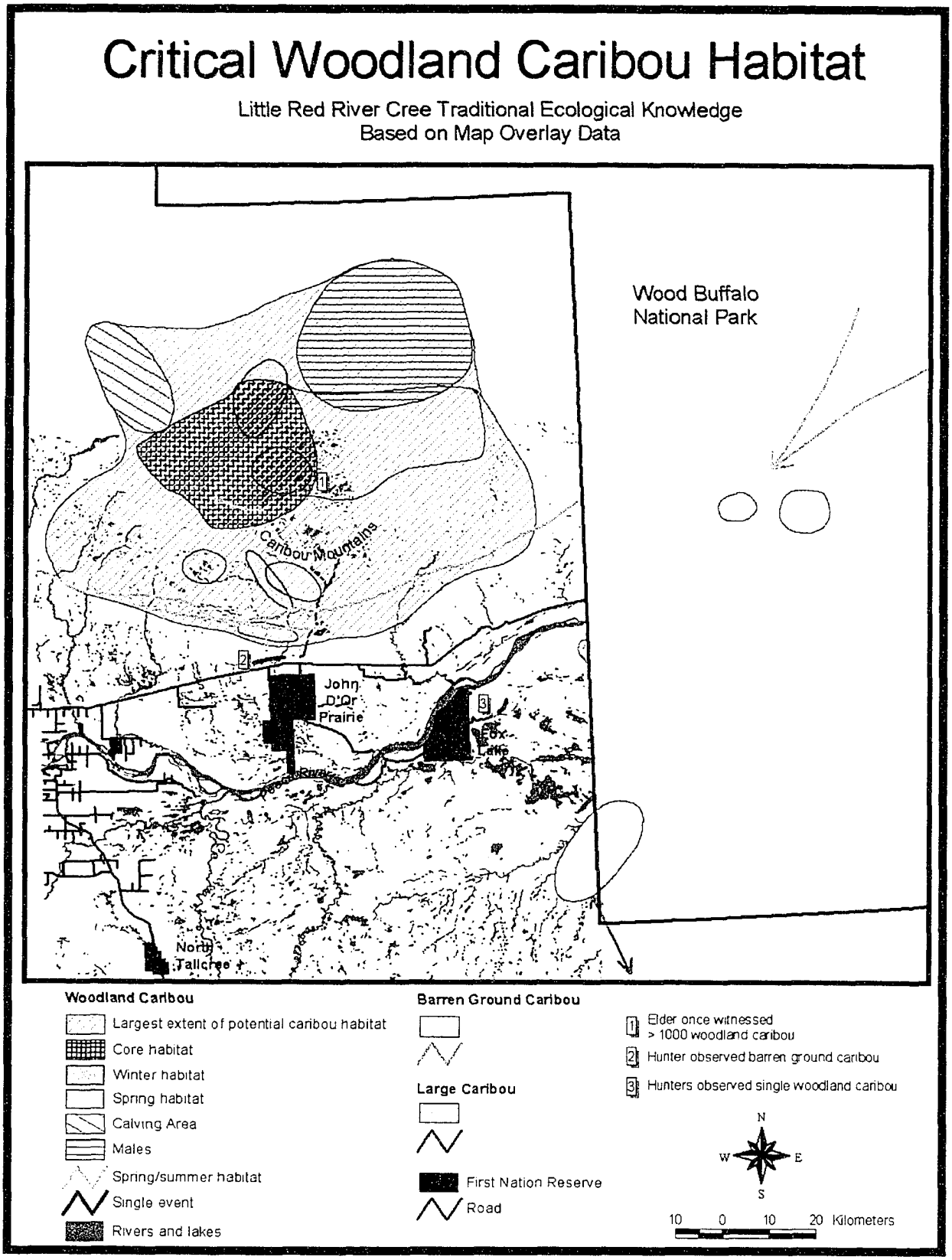

Map 6.1: Critical woodland caribou habitat based on map information provided by Little Red River Cree TEK experts

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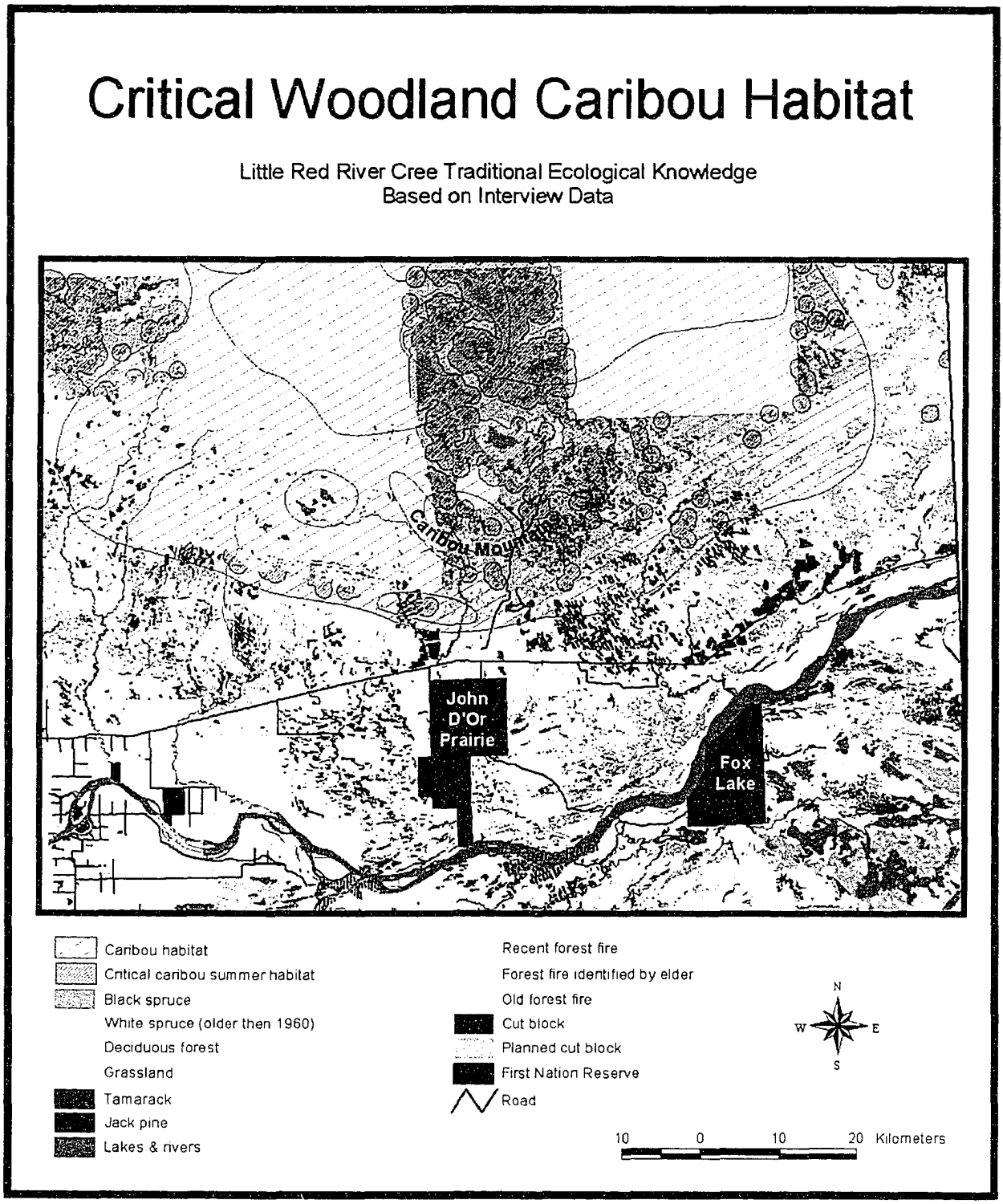

Map 6.2: Critical woodland caribou habitat in the Caribou Mountains based on descriptive information provided in Little Red River Cree TEK expert interviews

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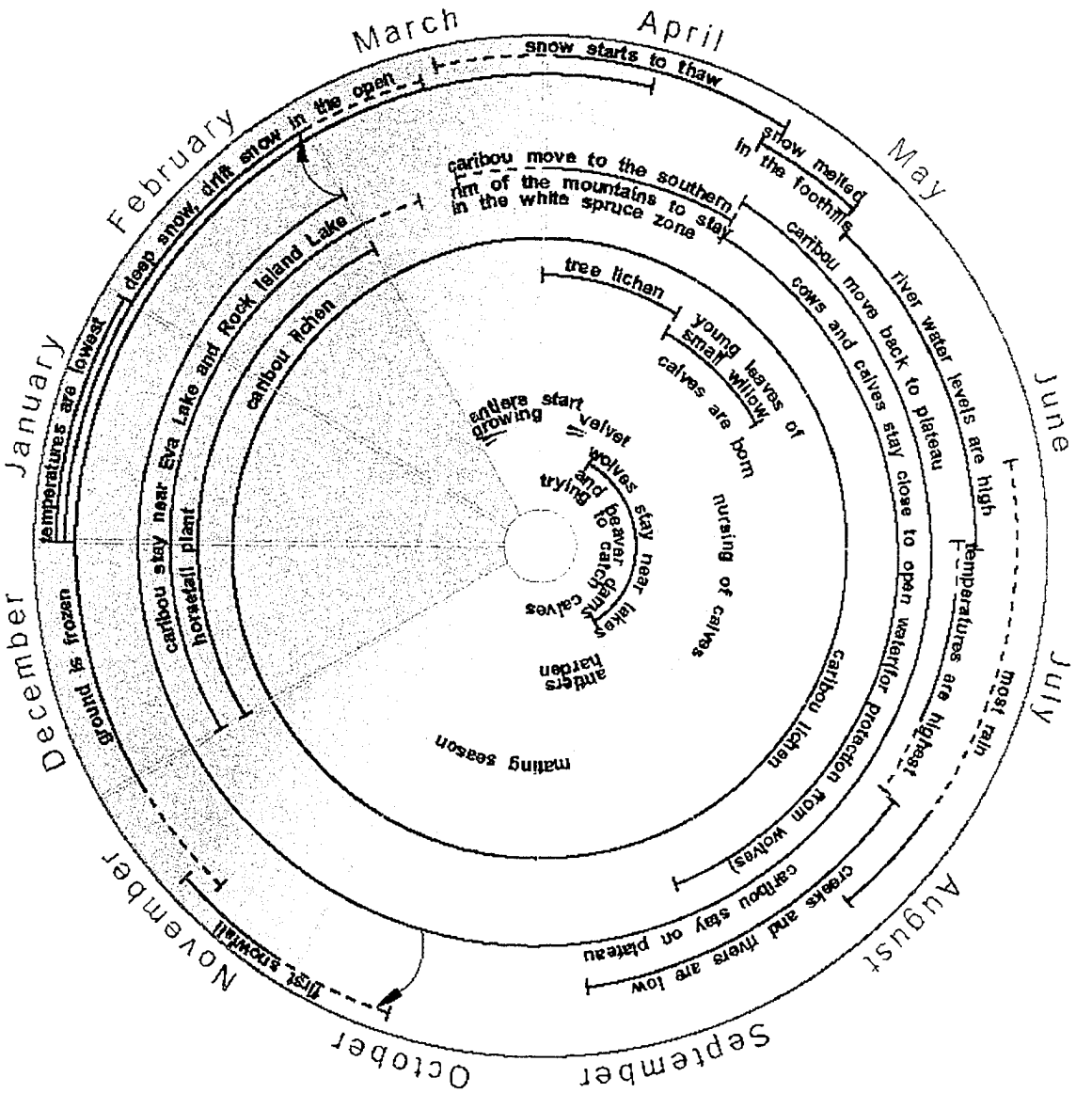

Figure 6.1: Caribou Mountain woodland caribou seasonal cycle diagram

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BISON

Literature Review

The wood bison, commonly also known as wood buffalo (*Bison bison athabascae*, also referred to as *Bos bison athabascae*), is North America's largest terrestrial animal. Its former range included much of the boreal forest of north-western Canada and eastern Alaska. Unlike the plains bison (*Bos bison bison*) of the historic past, the wood bison is non-migratory and tends to form smaller herds. Differences between plains and wood bison are generally described in morphological terms. A "typical" wood bison is larger in size and darker in colour than a plains bison. The wood bison hump forms at a steeper angle, and its beard tends to be shorter than with its plains relative. Plains bison, in turn, form a more distinct front cape, leg chaps and a denser mane than most wood bison (Carbyn et al. 1993).

Historical Overview

Northern Alberta and the south of the Northwest Territories are the only regions in North America where bison have been a continuous and integral part of the ecosystem since the end of the last ice age. At the time of arrival of the first white explorers, bison were plentiful throughout North America. During the height of the fur trade era in the 19th century, bison hunts were of vital importance to supply the forts and trading posts of the Canadian North with meat[33]. During the same period in the United States, the slaughter of the vast bison herds was promoted in order to subdue the Amerindian populations of the plains. Additionally, both in Canada and the United States, sports hunting became increasingly popular in the eighteen hundreds. By the late 1870s, however, only small herds of plains bison survived in secluded pockets. The last free roaming plains bison were reportedly killed in 1888 in east-central Alberta (MacEwan 1995).

Explorers like Mackenzie and Harmon reported that bison were numerous near Vermilion Falls on the Peace River between 1793 and 1810 (Soper 1941). Richardson noted that bison were still

[33] Charles Mair (1908, pp. 100-101), Commissioner for Treaty Eight, noted in 1899 that " (...) in the old buffalo days, the daily ration per head at the Company's prairie posts was eight pounds of fresh meat, which was all eaten, its equivalent being two pounds of pemmican (...)."

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plentiful in the Birch Mountains in 1848 (Soper 1941). In 1889, accounts of small herds of bison in the region still reach Fort Vermilion (Pike 1917). Some of the early pioneers and settlers (e.g., Hearne, Henry, Richardson, Jones, and Butler) were the first to notice morphological, behavioural, and habitat differences between wood and plains bison (Roe 1970).

In north-eastern Alberta, small groups of wood bison managed to survive the human hunting pressure of the fur trade era. In 1922, Wood Buffalo Park (which later was declared a national park) was established to protect the last wild bison of North America.[34] Between 1925 and 1928, 6673 plains bison from Wainwright, Alberta were released into the Park and subsequently interbred with the resident wood bison.[35] Prior to the shipment, plains bison from the Wainwright herd had tested positive for bovine tuberculosis[36]. The first record on the presence of bovine tuberculosis in wood bison can be found in the church diaries of Fort Chipewyan in 1937 (Chisholm 2001), and in 1947 testing of Park bison confirmed the presence of the disease in the Park (Carbyn et al. 1993, Chisholm 2001). In 1956, bovine brucellosis[37] was discovered in the Wood Buffalo National Park bison (Fuller 1966). Today it is widely assumed that both diseases were introduced into Wood Buffalo National Park by the relocated plains bison. The presence of the two diseases has triggered a variety of management proposals (for details see Fuller 1991, Wobeser 1992, and Chisholm 2001). The 1990 FEARO (Federal Environmental Assessment Review Office 1990) Panel suggested the eradication of diseased herds and their replacement with disease free wood bison. This option is currently still most favoured by many biologists and agricultural lobbyists (Fuller 1991, McCormack 1992, Wobeser 1992, Gates et al. 1992, 2001a, 2001b, Joly and Messier 2001). It is, however, an option that has been strongly opposed by local First Nations, and conservation groups such as the Canadian Nature Federation (CNF) and the Canadian Parks and Wilderness Society (CPAWS) (Ferguson and Burke 1992, Struzik 1999).

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[34] McCormack (1992) provides a detailed overview over the management history of the wood bison in Wood Buffalo National Park.

[35] Detailed descriptions on the relocation of plains bison into Wood Buffalo National Park can be found in Gates et al. (1992), Carbyn (1992), Carbyn et al. (1993), MacEwan (1995), and Geist (1996).

[36] Bovine tuberculosis is a bacterial disease caused by *Mycobacterium bovis*. *M. bovis* can be transmitted through contaminated water or food, or it can be inhaled when infected animals cough up or exhale the bacteria. Fetuses can get infected via the placenta, and calves can get the disease through nursing contaminated milk. Infected animals often develop lesions in the lungs or digestive tracts. Tuberculosis can stay dormant for long periods of time and often becomes active in older animals, generally weakening the affected animal. For more details see Tessaro (1992) and Carbyn et al. (1993).

[37] Bovine brucellosis is a bacterial disease caused by *Brucella abortis*, which often leads to abortions or otherwise negatively affects fertility. *B. abortis* is transmitted through contact with contaminated placentas, birth fluids, and aborted fetuses. For more details see Tessaro (1992), and Carbyn et al. (1993). For a discussion on Brucellosis in bison of Yellowstone National Park see Roffe (2001) and Lott (2002).

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An anthrax[38] outbreak occurred in the Hook Lake area in 1962 (Novakowski et al. 1963, Carbyn et al. 1993, Dragon et al. 1999, Nishi et al. 2001). However, historical and oral history research by Ferguson and Laviolette (1992) suggests that anthrax may have been present in the Fort Chipewyan and Fort Smith region since 1821. In 1964, the disease reached the Park (Carbyn et al. 1993). The Park conducted anthrax vaccination programs from 1965-1977 but decided to abandon the programs due to stress-induced high mortality rates (Carbyn et al. 1993, Hudson and Tennessen 1978). Anthrax outbreaks have since occurred frequently in Wood Buffalo National Park.

In 1957, a small herd of presumed "pure" wood bison was discovered in the north-western corner of the Park at the Nyarling River. Out of this herd, 77 animals were captured in 1963. Sixteen of these bison were sent to Fort Providence and formed the seed herd for the Mackenzie Bison Sanctuary. In 1965, an additional 47 bison were captured at the Nyarling River, out of which 21 animals were brought to Elk Island National Park. Due to presence of diseases in the original herd, only 11 offspring were used to form the wood bison herd in Elk Island (Wilson and Strobeck 1999). Although the presence of diseases in the Elk Island wood bison suggests that hybridization took place in the Nyarling River herd (Gates et al. 1992), the Elk Island bison are generally considered pure wood bison and, after disease eradication, have contributed seed herds to several wood bison introductions throughout North America (e.g., the Nahanni herd in the Northwest Territories, the Waterhen herd in Manitoba, the Hay Zama herd in Alberta/British Columbia, and the Nordquist herd in British Columbia). Wood bison reintroduction is proposed for the Yukon Flats in Alaska, and an introduction of wood bison to north-eastern Siberia as part of a proposed Pleistocene park is also considered (Gates et al, 2001b). While both Fuller (1991) and Geist (1991) agree that the Nyarling River herds in Elk Island National Park and in the Mackenzie Bison Sanctuary are severely bottlenecked, their interpretation of the genetic composition of the herd varies. Whereas Fuller (1991) believes that good conditions of the two herds indicates that there is no necessity to broaden their genetic base, Geist (1991) sees the herds as genetically impoverished.

In 1996, the Deninu Kue' First Nation and the Aboriginal Wildlife Harvesters' Committee of Fort Resolution, as well as the Government of the Northwest Territories started the Hook Lake Wood Bison Recovery Project (HLWBRP). Between 1996 and 1998, 62 neonatal calves were captured

[38] Anthrax is also a bacterial disease, caused by *Bacillus anthracis*. It is usually rapidly fatal and acute. Anthrax spores can survive in contaminated soil for more than 60 years (Carbyn et al. 1993).

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from the Hook Lake herd, tested and treated for diseases, and raised in captivity to establish a disease-free herd. The herd has now reached the captive breeding stage and is rapidly increasing in size (for more details on the HLWBRP see Nishi et al. 2001, and van Kessel 2002).

During the FEARO Panel hearings in the early 1990s, the Little Red River Cree Nation was one of the strong opponents of the proposed eradication of potentially diseased bison in the region. During one of the hearings, Little Red River Cree Chief Johnsen Sewepagaham stated (Ferguson and Burke 1994, p. 197):

> [Agriculture Canada] would have us believe that because wild buffalo within the Park and in northern Alberta outside the Park have been exposed to two diseases, brucellosis and tuberculosis... that it is necessary to hunt down and kill every buffalo, even if the buffalo is not sick.
> We have been told today that in the world today it is somehow all right to kill these buffalo to protect the Canadian cattle market. White experts have told us that the buffalo who have been exposed to these diseases aren't the kind of buffalo that white conservationists are interested in protecting. That the disease-exposed buffalo are somehow less worthy than other buffalo. These so-called experts would have us believe that by calling some buffalo "hybrids".... That we can somehow justify the slaughter.
> We believe that the northern buffalo that Agriculture Canada proposes to slaughter will be killed because white agricultural interests want to use these lands for grazing leases and because the white government wants to sell the trees on these lands to foreign pulp mills. As the Indian people of this area, we oppose these uses of the land and this unwarranted slaughter of wildlife.

Since then, the position of the band has changed towards a proactive approach that proposes salvage of healthy local bison and eradication of diseased bison and bison of undetermined status. Little Red River Cree consultants and university researchers developed a local disease eradication model that has been sensitive towards some of the concerns of local community members. Little Red River Cree elders, for example, opposed the capture of neonatal calves (used in the Fort Resolution bison recovery project), stating that they do not want to do to the children of the buffalo what the Canadian Government did to their own children. It would be like sending the buffalo calves to residential school. Instead, the program proposes the capture of small herds of wood bison (beginning with the Wentzel Lake herd), testing of the animals for TB and brucellosis, establishment of a disease-free captive herd, and elimination of diseased and untested free roaming bison. After a quarantine period it is planned to release the captive herd if reinfection can be excluded.[39] In 1997, the band started a bison monitoring program for the Wentzel Lake herd[40] that included the establishment of winter hay feeding stations which were

[39] Jim Webb, presentation at the Sustainable Forest Management Network conference in Edmonton, November 13-15, 2002.
[40] The disease status of the Wentzel Lake herd is unknown. In 1998/99 Alberta Fish and Wildlife

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intended to habituate local bison and prepare the site for future bison captures (Little Red River Cree Nation 2000). In the winters of 1999 and 2000 non-resident outfitters located the feeding stations and brought their bison hunting customers directly to the sites, resulting in the loss of at least four bison; one of them was a pregnant cow. [41] The baiting program has since been suspended, but the monitoring program continues.

Given this background on the wood bison debate, current research on wood bison focuses primarily on the following subjects: a) bison genetics, b) bison diseases – impacts and risk assessments, and c) bison population dynamics and habitat research.

What is a True Wood Bison? Taxonomy, Morphology, and Genetics

The question of 'what constitutes a true wood bison?' is of vital importance in the whole political debate surrounding the bison in and around Wood Buffalo National Park (McCormack 1992). Geist (1991, p. 283) gives the example that "The designation of Wood Buffalo National Park bison as hybrids, for instance, deprives them of legal protection under the Alberta Wildlife Act. Such is granted only to bison designated as *B. b. athabascae*, provided, of course, that such can be identified." Several attempts to identify wood bison as subspecies have been made through morphological and genetic studies. Van Zyll de Jong et al. (1995) conducted research on six plains bison herds and five herds with wood bison ancestry, examining eight external characteristics from photos of individual animals from these herds. Their research on three bison herds in Wood Buffalo National Park (Pine Lake herd, Sweetgrass herd, and Slave River Lowlands herd) demonstrates that the herd closest to the release site of the plains bison in 1925-28, the Pine Lake herd, shows the strongest phenotypic characteristics of plains bison. Further, according to the study, the plains bison phenotype in Wood Buffalo National Park bison seems to decline with the distance to the release site. Consequently, van Zyll de Jong et al. (1995) suggest that Pine Lake bison should be classified as *B. b. bison x B. b. athabascae*, whereas the other two herds should be classified as *B. b. athabascae*. Geist (1991) dismisses the attempt to base taxonomies on phenotypic classifications, since it lacks genetic analysis.

In the field of molecular genetics, Bork et al. (1991) studied the genetic relationship of wood and plains bison from the Elk Island National Park herds based on restriction fragment length

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slaughtered five bison of the herd for disease testing. All five animals tested disease-free (Little Red River Cree Nation 2000). Local hunters have not observed active signs of diseases in animals of this region.

[41] Malcolm Auger, personal communication, August 2001.

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polymorphisms (i.e. the analysis of DNA fragments with the focus on inherited differences found among individuals of a population). While stopping short of suggesting that the two herds have reached a subspecies status, the study indicates that both populations have reached a state of geographic isolation in their evolutionary divergence.

Wilson and Strobeck (1999) studied 11 microsatellite loci in samples from different plains and wood bison herds in North America. Wood bison from Wood Buffalo National Park, Elk Island National Park and from the Mackenzie Bison Sanctuary formed a cluster that implies (Wilson and Strobeck 1999, p. 494) "that wood bison are functioning as entities distinct from plains bison, and should continue to be managed separately." Their research further supports that Elk Island and Mackenzie Bison sanctuary bison are wood-plains bison hybrids like the animals in Wood Buffalo National Park. Wilson and Strobeck further genetically analyzed bison from five different herds within Wood Buffalo National Park (Garden River, Little Buffalo, Needle Lake, Pine Lake, and Sweetgrass). A *G*-test on allele frequencies indicates that the Pine Lake herd is significantly different from the other populations in the Park, supporting van Zyll de Jong et al. (1995) who suggested that plains bison influence was strongest in this herd because it is closest to the release site. However, an assignment test missassigned three animals from the Sweetgrass herd, one from Pine Lake, and one from Little Buffalo to plains bison herds, suggesting that plains bison genetic material occurs throughout the Park. In comparison to the morphological studies by van Zyll de Jong et al. (1995), Wilson and Strobeck's results for the Sweetgrass herd come as a surprise since the phenotype analysis identified the Sweetgrass herd as the herd with the strongest wood bison characteristics. Wilson and Strobeck further found that the wood bison herds from Elk Island National Park and the Mackenzie Bison Sanctuary show quite a large genetic distance, which is surprising considering that both herds originated from animals of the Nyarling River herd. Wilson and Strobeck attribute this to a strong founder effect since both herds originated from a very small number of animals (eleven and 18 bison). Wilson and Strobeck (1999, p. 494) conclude:

> As the wood bison populations at Elk Island National Park and Mackenzie Bison Sanctuary do not contain as much variation as their founding population, Wood Buffalo National Park, they would not be suitable replacements if the latter population is to be extirpated.

Additional research by Wilson et al. (2001) included bison from the Hook Lake Wood Bison Recovery Project herd, which has 58 founding animals. The results show that this herd is the most genetically variable of the salvaged herds, however, it is not as variable as the Wood Buffalo National Park herds. Wilson et al. (2001, p. A6-39) observed that:

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> Some of the genetic variation present in Wood Buffalo National Park is still not represented in any of the salvaged populations, and this should be considered in any future Wood Buffalo National Park management plan.

The debate surrounding the bison of Wood Buffalo National Park includes derogative terminology, such as the choice of the wording *worthless hybrids* (Geist 1991). There is, however, some historical evidence that the range of plains bison may have reached as far north as the Peace-Athabasca region (Seton 1886, Soper 1941, Roe 1970, Geist 1991), indicating that the segregation of the so-called subspecies was not complete and that hybridization occurred naturally in the region (Geist 1991). Soper (1941, p. 358) notes an observation that will become important later in this thesis:

> In 1914, and earlier, were reports (among them Seton's 1927: 3: 712) that the bison, in territory between the lower Peace and Nyarling rivers, were divided into two distinct herds – the northern one being true *athabascae* and the southern, or Peace River herd being intergrades between these and the plains bison.

Bison Diseases – Impacts and Risk Assessments

In Canada, most of the recent wood bison disease research has focused on risk assessments and impacts of brucellosis and tuberculosis on wild bison populations. This focus is primarily due to concerns about disease transmission to cattle and farmed bison in the region around Wood Buffalo National Park. The Animal, Plant and Food Risk Analysis Network (APFRAN 1999) created a risk assessment of brucellosis and tuberculosis for Wood Buffalo National Park and area that calculates probabilities of contact between potentially diseased bison with disease free captive herds of cattle and/or bison based by distance to diseased herds. Obvious shortcomings of APFRAN's model are that it does not take into consideration geographic features (that can create barriers or corridors), habitat suitability, and human hunting pressure. Gates et al. (2001a) developed a bison movement corridor model. The model is primarily based on a greenness map (derived from a phytomass or Leaf Area Index from Landsat data), topographic data, and distance to water. The calculations for Gates et al.'s (2001a) bison movement corridors are based on the density of least-resistant pathways and the model does not consider bison avoidance of human hunting. The report further contains bison herd information on location and distribution.

In the United States, researchers are very active in brucellosis research due to the presence of the disease in the bison of Yellowstone National Park and in elk in Wyoming. Research there has focused, among others, on the development of a vaccine, vaccine safety in non-target species, persistence of the disease in the environment, and manifestation of brucellosis in bison (Aune

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2001, Januszewski et al. 2001). Related research is also undertaken in Scandinavia. Tryland et al. (2001) recently discovered the presence of *Brucella* sp. antibodies in polar bears from Svalbard and the Barents Sea. The authors believe that the source of infection is likely the ingestion of infected seal tissue, since seals are known to carry the disease. *Brucella suis* is well established in reindeer and caribou populations throughout the circumpolar north. Brucellosis can infect any species of mammals and is known to become established in secondary hosts under unnatural conditions (Tessaro 1992). However, no reinfection has been reported to occur after elimination of the disease in the primary host population (Tessaro 1992).

There is currently no vaccine available against bovine tuberculosis (Tessaro 1992). Recent research by Rothschild et al. (2001) confirms the presence of DNA from the '*Mycobacterium tuberculosis* complex'[42] in bone samples from an extinct bison dated to 17,000 years before present. The discovery of tuberculosis in Pleistocene bison challenges the general assumption that the presence of the disease in North American bovids is not a natural condition (e.g., Wobeser 1992, p. 182, Tessaro 1992).

Between 1962 and 1993, nine anthrax outbreaks have been documented for bison herds in Wood Buffalo National Park and the Mackenzie Bison Sanctuary, which resulted in the death of at least 1309 bison (Dragon et al. 1999). Since the beginning of my field work in 1999, several outbreaks occurred in Wood Buffalo National Park. Anthrax research by Keim et al. (1997) and Hugh-Jones (Dragon et al. 1999, citing personal communication with Hugh-Jones) on the genetics of *Bacillus anthracis* have shown that the northern bison strains of the disease are distinctly different from the closely related principal bovine strain affecting western North America. It is likely, that "the establishment of anthrax in northern Canada was a singular event that occurred prior to the first recognized epizootic in 1962" (Dragon et al. 1999, p. 208), lending support to Ferguson and Laviolette's (1992) historical research on anthrax in the region.

Bison Population Dynamics and Habitat Research

The most comprehensive publication on wood bison is Soper's (1941) 'History, Range and Home Life of the Northern Bison'. This detailed monograph compiles information on bison ecology, habitat selection, and history with a special emphasis on the Wood Buffalo National Park region.

[42] The *Mycobacterium tuberculosis* complex consists of *M. tuberculosis*, *M. bovis*, *M. africanum*, and *M. microti*.

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After Soper (1941), Fuller dedicated much research towards the wood bison in Wood Buffalo National Park. His work includes publications on behaviour and social organization of wood bison, as well as on the political dimensions of the bison disease issue (e.g., Fuller 1960, 1966, and 1991). Carbyn has worked extensively on wood bison-wolf-habitat interactions (e.g., Carbyn and Trottier 1988, Carbyn et al. 1993, Carbyn 2003). Several other authors studied habitat selection and diet of wild wood bison populations. Reynolds et al. (1978) conducted studies in the Slave River lowlands, Pringle (1971) researched the bison range of the Peace-Athabasca Delta, and Larter and Gates (1991) conducted respective studies in the Mackenzie Bison Sanctuary. Joly and Messier (2000), analyzed wolf abundance in relationship to pelt price, number of trappers, and bison population size in Wood Buffalo National Park. They found that wolf pelt prices significantly affected wolf harvest. The statistical analysis of wolf sightings and bison population size suggests that wolf population sizes were correlated with bison numbers.

The issues introduced in this literature review (such as taxonomy, genetics, diseases, population dynamics and habitat research) show that the debate surrounding the wild bison of northern Alberta has many dimensions. The following subchapter contributes the results of Little Red River Cree traditional environmental knowledge of bison to the debate.

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Results: Traditional Environmental Knowledge of Critical Bison Habitat

In this study, LRR Cree traditional knowledge experts provided information on two different types of bison: bison with *wood bison* characteristics and bison with *plains bison* characteristics. Participants contributed knowledge on at least three distinct bison herds on their traditional lands: the *Wentzel Lake herd*, the *Mikkwa herd*, and a herd at the south-western corner of Wood Buffalo National Park – here referred to as the *South-Western Parks herd* (Map 6.3). In this study, I was not able to gain much information on bison on the north side of the Peace River in the western area of the Park, commonly referred to as the *Garden River herd*[43].

Bison with Wood Bison Characteristics

The Wentzel Lake Herd

The *Wentzel Lake herd* is situated on the north side of the Peace River outside of Wood Buffalo National Park on the south-eastern side of the Caribou Mountains. Today, the core habitat (dark green, Map 6.3) of this herd is near Wentzel Lake in the Caribou Mountains. The bison rarely go further west than the western bend of the Wentzel River. During his 50 years of experience on his trapline in the central Caribou Mountains, Charles Hemlin only once tracked a small herd of approximately four bison near the Lawrence River in the winter of 1991 (single event No. 1, Map 6.3).[44] His brother, Henry Hemlin, never tracked any bison on the same trapline. Local residents believe that some migration of local bison to and from Wood Buffalo National Park in the east occurs. Henry Moberly[45] indicated that migration is fairly limited though. Each herd stays in its area – the Wentzel Lake bison do not go very far into the Park, and the Park bison do not go very far outside the Park. To the south, bison of this herd currently rarely migrate closer than within

[43] Mitchell and Gates (2002) depict the bison herds north and south of the Peace River in the western part of Wood Buffalo National Park as one single herd, which they refer to as the Garden River herd. Informal discussions with Garden River residents left me with the impression that the Park's herd on the north side of the Peace River near Garden River was referred to as the Garden River herd, whereas the bison on the south side of the river in the western corner of the Park were regarded as the herd near the Park boundary. TEK experts did not provide information about exchange or migration of bison between the northern and the southern herds in western Wood Buffalo National Park. At the workshop in Fox Lake, Lester Nanooch referred to the Garden River herd – which was described to be between Garden River and the western boundary of the Park. He mentioned that the latest counts in the Park indicated that there were 300 bison in this herd. Recently (the summer of 2001) 40 animals of this herd were lost to anthrax.

[44] Interview in North Tallcree, September 02, 1999, translated by Celestan Nanooch.

[45] Interview in John D'Or Prairie, July 20, 1999, translated by John Dumas.

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eight kilometers of the winter road to Garden River. However, the range of this herd used to be much larger (general habitat, Map 6.3). Several TEK experts (e.g., Malcolm Auger, Alexis Meneen, Daniel Loonskin) reported that the home range of the Wentzel Lake herd extended much further south and south-west than today. Before John D'Or Prairie became a settlement in 1969 and before the road to Garden River was built in 1958, bison could occasionally be encountered at the prairie of John D'Or Prairie and would frequent the smaller prairies between the Lawrence and Wentzel Rivers. Several participants (Daniel Loonskin, Malcolm Auger, Alexis Meneen) pointed out that the bison would regularly visit saltlicks (blue circles, Map 6.3) at the Wentzel River and to the east of the river (south of the road). Alexis Meneen mentioned that the herd would even go as far south as the Peace River.

Official estimates for this herd can be as high as 110 animals[46] (Gates et al. 2001a – based on aerial surveys), Malcolm Auger, the local bison monitor, thinks that currently the numbers are much lower. He explains the herd structures in the region:[47]

> *Well there's numbers of bison through there, maybe three and then three, fifteen, ten, twelve – like that - eight. It's not one herd. It's just small herds – they just go back and forth.*
> *[T.S: So how many small herds do you have there, do you think?]*
> *Well, about six. Five or six. But they meet up, and again they regroup. And after a while they split up again.*[48]

One of the main characteristics of the animals in the Wentzel Lake region is that these bison travel in small family groups of usually six to fifteen animals and that they do not congregate as one large herd. Malcolm Auger noticed that the Wentzel Lake bison form herds according to snow conditions. If the snow is deep, they tend to form slightly larger herds, which allows more bison (in particular calves) to conserve energy since only a few animals need to break trail. Forming larger herds can also be more economical for feeding. Bison use their heads to push the snow to the side and create feeding craters. If the snow is soft they also blow the snow away. It is energy conserving for a bison to forage along the edges of an already established crater. If there is less snow, the Wentzel Lake bison form smaller herds, and they also stay in smaller herds during summer. Mr. Auger never counted more than 26 animals in a herd. Between 1999 and 2002, he did not track more than two or three small herds in the region per season. Over the last 40 years,

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[46] Malcolm Auger recalled that Park rangers counted 71 bison in the region a few years ago.
[47] Interview in John D'Or Prairie, September 07, 1999.
[48] Fuller (1960) made comparable observations in his research in Wood Buffalo National Park. He noticed that herds tended to be smaller in forested areas and that joining and splitting of herds was common. His data (collected primarily in the eastern areas of the Park) suggested that a basic herd unit contained about 11-20 animals.

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and in particular over the last decade, local residents have perceived a decline in bison in the Wentzel Lake area.

The animals of the Wentzel Lake herd are tall and dark and generally show all phenotypic characteristics of wood bison. TEK study participants pointed out that their morphology and behaviour differs from the animals of the Mikkwa and South-Western Parks herds on the south side of the Peace River. Daniel Loonskin[49] explained the differences between the herds:

> *This is wood buffalo [the Wentzel Lake bison]. This is not prairie bison. Prairie bison go off over here [He points out the location of the Mikkwa and south western Parks herds on a map] and stay in the Park. But, you know, there is no such thing as a pure bred prairie bison, 'cause they travel back and forth. They're a mix. But these ones [The Wentzel Lake bison], they go in the spruce. In willow. They feed on willows – like a moose. It's nothing compared to these [the prairie bison on the south side of the Peace River]. These are wild[50] [the Wentzel Lake bison]. They are more or less like moose. It's not like those prairie bison. You go out in the prairie and they're standing way up there, way out in the open. But these ones they're like moose. They stay out in poplar; they feed on caribou moss, willows, and stuff. It's like moose. You know X. [a local consultant]? I worked with him last winter. I told him: "Heck, those things are wild. This is like moose." "What?" He said. "Yeah, just like moose,"[...] I said: "You not gonna find them in open areas, you'll find them in the bush. They are scattered all over, you know."*[51]

The bison of the Wentzel Lake herd show seasonal differences in habitat use and food preferences, which are often linked to weather conditions. Figure 6.2 (p. 143) depicts a seasonal cycle diagram[52] for the herd. In early May, the snow has melted in the foothills of the Caribou Mountains and the bison cows are beginning to give birth to their calves. The bison have already started shedding their hair. For relief, they rub on tree trunks, uprooted trees, and wallow in soil. They particularly like to rub their necks on the rugged trunks of spruce trees. Malcolm Auger

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[49] Interview in Fox Lake, August 24, 1999.

[50] Mr. Loonskinn's use of the term *wild* for the Wentzel Lake bison likely corresponds with the concept of *untamed* in opposition to the released, partly domesticated *tamed* plains bison.

[51] It is interesting to note that the terminology Mr. Loonskin uses (e.g., *wild* and *like moose*) is similar to early historic descriptions of the wood bison phenotype, which were noticed by people who were able to compare both phenotypes. The following quotes are from Roe (1970, pp.44-46), emphasis added. Alexander Henry notes "[...] they are the wood buffalo, more shy and *wild* than those of the plains." Daniel W. Harmond writes that the wood buffalo "[...] are, also, more *wild* and difficult to approach [...]. " Sir William Butler describes "He [the wood bison] is nevertheless larger, darker, and *wilder* [...]." Alexander Henry writes about a herd near Rocky Mountain House " These are of the strong wood kind, and *as wild as moose* [...]." A guide told Dr.Hector about the thickwood variety, that "they run swiftly through the woods, and are quite wary and difficult to hunt as the *moose* deer [...]." Many early explorers further described that wood bison stayed in the forest, unlike the plains bison, which were found in the open.

[52] Figure 6.2 depicts the seasonal wood bison habitat selection cycle. The blue lines depict the seasonal weather and environmental conditions; the red lines show seasonal habitat preferences of wood bison; green represents the primary seasonal forage of wood bison, orange depicts the seasonal reproductive activities and physiological changes of wood bison; and purple describes particular seasonal vulnerabilities of bison to predators and parasites. Grey arrows link observations that are related or influence each other.

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observed that the Wentzel Lake bison show a general preference for rubbing on spruce trees. He believes that the scent of the spruce covers the scent of the bison and therefore makes the animals less vulnerable to wolf predation. Rubbing and wallowing continues throughout the summer, when the bison get irritated by biting insects. From mid May throughout the growing season, green grassy forage, referred to as green grass[53] by participants, becomes the dominant food source. Bison especially like the first green grass, which, according to Malcolm Auger, is particularly sweet. Mr. Auger further noticed that the bison prefer fine-leaved grass over sharp broad-leaved grass. Small willows are also of some importance. The bison like to feed on small fresh willow leaves that start to grow in early spring.[54] Henry Moberly describes that the bison eat little green shoots of small willow-like plants that grow in the meadows. These shoots are about three centimetres above the moss, and the plant only grows in certain places.

During the summer, bison from this herd are often found in open environments like prairie patches, meadows, and cutblocks, where grassy forage is abundant and the ground is solid and makes walking easier. The nutritious grassy forage causes the bison to gain weight during summer, and when the rutting season starts in August, bison are in prime physical condition. The winter hair starts to grow in September, preparing the bison for the first snowfall in October/November. During most of the winter, dry grassy forage becomes the main food source for the Wentzel Lake bison. Before trophy hunting reached the region, the bison often stayed at the Wentzel River during winter to forage in the meadows and along the sloughs. They were often tracked to forage along cutbanks because the hay[55] there reaches over the edges and the bison can forage without having to push away the snow.[56] From November to early May, the Wentzel Lake bison can mainly be found at small lakes, dry creeks, and old beaver dams. Daniel Loonskin also observed them in the cutblocks at the southern edge of the Caribou Mountains during winter. Although grasses and sedges are their preferred forage, there is an exception period from January to March, when caribou lichen becomes an important food source. Malcolm Auger explained that the importance of caribou lichen in winter is related to unavailability of hay. Heavy snow causes hay to break over and freeze to the ground, which makes it difficult for bison to

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[53] The term 'grass' is used by participants in a broad sense and includes other graminoids such as sedges. Participants, such as Malcolm Auger, are able to differentiate graminoid forage preferred by local bison by leaf shape, size, and habitat. In this thesis chapter, the term *grass* refers to graminoids in general.
[54] Research by Larter and Gates (1991) shows that willows were also part of the summer diet of the Mackenzie Bison Sanctuary bison.
[55] Informants use the term 'hay' to refer to dry grassy forage. This differs from the agricultural definition of 'hay', which means cut and dried grass. In this thesis chapter, the term *hay* refers to grassy forage naturally dried due to seasonal influences.
[56] Malcolm Auger, pers. com. August 18, 2002.

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reach. Under these conditions, it is easier for bison to forage on lichen, which still stand up underneath the snow cover.[57] There is also a difference in snow texture associated with lichen and hay communities. The hay meadows are usually covered by deep hard snow formed through snowdrift. Caribou lichen growing in spruce habitat has a lighter and softer snow cover because much of the snow is intercepted by the spruce trees and the environment is sheltered from wind, making it easier for bison to forage.[58] Malcolm Auger[59] further noted that the Wentzel Lake bison move to lichen habitat after freeze up because it is also easier for them to travel in this environment. Unlike the South-Western Parks herd, the Wentzel Lake herd is not known to feed on tree lichen. When he examined the stomachs of two bison he hunted, Lorne Tallcree further observed that bison foraged on horsetail plants (*Equisetum* spp.).

In the past, when the bison range was larger, Malcolm Auger observed that the bison used the saltlicks near the Garden River road during the summer, whereas Daniel Loonskin noticed that small herds would frequent the saltlicks mainly in winter.

According to Malcolm Auger, the main calving season of the Wenzel Lake herd appears to be from May to early June. He has, however, observed young calves throughout the year. He also witnessed that young bulls were mating – or practicing mating during March. Henry Moberly[60] noticed that bison cows that give birth to their calves stay in spruce bluffs where there is plenty of shade and lots of cover.

The South-Western Parks Herd

A second herd in the project region (here referred to as the *South-Western Parks herd*) is situated on the south side of the Peace River in the south-western corner of Wood Buffalo National Park (Map 6.3). During the summer, Paul Tallcree from Garden River has counted up to one hundred animals in this herd on his trapline.[61] Generally, though, he encounters them in smaller herds. In contrast to the Wentzel Lake bison, it seems that the South-West Parks bison tend to form larger

[57] Larter and Gates (1991) observed that lichen were an important part of the diet of the Mackenzie Bison Sanctuary bison during late summer and early fall (August-October). They suggest that this dietary choice could be related to its nutritional value since lichen has a low fiber content and is readily digested. Unlike in the case of the Wentzel Lake bison, which feed on caribou lichen during winter, snow cover does not influence the choice of lichen during fall in the Mackenzie Bison Sanctuary herd.
[58] Reynolds and Peden's (1987) research also shows that snow hardness is the principal factor influencing bison choice of feeding sites.
[59] Malcolm Auger, personal communication, December 28, 2001.
[60] Interview in John D'Or Prairie, July 20, 1999, translated by John Dumas.
[61] The herd information and location data of my study generally corresponds with results from the Gates et al. (2001a) report.

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herds in summer and smaller herds (ten to twenty animals in a herd) in winter. Participants noticed that herd numbers in the Park declined over the last three decades.

Paul Tallcree observed that most calves are born during spring. He noticed, however, that two calves were born when he participated in anthrax vaccinations at Sweetgrass Landing in the fall.

Animals of the South-Western Parks herd frequently migrate out of the Park towards Fox Lake but quickly retreat into the Park as soon as they face human hunting pressure. It is likely that the range of the herd used to be larger in the past. Daniel Loonskin recalls that the old people used to say that there were bison near Fox Lake during the time when bison hunting was illegal in Alberta (Date not available). Today, the South-Western Parks herd tends to stay on jack pine, tamarack and poplar ridges during summer (Map 6.4). In winter, when the ground is frozen, animals from this herd move into the hay meadows along the Peace River and into the muskeg areas east of Fox Lake (Paul Tallcree, Lorne Tallcree). They are also known to occasionally visit cutblocks north-east of Fox Lake (Map 6.3). Paul Tallcree further observed that these bison feed on tree lichen and caribou lichen in winter. Mr. Tallcree made another interesting winter foraging observation for this herd when he saw bison break open muskrat houses to feed on the building material. Muskrats use hay (rushes), cattail, and a small amount of moss to build their dwellings. The destruction of their houses leaves the muskrats without shelter in winter and could lead to negative impacts on local muskrat populations during that season.

Bison with Plains Bison Characteristics

The Mikkwa Herd

The Mikkwa herd (also sometimes referred to as Wabasca or Tallcree herd) is situated on the south side of the Peace River between the Mikkwa (Little Red) and Wabasca Rivers (Map 6.3). At the workshop in Fox Lake, Clifford Ribbonleg, who holds a trapline in the region, estimated that there are currently about 60 animals in this herd. Participants described the bison of the Mikkwa herd to be phenotypically and behaviourally different from the animals of the two other herds. TEK experts frequently referred to the Mikkwa bison as plains bison. These bison are smaller and not as husky in form as the animals of the Wentzel Lake herd and the bison in the Park. The Mikkwa herd tends to stay in open areas, in contrast to the Wentzel Lake bison (referred to as wood bison by the participants), which prefer forested areas. Clifford Ribbonleg

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and Daniel Loonskin[62] pointed out that this herd shows a strong preference for prairies, where they feed on "small prairie grass[63]". Map 6.4 shows that the general habitat of the Mikkwa herd is situated in an area with one of the highest densities of grasslands in the project region. Mr. Ribbonleg further adds that their habitat also includes a lot of muskeg environment. John Dumas[64] made the same observation, stating that these bison like to stay in meadows, swamps and sloughs – areas with access to water.

At the workshop in Fox Lake, I asked if the Mikkwa herd could have originated with the introduction of plains bison in Wood Buffalo National Park. Isador Laboucan from Fox Lake responded, that, as far as he knew, the Mikkwa herd has always been there. This statement seemed to be supported by the other elders present.

Local residents reported that migration occurs between the South-Western Parks herd and the Mikkwa herd (Map 6.3). Clifford Ribbonleg observed a curious migration pattern, where a single bull of the Mikkwa herd would occasionally migrate to the South-Western Parks herd and later return to the Mikkwa herd with approximately six cows (Map 6.3, single event No. 3). Mr. Ribbonleg was able to recognize the tracks because this bull leaves a unique distinguishable shape of hoof prints. Cow and bull tracks are further distinguishable by their size and degree of roundness. Bull tracks tend to be larger and more rounded than cow tracks.

Wolf - Bison Relationships in the Project Region

Many participants noticed that wolves usually follow the local bison herds. Lorne Tallcree, for example, observed that in winter, when the South-Western Parks herd feeds in the meadows, the wolves are close behind them and follow the herds. Malcolm Auger thinks that there are about three packs of wolves (which he considers "not that many")[65], staying near the Wentzel Lake bison. Each pack has about six or seven members. Paul Tallcree also noticed that there is always one pack that follows the South-Western Parks bison. John Laboucan has perceived a decrease in wolves around Fox Lake. He speculates that this decrease could be linked to the overall decrease in moose and bison in the Fox Lake region.

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[62] Interview in Fox Lake, August 24, 1999.
[63] Term used by Clifford Ribbonleg at the workshop at Fox Lake, August 02, 2001.
[64] During the interview with Henry Moberly, July 20, 1999.
[65] Interview in the Caribou Mountains, June 22, 1999.

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For the South-Western Parks herd, Paul Tallcree observed that the wolves predominantly take calves. He has seen groups of bison where only a few calves survived. Occasionally, the wolves take the odd old or sick animal, but mainly they take the calves[66]. Malcolm Auger also believes that the wolves in the Caribou Mountains are particularly interested in killing calves. On the subject of wolves following the bison, he explained:[67]

> *M: Oh yeah. I see their tracks, wolf tracks behind the... following the buffalo. But they kept their distance; they don't wanna go right up. Unless there's a few calves in a small herd, that's easy prey for them. Well, a big herd, maybe ten, twelve, they won't go. They'll stay away. But they will just circle a few times and then leave.*
> *T: Oh, so when there are ten, twelve buffalos they do not attack?*
> *M: Right, right – no, no. But if there's about maybe five and there's a couple of calves, oh yeah, they go after them, right now.*
> *T: So the wolves here specialize on the calves?*
> *M: Oh yeah, they're in trouble.*

Mr. Auger further explains that bison during a wolf attack "will stand there and chase them head on. Oh, they [the wolves] wouldn't just try and go ahead and strife a buffalo like that." He believes that bison of the Wentzel Lake herd are particularly vulnerable to wolf predation during summer, because the moist ground causes the heavy bison to sink, which slows them down when trying to run away from pursuing wolves. The cows and calves then try to stay together, and it is often the calf that is taken by the wolves. He further observed that the Wentzel Lake bison used the cutlines a lot before trophy hunters began to frequent the region. He believes that bison used the cutlines as a way to protect themselves from wolves. The open cutlines allow bison to see wolves earlier than in forested areas, where wolves can sneak up close without being seen. The cutlines also give the bison space to form a protective circle[68] or to run away.[69] The same applies for the open meadows along the Wentzel River in winter.

At the workshop in Fox Lake, participants explained that wolves attack bison from the side. As long as the herd stays together calmly the wolves do not have much of a chance. They get their chance when the herd is 'spooked' and opens up.[70] Malcolm Auger explains the bison defence strategies of the Wentzel Lake bison. If there are calves in the herd, the bison form a circle and

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[66] Carbyn and Trottier (1988) found that wolves in the south-eastern part of Wood Buffalo National Park were specialized on preying on bison calves.
[67] Interview in John D'Or Prairie, September 07, 1999.
[68] Observations by Carbyn and Trottier (1988) also suggest that bison protect their calves in using a combination of group defense and fleeing.
[69] Malcolm Auger, pers. com. August 18, 2002.
[70] This coincides with observations by Carbyn and Trottier (1988) which suggest that wolves are more successful when a bison herd stampedes than if the herd stands its ground.

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protect the calves in the centre. In winter, when they travel single file, they have the big bulls in the front and secure the end with a few big cows. The calves travel in the middle. If the wolves manage to sneak up on the trail, they very likely will get the last animal, especially if it is a bull. Since wolves tend to focus their attack on the genital regions, bulls are more at risk since the wolves take the testicles and rip the bull open.

Wolves also prey on old and sick bison, and according to workshop participants also "pick out fat ones too." They don't, however, "touch the boss." Generally though, participants at the workshop in Fox Lake believed that wolves and bison can be around each other, and that the bison do not live in constant fear.

Diseases in Bison

During the interviews and many informal conversations the bison disease issue became an important topic. Due to the political dimensions of the bison disease eradication program, participants often were more comfortable discussing the issue off the record, or – as in the case of the workshop in Fox Lake, discussed the issue amongst themselves in Cree without providing a translation into English.[71] During the discussions it became evident that the presence of anthrax in the region was of far greater concern to community members than the presence of tuberculosis and brucellosis. This can be attributed in part to the difference in disease outbreak patterns. Since tuberculosis tends to develop active signs primarily in older animals, which are not considered prime game animals, native hunters do not often encounter signs of active diseases in hunted bison. In contrast, anthrax outbreaks rapidly kill large numbers of younger bison and lead to hunting bans in the effected areas in the Park. When hunting bison, hunters look for active signs of diseases. One hunter explains[72]:

> *When the lungs have blisters and are white you don't eat it, especially if the animal is skinny. You check it right away, and wash your hands afterwards.*

Another participant mentioned[73]:

> *I remember my dad killed, you know, a few that are sick. But you open them up, they know. You can see they are sick. So we just have to throw them away or, you know, we feed it to the dogs. And the dogs don't get sick.*

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[71] To honor the confidentiality of this information, names of participants who contributed sensitive information to this subchapter have been concealed.
[72] Interview # 23.
[73] Interview # 13.

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As previously mentioned, I was left with the impression that local residents were much more concerned over anthrax than over the presence of TB and brucellosis in wild bison populations. At the Fox Lake workshop elders stated: "We understand TB and know it is curable. But we don't know the effects of anthrax on humans." They also seemed to be more concerned about the lasting impacts of anthrax vaccinations and the influence of industrial pollutants on the wild populations. The anthrax vaccinations at Sweetgrass Landing in Wood Buffalo National Park were a subject of lively discussion during the August 2nd Fox Lake workshop. Many participants and people in the region felt that the bison became sick from the vaccinations and that bison numbers started to decline afterwards. One participant[74] who worked at Sweetgrass Landing during the first anthrax vaccinations observed that the first animal vaccinated received a lot of vaccine and broke down after the vaccination. It did not get up again and died. He believes that the animal was overdosed.[75] The next animal received half of the dose. The bison fell over and then walked away. He concluded that "after the vaccinations the buffalo started dying off." Participants at the Fox Lake workshop further voiced the opinion that the disease went into the ground when the animals were corralled during the vaccination program. They believe that bison that were born after the vaccination are also exposed to the vaccine. Participants think that the vaccine is in the system of the animal and is passed to the foetus. One participant from Fox Lake (who has his trapline on the south side of the Peace River to the south-west of Fox Lake in the range of the Mikkwa bison herd) mentioned that the bison in his trapline area are tastier than the bison in the Park because they were not 'drugged'. He claims that the meat of Park animals is drier and tougher than the meat of the Mikkwa herd bison.[76]

Participants' observations sometimes are contrary to scientific observation. Local residents were told that animals that are infected with anthrax die within one to two days. One participant[77] observed that animals die on high ground. In order to get to higher ground from a known anthrax contamination site, the animal must cross a tamarack swamp. This takes the animal longer than one to two days.

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[74] Interview # 24 and workshop at Fox Lake, August 2, 2001.
[75] The scientific explanation for this phenomenon is stress induced capture myopathy, which Hudson and Tennesses (1978) have related to observations made during handling of bison at the Sweetgrass Landing vaccination site.
[76] Workshop at Fox Lake, August 2, 2001.
[77] Workshop at Fox Lake, August 2, 2001.

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During many interviews and at the Fox Lake workshop, participants stated that diseases are a normal part of the natural cycles. Every animal has a cycle, and sickness and death is part of this natural cycle. One participant linked the presence of diseases to environmental pollution[78]:

> *Buffalo can get the disease from the water. The Peace River is polluted. With the morning fog the pollutants are lifted up and dropped elsewhere as rain. It's in the fur of animals, and people pass it on.*

During the Fox Lake workshop participants mentioned the bison project at the experimental farm in Fort Vermilion (for a project description see Boos, 2001). In the comparative observations of the elders, the free roaming bison on the traditional lands of the Little Red River Cree were in much better physical condition than the bison at the experimental farm, indicating that potentially diseased bison seem to be much healthier than domestic so-called disease-free bison. The elders voiced that the farm bison were "in bad shape" and they were concerned that the animals were fenced in and handled by people. One participant said: "These animals are not meant for the corral." It also generated concerns with the participants that the bison are to be killed when the project is competed. This lead to a lively discussion on the proposed Little Red River Cree bison disease elimination and recovery project, from which Dr. Krogman and I were excluded for the most part because participants discussed the issue in Cree and the translator did not provide a translation. The atmosphere of the discussion leads me to believe that there seemed to be some opposition to the official band proposal; however, I observed on several occasions that local residents are very hesitant to voice criticism over decisions made by their leadership. One participant explained his concern over the proposed capture and fencing of the local free herds: "We are surrounded by an invisible fence – the reserve and the Park. Why should we do that to our animals?" There was also concern that released disease-free bison could be reinfected, and that the proposed project does not include the elimination of anthrax, which is of much greater concern to local residents than TB and brucellosis. Some participants suggested that the bison could be corralled but that the area would need to be cleaned of bones and carcasses in order to prevent anthrax. The general support for the proposed LRR Cree bison project seems to arise from the need to save the bison in the region from slaughter programs and outside trophy hunters, and to ensure their presence for future generations of Little Red River Cree to enjoy. One elder explained his view in an interview[79]:

> *[The narrator perspective is that of the translator] Yeah, he said – I'll put it this way - he said: "I know they are there and where they are, and for me, if I was to see a buffalo – bison - now, I*

[78] Workshop at Fox Lake, August 2, 2000.
[79] Interview # 14.

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would shoot it and kill it [...?] and I would take everything back, bring everything back and not waste anything, let anything go to waste." He said: "But these animals we relied on them for our survival in the past. And the government's speculation was that the herd has a disease - and they talk about eradicating the herd, killing everything off and bring in new herds. But a lot of the elders didn't want them killed off - eradicated. They [the elders] rather see get the research [done], get them tested and find out for sure if they are indeed diseased." He said: "Many of our band members have refrained from hunting there, hunting them. There's a specified area that the band is working on, like Malcolm has an area in there where people don't go in that area, especially our own people" He said they respect the decision of Chief, council and the elders not to go there because of the program, the monitoring program. But outside that area people have... it's been known that some of our Native hunters are killing the odd buffalo, now and then. Like, two or three animals last three years anyway. And he said: "We have mutual respect for these animals." And he said: "I guess that's one reason why we don't want - if in fact they're diseased that they [the diseases] - with human contact maybe be passed on to the human, [...?] to a hunter. And the other thing too is that we don't want the buffalo to advance further west and into the farmland, into the cattle ranches and stuff like that. And then, if that was to happen sure people would just kill them off." And he said: "If I kill them I bring everything home; I wouldn't sell nothing. I wouldn't be shooting it for profit but for my own survival. But until the time has proven that they're not diseased and then until the government is fully satisfied that they're not diseased, then – up to that point the Native hunters will probably stay away from them, now."

Another participant explained his view in detail[80]:

XX: *But the way I understand it was that - they were gonna slaughter the buffalos because they had TB, anthrax and I don't know what else they had. [I] did see it when some councilors asked me to go to Edmonton, because they were gonna slaughter them and we won. We didn't want that. Because we understand, our ways, the animals – the way we look at them they have a different cycle every year. I don't know what the cycle is on buffalo, it could be a hundred-fifty years, who knows. But, you know, when they brought those buffaloes from Edmonton, years ago - they barged them in – they were sick already. They knew they were sick. I don't know what they had... anthrax or TB at the time.*

T: *TB and brucellosis they brought in.*

XX: *Yeah, yeah. They were sick. But it's like people, you know. There's lot of people. She gets the flu [referring to the liaison who was present at this interview], oh we surely gonna get it within a week. When there's lots of buffalo – what, there was fifty-seven, sixty thousand [hundred?] buffalo, you know. There's no way it's gonna be a healthy bunch. If there's a sick buffalo, well heck, you were looking at thousands of sick buffalos over here. And it keeps on generating. And there's about thirty thousand [hundred?] or so drowned at one year in Sweetgrass in the flood. And now there's TB, and there's a whole bunch of them dying off. I don't know, they were scared for people to eat them [...] Anyway, we went up there and we tried to argue. If you wanna slaughter them give us some to preserve. 'Because we believe not all the animals - usually when they die off they don't totally die off. There's a few that stay alive. In all the animals - that's the way we look at the animals. Like the beaver in Alberta. In the Park one year they died off. I don't know if it was sickness or same reason what they have now. But that was years ago, I remember. Now they're starting to come back. They didn't all die off. If they all died off there would be no beaver today. You know, there gotta be some survivors in order to regenerate. Well, it's the same thing with the buffalo. They say they're sick. I remember my dad killed a few that are sick. But you open them up, they know. You can see they are sick. So, you know, we just have to throw them away or we feed it to the dogs. And the dogs don't get sick, you know. But, so we went up there and we argued. I said: "Hey, come on, give us some." Anyway, they were gonna slaughter them. Now the Americans come in, they go and shoot them. They pay so much money, you know. That's why we're trying to save our herd over here. If they're gonna kill them off, ok, fine, not in that area, you know. This is ours, we want something for our people, years to come. They know they*

[80] Interview # 13

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have something there. That's why Americans go up there, you know, they say: 'We get harassed by Natives up there.' Well, you know, last winter I sat with them. They were in Wentzel, they were hunting buffalo. I sat with them for about, oh, maybe five, ten minutes, had coffee with them. So I told them. I said: "Look, there could be some, you know." I knew there were some but I didn't want to tell them where. I said: "You just have to go and look for them. That's the way we hunt. We don't know".

But anyway, you know, that's the way I see it for buffalo, you know. We want something to be there in years to come. Because if we let them come in here, if we don't say nothing, they gonna kill them off. And if they [Government] say: 'Don't kill no more buffalo, if you kill anything, well you would pay fines and stuff like[that], well, we know we have our herd out there, preserved for us, you know. If we want it we go up there and shoot it.
T: *Is the importance of that herd to maybe use it for hunting some time in the future or is it more a cultural thing that it is just important for them to be there?*
XX: *Well, the way I look at is sort of culture in it. If a family wants to go up there in the fall to kill - because that's the way they used to be years ago, they go where the food was. If they go out there to hunt, fine. It's not just the family is going out there and killing 200 head of buffalo, you know? They just take five, maybe two or three, like that. Ok, fine, that's great. And the buffalo, I mean, can regenerate that next year. Have some more calves and they'll be there for a long time. But, if you let these guys come here with their bows and guns and hunting, there'll be nothing left for us. Because, you [can] go up and stay there too. They have Parks and you pay so much. They kill one animal, you don't go in there and kill ten. But heck, I know of some [trophy] hunters going up there killing four or five buffalo. That's within, you know, in Alberta. These people, they go up there, they shoot them.*

In the view of the participant, sickness is a natural part of the life cycle; however, the human induced concentration of bison through the introduction of sick plains bison created the disease problem. In his experience, a local disease never affects all animals in the region.
Many of the above concerns voiced by the Little Red River Cree participants in this study are similar to concerns expressed by Dene participants in Janna van Kessel's (2002) study of the Fort Resolution Bison Recovery project. Dene elders, in particular, often mentioned discomfort with bison held in captivity, the handling of the animals, and concerns about disturbing the cultural and spiritual relationship with the bison.

Bison and Human and Natural Disturbances

Local TEK experts (e.g., Malcolm Auger, Alexis Meneen, Daniel Loonskin) observed that the construction of the road and right-of-way to John D'Or Prairie and Garden River in the early 1970s impacted the migration behaviour of the Wentzel Lake herd. Before the road, bison regularly came to the prairie patches near John D'Or Prairie. They also used to frequent some salt licks and prairie patches between the Wentzel and Lawrence Rivers, and east of the Wentzel River to the south of the right-of-way. Increased human hunting pressure from the road changed this behaviour. As soon as local commuters found tracks on the road they hunted for the bison. Although local residents have started to observe a voluntary hunting moratorium for the bison in

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the last few years, new pressure arose with the arrival of trophy hunters. The seismic lines in the Caribou Mountains have become the main access corridors for the trophy hunters.[81] They found the baiting grounds that the Little Red River Bison Monitoring Program initiated to aid research on this herd. Consequently, the program has abandoned the baiting policy since the winter of 2001/2002 and the habituation process has been unsuccessful due to the hunting pressure. TEK experts reported that the bison now very rarely leave the Caribou Mountains and seldom come closer than within seven kilometres of the road. Daniel Loonskin[82] noticed:

> ***D:*** *[...?] once they have this road built the buffalo don't come anymore.*
> ***T:*** *Oh, they don't cross the road.*
> ***D:*** *No, as soon as they cross there is always somebody going after them. Chasing them back up. Now they don't come as often.*
> ***T:*** *I heard also that they used to come to John D'Or.*
> ***D:*** *Yeah, oh yeah.*
> ***T:*** *But after the road, they didn't come.*
> ***D:*** *After the people move in, the road come in and they're gone, they don't come down. Even the caribou used to come down to John D'Or. You see an odd one there. But now they don't, you know. I never see any. They all stay in here [in the Caribou Mountains].*
>
> ***T:*** *When would the buffalo use the salt licks?*
> ***D:*** *In winter they usually come down. Very, very, very odd time, and probably before the road, they'd be there in the summer or in the fall. They'd be there. But now the road is in, oh it's sometimes about maybe 10 or15 of them are going there. For there is people travelling back and forth there, as soon as they track them they go after them and chase them back up. That's why they don't come there very often now.*

Malcolm Auger observed that bison tended to use the cutlines to travel, especially before the trophy hunters came. [83] Now the bison tend to stay more often in dense vegetation.

Based on these observations, this study disagrees with some of Gates et al.'s (2001a) predictions for a bison movement corridor model. The model is primarily based on a greenness map (derived from a phytomass or Leaf Area Index from Landsat data), topographic data, and distance to water. The prediction of the model in regard to movement corridors for the Mikkwa and South-Western Parks herds correspond with observations TEK experts contributed to this study. The results of this study, however, do not support Gates et al.'s prediction that bison north of the Peace River are highly likely to move through the settlement of John D'Or Prairie. The calculations for Gates et al.'s bison movement corridors are based on the density of least-resistant pathways and do not consider bison avoidance of human hunting. As documented in this study

[81] Malcolm Auger, Interview in John D'Or Prairie June 22, 1999 and September 7, 1999.
[82] Interview in Fox Lake, August 24, 1999.
[83] Malcolm Auger, Interview in John D'Or Prairie June 22, 1999 and September 7, 1999.

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however, TEK experts emphasized that human hunting pressure was the most important factor in limiting the range of the Wentzel Lake herd.

Daniel Loonskin[84] recalled that the old people used to tell that there were bison near Fox Lake (on the south side of the Peace River) during the time when bison hunting was illegal in Alberta. Today, the bison on that side of the River tend to stay in the Park to avoid hunting pressure. Participants indicated that bison know where the boundaries are and that they retreat into the Park when hunters pursue them: "They know they are in the Park. They don't go out."[85]

John Laboucan thinks that logging forces bison and moose to leave an area. He feels that the bison near Fox Lake are still safe because there has been less logging than in other areas. He also points out that logging is planned south of the Peace River near the Park. People can only hunt the bison that come out of the Park, and they do, every now and then. He believes that the logging will force the bison back into the Park and make hunting even more difficult.

> *And every now and then buffaloes come out of the Park. It's close to the Park, where the logging is gonna be. They're gonna force them back in. We're not trying to kill them all as they come out but we need to, every now and then. There's a lot of people from Fox Lake that never seen a bison yet. I've only seen one live bison, like... wild one – myself.*[86]

Several participants (e.g., Malcolm Auger and Daniel Loonskin) observed that bison would forage on graminoids in cutblocks in the south-eastern escarpment of the Caribou Mountains and east of Fox Lake (see Map 6.3).

In the Caribou Mountains, where the Wentzel Lake bison depend strongly on caribou lichen in winter, fire can negatively affect this resource since it takes a very long time for lichen to regenerate. In contrast, caribou lichen seem not to be affected as negatively by logging[87] as long as scarring is not too extensive.

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[84] Interview in Fox Lake, August 24, 1999.
[85] Interview # 20.
[86] John Laboucan, interview in Fox Lake, August 18, 1999.
[87] Malcolm Auger, interview in the Caribou Mountains, June 24, 1999

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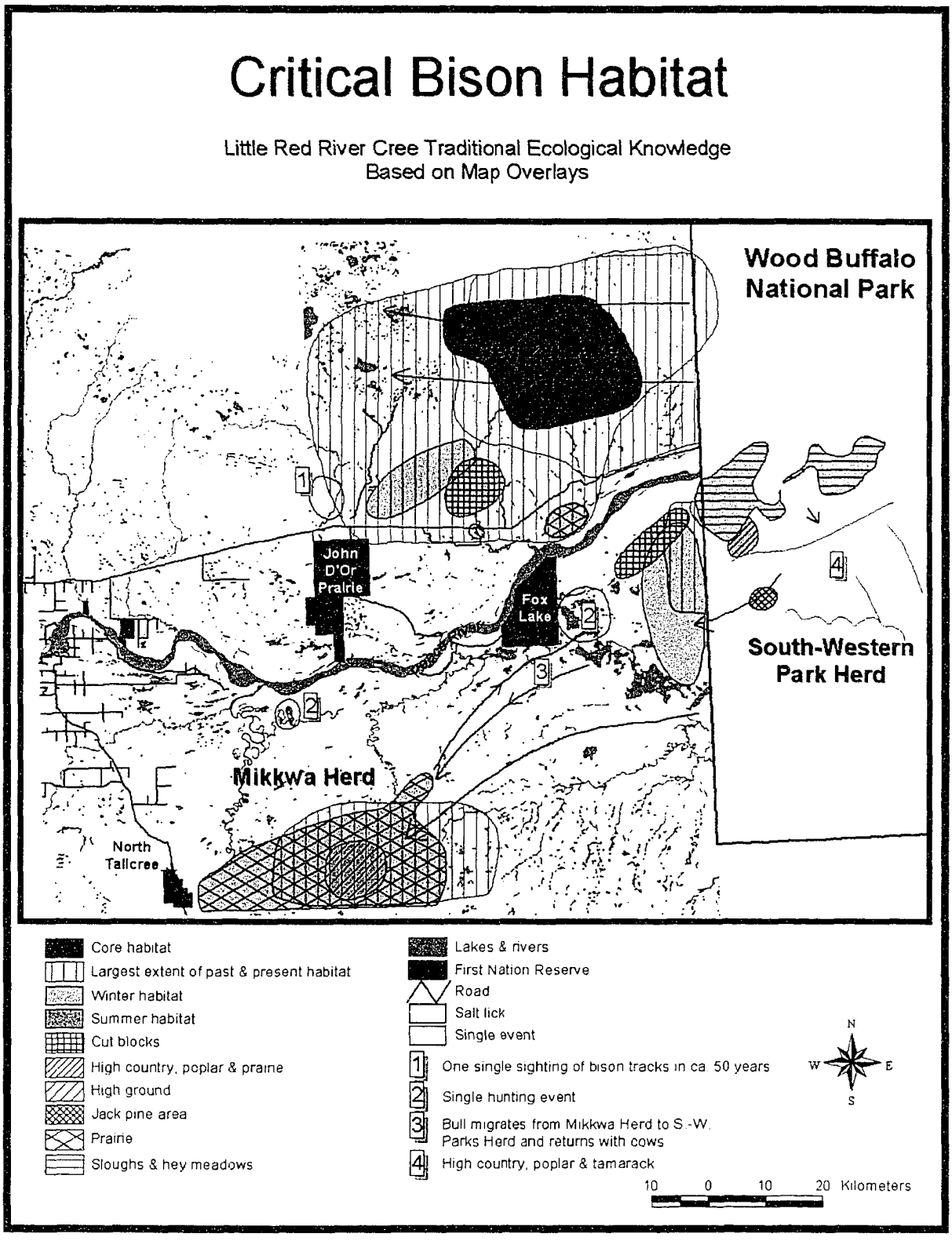

Map 6.3: Critical bison habitat in the Caribou Mountains region based on map information provided by Little Red River Cree TEK experts

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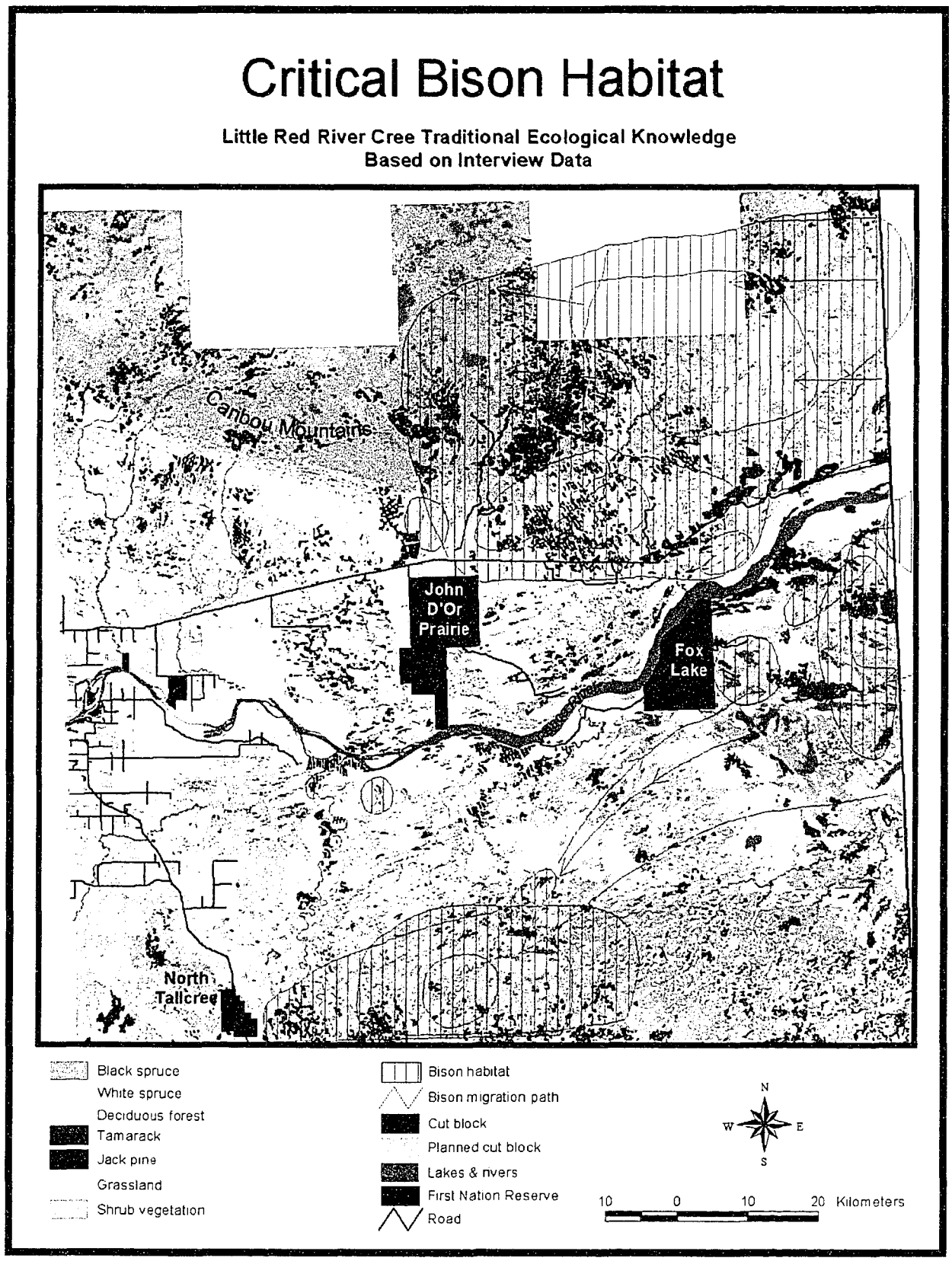

Map 6.4: Critical bison habitat in the Caribou Mountains region based on descriptive information provided in Little Red River Cree TEK expert interviews

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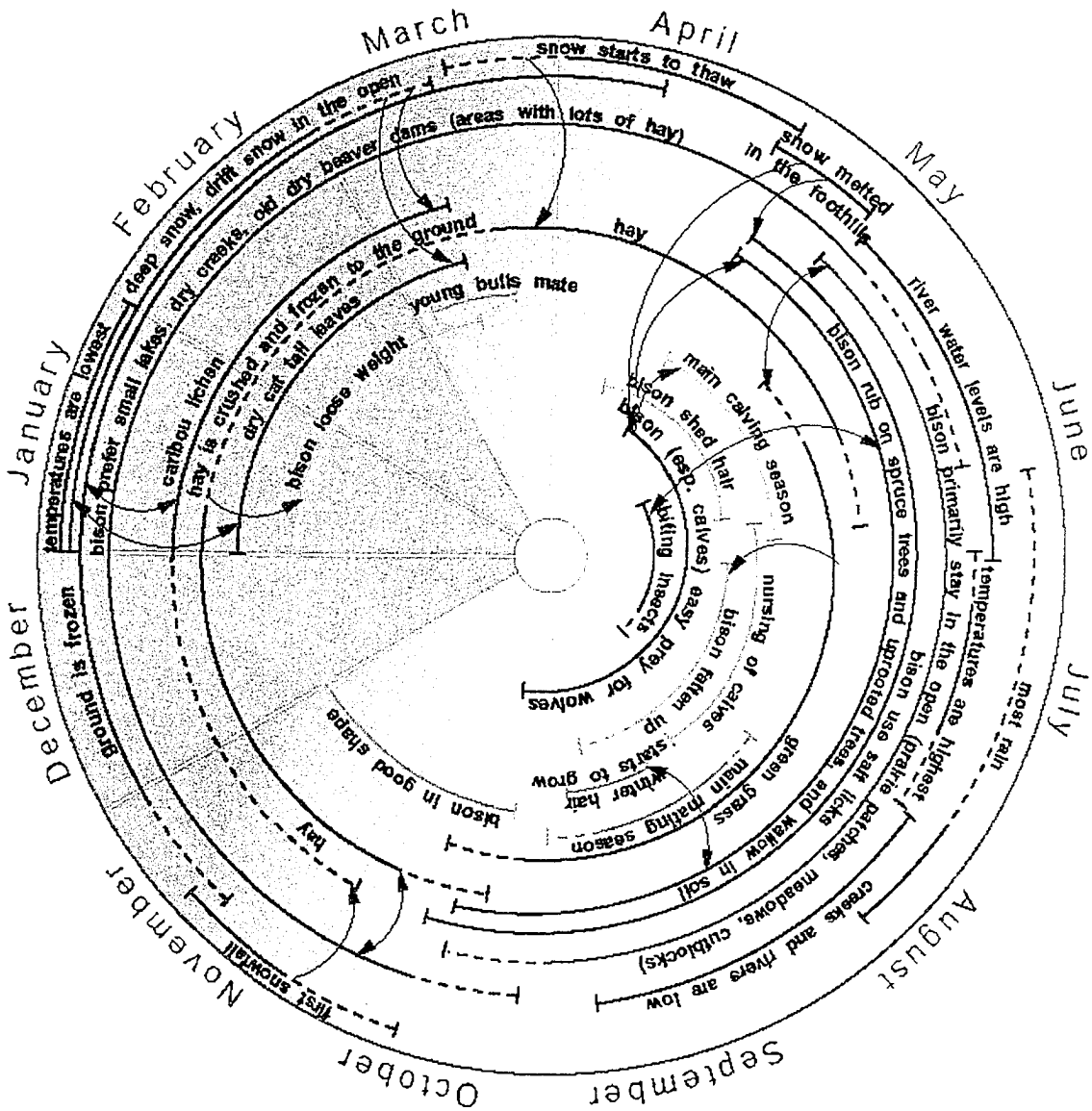

Figure 6.2: Wenzel Lake wood bison seasonal cycle diagram

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MOOSE

Literature Review

The North American moose is the largest member of the deer family and a typical inhabitant of Alberta's boreal forest and parkland. Currently, the scientific community recognizes four subspecies of moose in North America: the Shira's or Yellowstone moose (*Alces alces shirasi*), eastern or taiga moose (*Alces alces americana*), north-western moose (*Alces alces andersoni*), and the Alaskan/Yukon or tundra moose (*Alces alces gigas*) (Bubenik 1998a). With its distribution ranging from western Ontario to central British Columbia, and north into the Yukon and Northwest Territories, the north-western moose is the subspecies found in north-central Alberta.

As an ever-present symbol of the Canadian boreal forest, an attractive recreational hunting species, and the most important subsistence species for the indigenous people of Alberta's boreal north, the moose continues to attract research interests on a variety of topics. Franzmann and Schwartz's (1998) collection of 19 articles on the ecology and management of the North American moose is probably the most comprehensive work on North American moose available today. In it a variety of renowned scholars contribute insights into a broad range of topics such as history, population dynamics, predator – prey relationships, diseases, as well as population and habitat management. In the context of the present study, Pyc's (1998, 1999) research on Cree moose hunting strategies, traditional knowledge, and moose management in Wood Buffalo National Park is one of the most relevant works available.[88]

In the frame of my study it is of particular interest to look in more detail into the research on critical moose habitat, seasonal activities, natural and human disturbances of moose habitat, predator – prey relationships, and diseases/parasites, with a special focus on the north-western moose (*Alces alces andersoni*).

[88] The study includes details on seasonal moose habitat selection and contains management perspectives of participants, such as the information that a healthy strong male population is as important as a strong cow population to secure a viable moose population.

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Moose Critical Habitat and Seasonal Cycle Activities Research

The moose as a browser prefers habitats that allow access to readily available green leafy forage and easily browseable shrubs. Renecker and Hudson (1989) conducted a controlled study on seasonal activity budgets of two moose, which yielded the following results on moose feeding behaviour (Renecker and Hudson 1989, p. 297):

> The moose divided winter feeding times between browsing on woody stems and feeding on fallen leaves under the snowpack. In early spring, moose spent more time stripping bark from trembling aspen and balsam poplar than during other sample periods. When food was abundant and of high quality in late spring and summer, moose stripped leaves from shrubs in the low and middle categories. During summer, more time was spent grazing aquatic plants. Both moose relied heavily on fallen leaves in October. They browsed more in January 1984 than the previous winter because the dense snow crust prevented access to leaf litter.

Peek (1998, 1974), who conducted moose habitat research in north-eastern Minnesota, believes that the availability of palatable forage is a primary factor for moose habitat use, except for severe winter conditions, which force moose to closed canopy forest stands. Peek's (1974) research indicates, that Shira's moose prefer young aspen stands (younger than 20 years) from April to June. During July and August they shift to more mature conifer-aspen-birch forests (older than 50 years). From September to December, moose can be found in clearcuts (younger than 20 years), with the exception of the rut in September/October, which they spend in mature conifer-aspen-birch forests (older than 50 years). During the more severe winter months from January to March, moose prefer spruce-fir habitats (about 40 years old). Collins and Helm (1997) found that moose at Alaska's Susitna River floodplain selected early shrub and old poplar (*Populus balsamifera*) forest sites for wintering. Availability of browse was the most important factor in winter habitat selection.

Hauge and Keith (1981) studied population dynamics of moose in Alberta's oil sand region of Ft. McMurray and Ft. MacKay. Their study area included a portion of the Birch Mountains, which to some extent is geographically comparable to the Caribou Mountains. Their data indicate that moose show evidence of seasonal migration into the Birch Mountains in spring and out of the Mountains in fall. They are largely absent from the area in winter. Through relocation of radio-collared moose, Hauge and Keith (1981) found that moose in their study area were in aspen and aspen-white spruce dominated uplands from June through September. During November and December moose tended to be observed more often in open bog willow-tamarack or willow-tamarack-black spruce lowlands. From January to March, moose increasingly used aspen as well as aspen-white spruce uplands - an observation that seems to be related to snow cover, which was

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lower in uplands than in lowlands. In April and May, moose returned to the lowlands where they tended to prefer black spruce habitats especially during May. This might be linked to earlier snowmelt and green-up in these habitats. The authors suggest that lowland habitats in spring might be the most critical habitat in the year-round cycle of moose habitat use since it coincides with the energy-demanding late stage of pregnancy in cows and a time when moose have been greatly affected by the negative energy balance of the winter months.

Another important factor in moose habitat selection is predator avoidance and shelter. Schwartz (1998), for example, notes that birthing sites are often close to water, on peninsulas or islands. This is also confirmed by Bubenik (1998b, p. 175), who writes that:

> Breeding areas in the taiga are elevated grounds, usually bordered by water or scattered ponds. Elevated ground or shores are preferred scentmarking, vocalization and listening sites of both sexes in the rut. Preferred calving grounds are small islands not far from the mainland.

Chekchak et al. (1998) found that calving sites in Quebec were often found on hilltops, preferably on hills with less that 10% slopes. Their results yielded that distance to the nearest river was greater for calving sites (mean = 543 m) than for control sites (mean = 339 m). Bowyer et al. (1999) found that Alaskan moose preferred birth sites that were on southerly exposures with low soil moisture and high variability in overstory cover. They also found that cover of forage, especially willows, was more than twice as abundant at birth sites than at random sites.

The Effects of Human and Natural Disturbances on Moose and Their Habitat

The moose is a selective browser, who primarily feeds on early successional plants such as willows, aspen, and birch. Therefore it tends to benefit greatly from natural and human disturbances that encourage the growth of these plants. Schwartz (1998, p.162) summarizes:

> Logging and fire are important ecological forces throughout much of the moose range in North America. Early seral forests contain many deciduous tree species that represent high quality food for moose. Moose in such habitats tend to have high reproductive rates. There is a premium placed on rapid colonization of quickly created habitats that favor the cow producing the greatest number of offspring (Geist 1974a, Peek 1974a).

Fire is the most important natural disturbance in the creation of moose habitat. Moose have long been associated with post-fire habitats. Peek (1998) provides a detailed overview of studies on fire-influenced moose habitat, covering 50 years of research in this field. MacCracken and Viereck (1990) researched the short-term effects of fire on plant response and moose (*Alces alces Miller*) browse following the Rosie Creek fire near Fairbanks, Alaska. They found that moose

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foraged in the burn the first post-fire winter. In terms of browse production, aspen sites were the most productive, followed by white spruce, birch, and black spruce.

The periodic flooding of river and stream banks, and changes in river channels create floodplain alluvial habitats that also allow for the growth of successional plants (especially willows) and consequently produce highly productive moose habitat (Peek 1998). Karns (1998) points out that the suppression of fire and the creation of dams (reduced flooding on streams) consequently affects moose populations. Subsequently, another natural disturbance beneficial to moose is the dam-building activity of beaver (Boer 1998). Moose generally browse on riparian shrubs, however, beaver ponds also provide aquatic vegetation that moose feed on in summer. Due to the cutting of mature aspen by beaver, the growth of suckers and sprouts are promoted (Boer 1998). Moose, in turn, might also contribute to the growth of their own favourable habitat. A controlled experiment by Bergman (2002) demonstrated that moose saliva stimulates the branching of sallow saplings (*Salix caprea*). Forbes and Theberge (1993) found that moose habitat was also created in areas severely affected by spruce budworm (*Choristoneura fumiferana*) defoliation.

Logging has long been known to create favourable moose habitat through the subsequent production of successional plants such as willows for moose browse. Zasada et al. (1981), for example, found that clear-cut areas produced much more moose browse than undisturbed control sites. Forbes and Theberge (1993), who studied moose habitat disturbance at local and regional landscape scales in Algonquin Provincial Park, Ontario, found that plots with more than 33% of their area logged (non-clearcut logging) supported more moose during winter than plots with less than one-third of their area logged.

Rempel et al. (1997) compared moose density in landscapes affected by natural and human disturbance (wild fire and logging) with and without hunter access. Their findings indicate that neither effects of disturbance or hunter access were significant. The interactions of both, however, were statistically significant, with moose density increasing if disturbance occurred without hunter access.

The knowledge of the effects of disturbances on moose habitat leads to recommendations for habitat management. Thompson and Stewart (1993, p. 384) suggest the following objectives for short-term (10 - 20 years) habitat management at the forest stand level:

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1. Protection of moose colonizing a recently logged or burned area from excessive hunting pressure for a period of 5 to 8 years until the regrowth reaches a height sufficient to provide escape cover and to allow roads to deteriorate enough to reduce ease of hunter access;
2. Provision of shelter reserves adjacent to aquatic feeding areas or mineral licks;
3. Maintenance of particular calving sites (e.g., leave a peninsula uncut);
4. Improvement in the quality of a specified number of hectares of moose winter habitat through mechanical means or prescribed burning; and
5. Diversion of moose from dangerous areas such as roads and railways.

Population Dynamics, Predation, Diseases and Hunting

Many studies on predator-prey relationships between moose and their main predators have been conducted in North America. Ballard and Van Ballenberghe (1998) provide a very good geographic and in-depth overview over North American research done in this field. In Bertram and Vivion's (2002) study of moose mortality in eastern interior Alaska, black bears (*Ursus americanus*) and grizzly bears (*Ursus arctos*) accounted for 84% of the known calf mortality. Hauge and Keith's (1981) research in north-eastern Alberta estimated that 29% of calf loss was due to wolf predation, although they also suspect that black bears may cause appreciable calf mortality – based on large numbers of bears, and calf hair in early summer bear scats. Boutin (1992) disputes this and other estimates because the assumptions on which they were based had not been addressed, alternative hypothesis had not been given similar consideration, and adequate experiments had not been conducted.

Moose are vulnerable to a variety of parasites, diseases and pests.[89] One of the most visible parasites to distress moose is the moose tick (*Dermacentor albipictus*). Moose are most severely affected between January and early April when the nymphs begin blood feeding and subsequently develop into mature ticks. During the summer, moose are tick-free. Flies and other biting insects cause distress in moose during the summer months. Internally, moose are potential hosts to a variety of trematodes (parasitic flatworms of the digestive tract and associated organs), cestodes (tapeworms), and nematodes (roundworms). Important in the context of this study is that moose are susceptible to brucellosis and anthrax.[90] Lankester and Samuel (1998, p. 483) summarize the following on brucellosis and moose:

> *B. abortus* has been isolated from dead or dying moose in Minnesota, Montana and Alberta (see McCorquodale and DiGiacomo 1985). Yet, the absence of seropositive animals in other areas where the disease occurs in cattle indicates that infection of moose may be infrequent. Some

[89] Information in this sub-paragraph is primarily based on Lankester and Samuel (1998), who provide a thorough overview of the many diseases, parasites and pests that affect moose.
[90] Although moose can also become infected with tuberculosis, no infections of wild moose have been reported in Alberta (www3.gov.ab.ca/srd/fw/diseases/factsheet/BovineTB.pdf).

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> investigators have suggested that moose may be highly susceptible and die quickly after infection, leaving few if any seropositive survivors detectable in the population (Jellison et al. 1953, Corner and Connell 1958).

Kunkel and Pletscher's (2000) data suggest that in winter, moose in their study region were at less risk of predation by wolves near roads and trails because of legal and illegal wolf hunting by snowmobilers.

As mentioned earlier, Rempel et al. (1997) found a link between moose densities and the combination of disturbance and hunter access. For the purpose of regulating the annual moose harvest, Alberta initiated the Northern Moose Management Program in 1993. The program conducted moose surveys to determine population dynamics for management purposes.[91] In Alberta there are regulations in place that provide some degree of control over the number of moose harvested. Timmerman and Buss (1993, p. 388) review a variety of Government controlled management options for moose harvesting, including sale of permits or licenses, associated regulations that limit harvest and access, established seasons, and restricted use of various weapons or equipment. Some of Alberta's provincial and federal regulations include[92]:

- the sale and/or draw of licences,
- limitation of access (e.g., no hunting of big game until six hours after disembarking from an aircraft, prohibition of hunting from vehicles and boats),
- established seasons,
- restrictions on weapon use (e.g., specifics on the type of weapons, prohibition of travelling with loaded weapons),
- other regulations (e.g., no hunting between one-half-hour after sunset and one-half-hour before sunrise).

While First Nation subsistence hunters are exempt from some of the regulations (e.g., hunting seasons, limitations on numbers of and gender of moose harvested), they are restricted by others (such as registration of weapons, restrictions of weapon use, provincial requirements for boating). As mentioned in Chapter 3 (Research Setting), specific moose hunting regulations apply for Native subsistence hunters in Wood Buffalo National Park.

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[91] Government of Alberta, Sustainable Resource Development: http://www3.gov.ab.ca/srd/fw/hunting/northmoose/98nmoose.html

[92] Government of Alberta: http://www.albertaoutdoorsmen.ca/huntingregs/ and Government of Alberta: http://www3.gov.ab.ca/srd/fw/hunting/index.html

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Results: Traditional Environmental Knowledge of Critical Moose Habitat

Moose can be found throughout the traditional lands of the Little Red River Cree. The fact that moose are solitary requires a different descriptive approach for the results than the one used for the previously described resident herd ungulates, the woodland caribou and wood bison. The information provided by participants when describing moose habitat tended to be rich in details but geographically more generalized than the information offered regarding caribou and bison habitat, which tended to be less detailed but geographically more precise. According to the TEK experts, moose habitat choices follow a seasonal cycle in which availability of food and protection from predators seem to be the major influencing factors.[93]

Regional Moose Habitat Information

Moose in the Caribou Mountains region show seasonal changes in habitat preferences. Alexis Meneen[94] described that moose can be found in the lakes regions (e.g., Pichimo Lake) of the Caribou Mountains in summer (Map 6.3, purple line) whereas the region along the foothills of the Caribou Mountains (to the south of the woodland caribou range) provides winter and summer habitat. Charles Hemlin[95], confirms that moose stay below the foothills in winter (Map 6.3, grey line). Celestan Nanooch[96] and John Dumas[97] also observed that moose could be found along the big lakes (e.g., Margaret and Eva Lakes) of the plateau in the summer – where they feed off the water lily root. Charles and Henry Hemlin[98], however, never tracked many moose on their trapline in the south-central Caribou Mountains, which might be related to the seasonality of trapping from fall to spring, when moose do not tend to stay in the mountains.[99] Malcolm

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[93] The traditional knowledge data in this study are very similar to Cynthia Pyc's (1998) results for her Garden River study. This is not surprising since we worked with the same First Nation and to a certain degree probably with the same TEK experts.
[94] Interview in Fox Lake, August 19, 1999, translated by Celestan Nanooch.
[95] Interview in North Tallcree, September 02, 1999, translated by Celestan Nanooch.
[96] Interview with Charles Hemlin in North Tallcree, September 02, 1999, translated by Celestan Nanooch.
[97] Interview in John D'Or Prairie, July 17, 1999.
[98] Interview in North Tallcree, September 02, 1999. Mr. Hemlin mentioned that in the forty years of trapping on his trapline he only saw one moose. He related his observation to the fact that the area is dominated by spruce and lacks high bush cranberries and red willows, which he described to be a choice food of moose.
[99] Hauge and Keith (1981) observed a similar seasonal migration trend for moose in the Birch Mountains of Alberta.

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Auger[100] observed that moose like to frequent the cutblocks along the south-eastern rim of the Caribou Mountains (Map 6.3, green arrows and lines to the north of the Peace River), although he found that numbers of moose are not very high, which he related to hunting. Lorne Tallcree[101] recalled that his father used to hunt for moose in the Caribou Mountains region near the Wentzel Lake bison range. During my field summer and several visits to the region between 1999-2002, I heard of several local hunters (and saw vehicle tracks) who had set up moose hunting camps in the region between the Wentzel River and Wood Buffalo National Park, which indicated to me that the region is still an important and popular moose hunting ground for hunters from Garden River and John D'Or Prairie.

Hunters from all three communities (e.g., Malcolm Auger[102], Paul Tallcree[103], Lester Nanooch[104], John Laboucan[105], and participants at the Fox Lake workshop) mentioned the importance of the Peace River and its islands as critical summer habitat for moose cows and their calves (Map 6.3, pink polygons). During the rutting season, the sloughs along the Peace River (both inside and outside the Park) are favourite areas for moose hunting, which is also indicated by the presence of long-established hunting camps (e.g., Little Fishery and Big Slough in Wood Buffalo National Park). Paul Tallcree further explained that he regularly finds signs of moose activity (willow browsing in summer) along the creek on his trapline in the south-western area of Wood Buffalo National Park.

Several hunters from Fox Lake (e.g., Daniel Loonskin[106], John Laboucan[107], Alfred Seeseequon[108]) identified the region between Fox Lake and the Mikkwa and Wabasca Rivers and Harper Creek (Map 6.3, green arrows and lines to the south of the Peace River) as important moose habitat and hunting grounds. The region has many rivers, creeks and sloughs; which provide good habitat year round. Lorne Tallcree further noticed that moose can be found along the Birch River in March, where they feed on red-osier dogwood.

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[100] Interview in John D'Or Prairie, September 7, 1999.
[101] Interview in John D'Or Prairie, September 8, 1999.
[102] Interview in John D'Or Prairie, September 7, 1999
[103] Interview on Mr. Tallcree's trapline near Garden River, August 7, 1999
[104] Interview with Mr. Nanooch during a field trip along the Peace River, August 4, 1999
[105] Interview in Fox Lake, August 18, 1999
[106] Interview in Fox Lake, August 24, 1999
[107] Interview in Fox Lake, August 18, 1999
[108] Interview in Fox Lake, August 25, 1999

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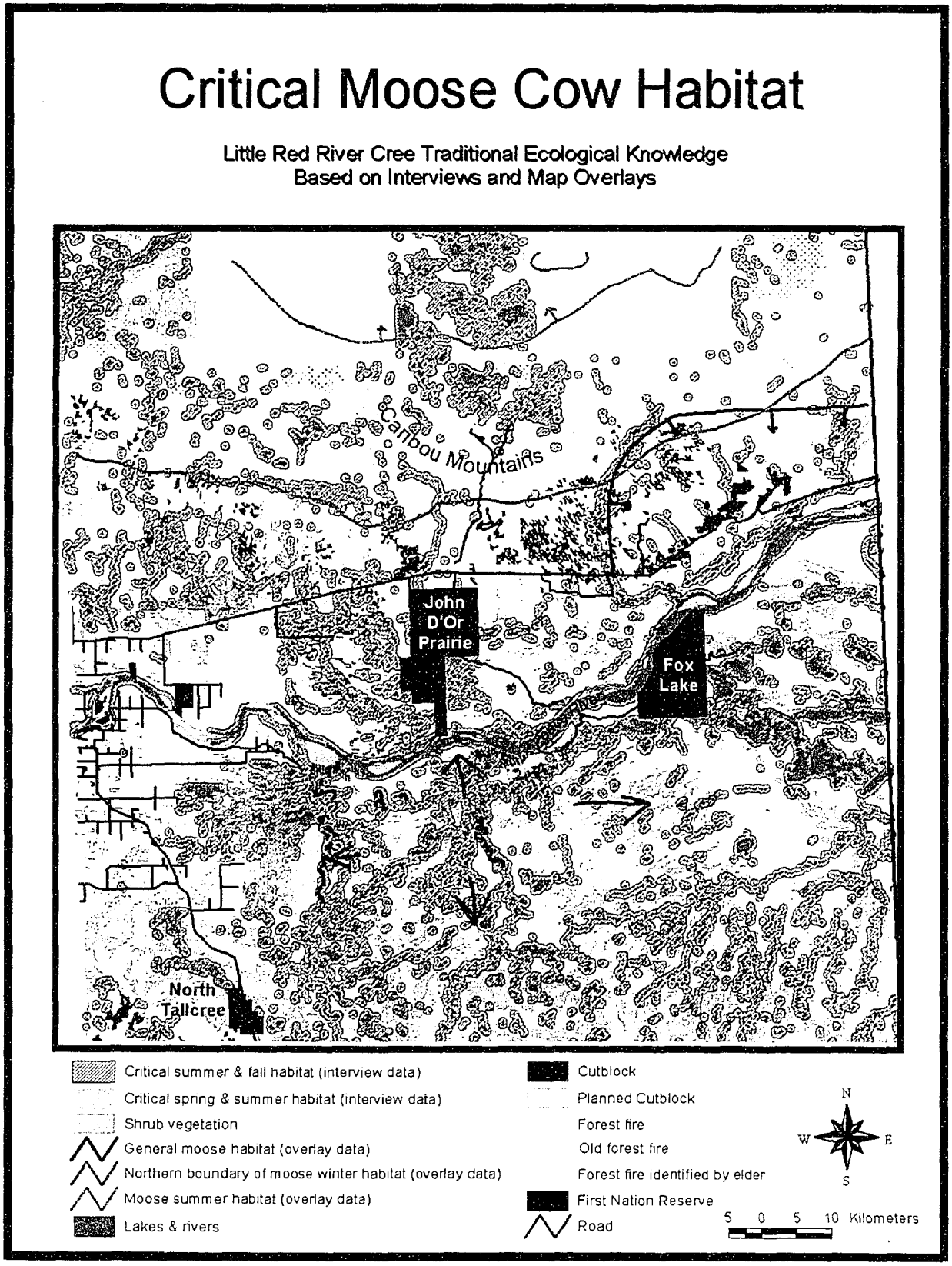

Map 6.5: Critical moose cow habitat in the Caribou Mountains based on descriptive and map information provided by Little Red River Cree TEK experts

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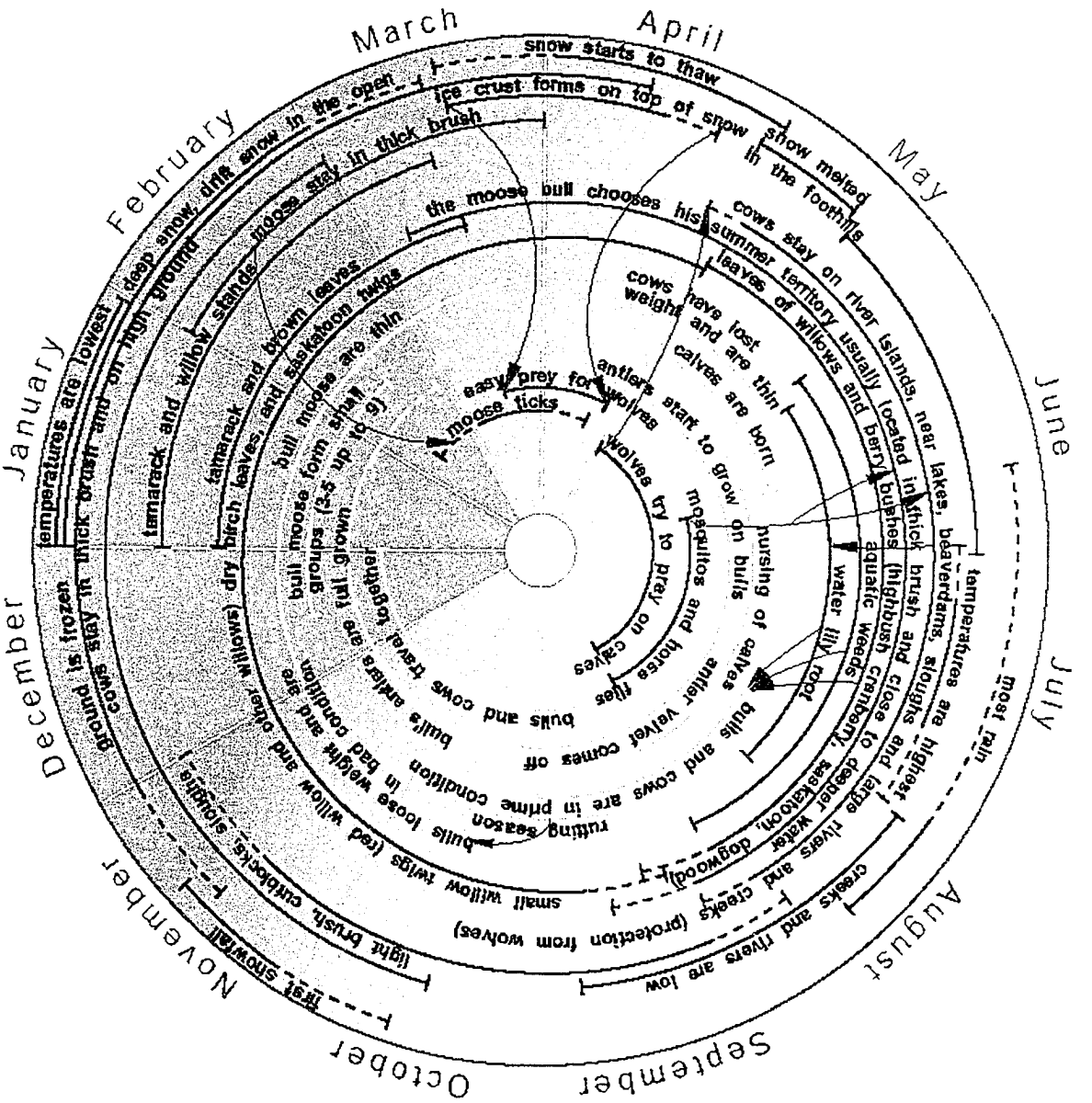

Figure 6.3: Moose seasonal cycle diagram

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Seasonal Cycle of Moose Habitat Selection[109]

Unlike woodland caribou and wood bison, moose do not choose a long-term home range, but rather show preferences for different habitats at different times of the year. A cycle diagram that describes the seasonal cycle of moose habitat selection therefore proves to be particularly useful in describing the results of this study. Figure 6.2 depicts the seasonal moose habitat selection cycle. The blue lines describe the seasonal weather and environmental conditions; the red lines show seasonal habitat preferences of moose; green represents the primary seasonal forage of moose; orange depicts the seasonal reproductive activities and physiological changes of moose; and purple describes particular seasonal vulnerabilities of moose to predators and parasites. Grey arrows link observations that are related or influence each other.

According to the TEK experts, the moose calving season begins in early May and can stretch into late June. During this time the cows stay close to water. They retreat to river islands (Map 6.3, pink) or stay near lakes, beaver dams, sloughs, or large rivers and creeks. The main reason for this habitat selection is to provide the cows and their calves with an easy escape from wolves into the water. From March to April, bull moose select a location for the summer. They stay in the same area for the length of the summer in order to conserve energy for the mating season.

During summer, moose will browse on willow leaves (*Salix* spp.), high bush cranberry (*Viburnum opulus*), saskatoon (*Amelanchier alnifolia*), red-osier dogwood (also known as red willow, *Cornus stolonifera*) and other berry bushes, green alder (*Alnus viridis*), as well as water lily root (*Nuphar variegatum* or *Nymphaea tetragona*) and long green feathery aquatic plants (translated from Cree as "weeds in the water") from the lakes. For moose, the lakes provide additional relief from biting insects, which are particularly aggressive during June and July.[110] To spatially reflect the importance of this summer habitat on a map, I selected a 500m zone around all larger water bodies[111] (Map 6.3, dark green hatched zones).

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[109] The results presented in this subchapter are based on information provided by (in alphabetical order) Malcolm Auger, John Dumas, Charles Hemlin, Henry Hemlin, Isadore Laboucan, John Laboucan, Daniel Loonskin, Alexis Meneen, Henry Moberley, Celestan Nanooch, Lester Nanooch, Clifford Ribbonleg, Lorne Tallcree, Paul Tallcree in individual interviews and at the workshop in Fox Lake.

[110] It is interesting to note that participants named avoidance of wolf predation and biting insects as main reasons for moose to stay near larger water bodies. Karns (1998) refers to heat stress as a main reason for moose to stay near water in summer. He describes that moose in winter coats become stressed by temperatures more than 5.1 °C, and 14 °C when in summer coats.

[111] The buffer was created after consultations with elder M. Auger. The distance of 500m was chosen to

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In August, when the fireweed reaches its flowery peak, the bull moose is 'getting fat' and the cow moose also starts to be in prime condition. At this time, the main Woodland Cree moose hunting season begins. The fall migration of the cranes in September signals the beginning of the moose mating[112] season.[113] Also in September, the fur coat of the moose changes from a summer to a winter coat. The hair starts to fall out (which was referred to as "drizzle" by participants) and the new coat gets thicker. The drizzling of the hair is called *moose rain* by the Woodland Cree.

At this time of year, the cows are still near water (especially near beaver dams and sloughs), where they now are joined by the bulls. During fall (September to November) moose will move to drier, higher ground. From mid-October to February the cow stays in thick brush that contains substantial windfall. This is another predator avoidance strategy since the long-legged moose can step easily over windfall, especially during a wolf attack. The wolves, in comparison, are slowed down by the obstacles. In winter, the moose diet mainly consists of brush tips and twigs (preferably willow, particularly red willow) dry leaves[114] (Malcolm Auger particularly referred to dry birch leaves), and saskatoon twigs. From January to mid March they prefer to browse in tamarack and willow stands.

During February and March, moose generally stay in thick brush, partly for forage, but also to get relief from moose ticks, which (after infesting the moose earlier) have their greatest impact on moose at that time. According to participants, the rubbing of the brush gives the moose some relief from ticks. In April, when the snow starts to thaw and is ice crusted, moose are particularly vulnerable to wolf predation. While moose break through the crust, wolves can still run on top of it. All year round, moose are attracted to areas with willow stands, like cutblocks, although they tend to utilize cutblocks most during the early fall.

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depict the spatial connection of suitable habitat.

[112] Malcolm Auger observed that young bulls start rutting earlier than older bulls (pers. communication April 20, 2002). This is different from Bubenik's (1998b) description where prime bulls are sexually active before submature bulls.

[113] Lorne Tallcree explained that the mating season begins when the cranes have been seen four times to migrate south (Interview in John D'Or Prairie, September 8, 1999). Celestan Nanooch also referred to the beginning of the mating season, when we saw cranes migrating by during an interview with Charles Hemlin at North Tallcree on September 02, 1999.

[114] The observation of moose foraging on dry leaves corresponds with Renecker and Hudson's (1989) results.

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Moose – Wolf Relationships

Most of the information provided by TEK experts in regard to moose and wolf interactions (e.g., estimates on wolf population increases or decreases, interactions with other ungulate prey species like caribou and bison) has already been discussed in the subchapters *Woodland Caribou and Predators* and *Wolf - Bison Relationships in the Project Region*. According to many TEK experts, escape from wolf predation is one of the main factors contributing to moose habitat selection in different seasons. As described in the subchaper on *The Seasonal Cycle of Moose Habitat Selection*, moose cows with their calves (like woodland caribou cows) stay close to deeper water during the summer in order to provide for an easy escape route in case of a wolf attack. As mentioned earlier, during the fall and winter months, moose cows will stay in thick brush that contains substantial windfall. In this environment, the long legged moose has the advantage over the wolf during an attack and escape event. As previously mentioned, moose are most vulnerable to wolf predation during March and April, when the thick ice crust on top of the snow allows the wolves to run on top of the snow while the moose breaks through.

Moose Diseases and Parasites

Participants agreed that generally the moose in the region are healthy and in 'good shape'. Occasionally, however, hunters encounter diseased animals. Paul Tallcree describes[115]:

> *Well, there's some that are sick, sometimes. Even the people they're sick. Animal is the same. They have sickness, you know. They die. You'll find the odd one, sick moose, you know.*

Malcolm Auger[116] had heard accounts from other local hunters, who found moose hunted in the oilrig areas near Red Earth Creek to be diseased. They described big cysts (about 3 cm in diameter) in the lungs, chests and breasts.[117] I brought up the subject at the workshop in Fox Lake, but none of the participants were able to confirm it[118]. However, Paul Tallcree from Garden River remembered that in the 1970's he found several skinny moose with pus in their lungs. Daniel Loonskin mentioned that in the 1960's he shot a moose near Birch River that had worms in most of its tissue, even in the tongue. Participants at the Fox Lake workshop offered the explanation that after the mating season in the fall, bull moose are more vulnerable to sickness.

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[115] Interview on Mr. Tallcree's trapline near Garden River, August 07, 1999.
[116] Interview at Foggy Tower, Caribou Mountains, June 24, 1999.
[117] This could be an indication of the presence of tuberculosis or wolf tapeworm (*Echinococcus granulosus*).
[118] Participants speculated, that diseased animals could have come from the Swan Hills plant area.

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They attributed this to injuries moose may acquire during rival fighting, which might affect one in a 100 males (estimation by Daniel Loonskin). The injured animals tend to have internal injuries that can lead to pus in the injured places. The fighting during mating season is aggressive. TEK experts reported that some bulls will even attack their own cows – sometimes they injure their mates because they are so possessive. Generally native hunters only observe sick animals when they happen to encounter them, they do not deliberately monitor them.

During summer, biting insects, especially blowflies, are a source of discomfort for moose. In order to find relief, moose will stay close to deep water into which they retreat, especially during hot days. During late winter and early spring moose are parasitized by moose ticks. The infestation with moose ticks can start as early as February, and generally has its peak in March and April. The time is influenced by the weather. The severeness of the infestation varies between years – in "*some years they are thick, other years there are few – hardly any*"[119]

During the discussion of moose diseases at the workshop in Fox Lake, participants introduced the subject of sickness caused by wolf bites. Participants explained that when a wolf bites an animal it gets infected and then gradually dies. This animal is not safe to eat. Daniel Loonskin mentioned that he shot a moose recently, and on close examination he found that the legs had been injured by a wolf. He had been told by the 'old timers' that you don't take an animal that has been bitten by a wolf. So Mr. Loonskin cut off the injured leg and left the moose for a day, only to find afterwards that the whole carcass had already been spoiled. Malcolm Auger also shared a story on this issue, where his uncle shot a moose that was bitten by a wolf. It was bitten close to the moose's hindquarters. The uncle and his companion cooked the meat and ate some of it. The uncle then started to feel dizzy. His companion also felt dizzy. Mr. Auger concluded his account by mentioning that dogs do not even touch the meat of a moose that was bitten by a wolf. With the exception of sickness caused through wolf bites, participants at the Fox Lake workshop do not recall that a person ever contracted a disease from an animal.

Moose and Human and Natural Disturbances

Fire is the most common natural disturbance to affect moose habitat in the region. Henry Moberly[120] explained that in contrast to caribou, moose respond well to fire disturbance. Since it

[119] Malcolm Auger, Interview at Foggy Tower, Caribou Mountains, June 24, 1999.
[120] Interview at John D'Or Prairie, July 29, 1999.

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only takes one or two years for poplars and willows to regrow after a major fire, moose return to the affected area within the first two years. John Dumas[121] thinks that moose may have a migration cycle, which might be related to fires that influence moose migration.

John Dumas[122] also pointed out that beaver activity creates good moose habitat since it generates water bodies which moose take advantage of.

Participants tended to divide the effects of human disturbance through logging into short-term and long-term effects. John Laboucan and John Dumas explained, for example, that moose will leave an area during active logging. They will return, however, some time after the logging has stopped. Paul Tallcree described that two years after the logging, willows, poplar and aspen will start to grow, which is good for moose.[123] Many participants emphasized that moose like to browse in cutblocks. Malcolm Auger[124] observed that moose like cutblocks; it is a good place for them. If a person goes to a cutblock, a moose track will be the first thing he or she will see. Lorne Tallcree believes that logging leads to an increase in local moose numbers since moose are now found in the cutblocks but did not previously utilize heavy timber (old growth forest).

The disturbance caused by skidoos was of concern to Lorne Tallcree. The smell from a skidoo trail will drive moose away from the trail and they will stay away from a fresh trail. Because of this, hunters change their clothes after a skidoo ride to get rid of the skidoo smell.

Conclusions

This chapter presented overviews over wildlife research of woodland caribou, wood bison, and moose and the results of my analysis of the TEK experts' contributions on the three ungulate species. Many of the TEK expert observations of ungulates and their critical habitat and their interpretations of phenomena matched findings in the scientific literature. However, the analysis of the results also brought to light a variety of interesting observations and insights that were

[121] Interview at John D'Or Prairie, July 17, 1999.
[122] Interview at John D'Or Prairie, July 07, 1999.
[123] The estimated return time for moose after the end of logging activities varied between participants. Henry Moberly, for example, mentioned that poplar regrowth begins one year after logging and the moose return to the area. Lorne Tallcree described that moose return three or four years after logging.
[124] Interview at Foggy Tower, Caribou Mountains, June 24, 1999.

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presently unknown to the broader scientific community and can inspire new research projects. Some results are likely to contribute to political debates (e.g. northern bison issue) and management decisions (e.g. protection of bison and caribou habitat). While this chapter focused on results directly related to wildlife, the following chapter presents results in the context of human and natural disturbances.

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7 TRADITIONAL ENVIRONMENTAL KNOWLEDGE PERSPECTIVES ON ENVIRONMENTAL DISTURBANCES

The traditional lands of the Little Red River Cree have long been affected by environmental disturbances. Natural disturbances such as fire and flooding have shaped the landscape for thousands of years. In recent times, human disturbances such as roads, seismic lines, and logging had major modifying impacts on the region. This chapter outlines the knowledge that TEK experts contributed to this study in regard to the effects of environmental disturbances.

Ungulates and Human Disturbances

TEK experts often identified different types of human disturbances as main reasons for changes in ungulate habitat selection and decline in ungulate numbers. Main human disturbances were hunting, travel corridors, forestry, noise, and pollution. Often the introduction of one main disturbance leads to other disturbances. The building of roads and seismic lines, for example, gives hunters easier access to remote regions. Forestry and seismic exploration are often associated with noise and pollution. In the following sections, the impacts of different human disturbances on ungulates and other animals in the project region as understood by TEK experts will be discussed.

Hunting

As pointed out in the story of *Separate Ways*, about Wesakychak and the Moose (Chapter 5, p. 95), herd animals, like the bison, are particularly vulnerable to human hunting pressure. They are easier to find, and provide more targets per hunt than solitary animals. The bison of the Wentzel Lake herd have been vulnerable to both subsistence and trophy hunting. After the road to Garden River was built, local subsistence hunters tended to go bison hunting as soon as they were able to track the bison along the road. Currently, most local hunters observe a voluntary hunting moratorium on these bison. Since the mid 1990s, following the Provincial de-regulation of the wild bison, non-resident outfitters have started to bring trophy hunters into the Caribou Mountains. The bison reacted to increased hunting pressure by retreating into the remote areas of the Caribou Mountains. Through this protective measure they have lost the use of salt licks

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(which are situated next to the right-of-way to Garden River) and the valuable early spring feeding grounds on the prairies south of the Caribou Mountains. The loss of access to fresh nutritious grass at the end of a harsh winter and before the beginning of the calving season is a trade-off for their retreat that might have negative impacts on this herd. It could affect the birth weight of the calves and the weight and health of the cows, thereby leading to lower calf recruitment rates. The direct loss of bison through increased hunting is another threat to all of the local bison herds situated outside the Park. Trophy hunters tend to hunt bison from the Wentzel Lake herd from late winter to early spring, when the Caribou Mountains are easily accessible by skidoo. Since these bison are not protected at all, no hunting regulations apply and the hunters indiscriminately shoot bulls as well as pregnant cows (Malcolm Auger, personal communication 2001). The hunting of pregnant cows not only means the loss of an animal of an already small herd but it also negatively affects the calf recruitment rate through the loss of the foetus.

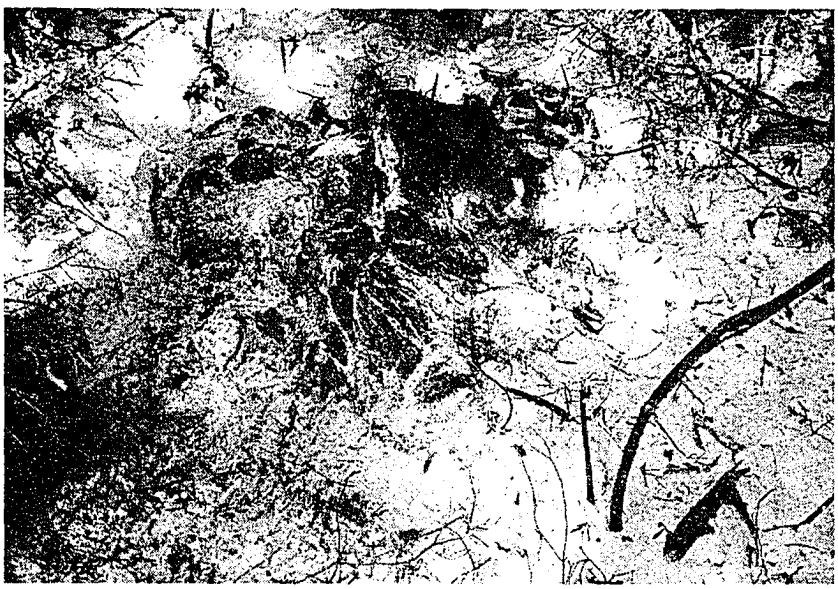

Photo 7.1: The remains of a pregnant bison cow hunted by trophy hunters in the Wentzel Lake region in early spring 2001. The hunters only took the head and the coat. Photo courtesy of Malcolm Auger.

In contrast to the bison situation, the participants did not readily identify hunting as a threat to woodland caribou populations in the Caribou Mountains. Although occasional hunting did occur in the past, most local subsistence hunters currently observe a voluntary hunting moratorium on woodland caribou. It also seems that trappers who needed fresh or dried meat tended to only hunt woodland caribou in small numbers.

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Moose is the only ungulate species of this study that is regularly hunted by local Cree hunters, and consequently it is of high importance in the local subsistence economy. Due to road access, moose along the right-of-way to Garden River can be hunted more easily than moose in other areas in the project region. Residents from Garden River and John D'Or Prairie regularly establish hunting camps in the region. Malcolm Auger[1] contended that moose numbers are low in the south-eastern Caribou Mountains because of human hunting pressure. Florence Nanooch[2] mentioned that moose are not so visible along the highways because of the increased hunting activity along highways:

> *People don't hunt like they used to. Go out in the bush and walk and do a lot of hunting. I still noticed when people go hunting down the river by boats they'll kill something. But, I guess, moose are out there in the bush, not on the highways all the time. Because a lot of times the people are hunting the highways now instead of doing the foot-move-you. They don't use that anymore. So, I'm pretty sure there's a lot of moose out there, still a lot of moose, if a person was to go hunting like that.*

As discussed in Chapter 5 (The Place of Ungulates and the Environment in the Local Cree Culture), the change in hunting strategies from tracking to 'crow hunting' is a concern to many Little Red River Cree residents.

Travel Corridors

Even though the Caribou Mountains are one of the remotest regions in Alberta, they are relatively easily accessible in winter through a vast grid of travel corridors (see Map 4.5, p. 81). Most of the travel corridors are seismic lines (also referred to as cutlines); others are mainly logging roads. According to the TEK experts, the travel corridors combined with other disturbances such as hunting, noise, and pollution have negative impacts on local animal populations. The combined impacts of the right-of-way to Garden River and hunting on the Wentzel Lake herd and local moose have already been discussed in the *hunting* subsection of this chapter. Daniel Loonskin describes the impact of the road as follows:

D: *We didn't [see them?] up there. The reason for that is once they have this road built the buffalo don't come anymore.*
T: *Oh, they don't cross the road.*
D: *No, as soon as they cross there is always somebody going after them. Chasing them back up. Now they don't come as often.*
T: *I heard also that they used to come to John D'Or.*
D: *Yeah, oh yeah.*

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[1] Interview in John D'Or Prairie, September 7, 1999.
[2] Interview in John D'Or Prairie, July 2, 1999.

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T: *But after the road, they didn't come?*

D: *After the people moved in, the road come in and they're gone, they don't come down. Even the caribou used to come down to John D'Or. You see an odd one there. But now they don't, you know. I never see any.*

As Mr. Loonskin mentioned, woodland caribou were occasionally seen near John D'Or Prairie before the right-of-way to Garden River was built. According to TEK experts, the construction of the road has been a main factor in limiting the caribou range to the south of the Caribou Mountains. Noise disturbance associated with roads, seismic lines and logging activities is believed to be mainly responsible for the avoidance of caribou of these areas.

Several TEK experts noted that animals like to use seismic lines as travel corridors. Charles Hemlin[3], for example, observed that in the past, when caribou and marten were still present on his trapline, they would travel along the cutlines. Alfred Seeseequon[4] noted that lynx, marten and foxes follow the trails. Bison use the trails on Malcolm Auger's[5] trapline.

Noise and Pollution

Environmental pollution is a big concern for many LRR Cree residents. Many participants regard wild meat as a healthy, uncontaminated food source. Consequently they are very concerned about pollution and contamination that occurs during industrial operations, or the use of herbicides in forestry and along roadsides. Many participants reported observations that noise and exhaust or gas smell drives animals away. Clifford Ribbonleg[6], for example, noticed:

In terms of wildlife, over the last say, maybe 15 years, in terms of wildlife, birds and stuff, it's been totally disrupted in our community. Very seldom you hear a bird in the evening like this. Used to be like when there hardly was any vehicles or any quads or anything like that, in the evening you would hear the robin pray... praying. Every morning first thing you would hear is the robin pray. And the robin just sits up there, up on a tree and just prays, every morning. But now, that's gone. You will see that in the bush. You go out of the community, about 10 miles out of the community; you'll see that. The reason these birds are not here any more is because of the smell of gas. They smell that gas and that's what drives them away. The noise; the smell and the noise of the power plant just drives them away. But you go 6 miles, 10 miles outside out in the bush you'll hear all that commotion that you used to hear in the old days with the birds.

Daniel Loonskin[7] observed:

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[3] Interview in North Tallcree, September 02, 1999.
[4] Interview in Fox Lake, August 25, 1999.
[5] Interview in the Caribou Mountains, June 22, 1999.
[6] Interview in Fox Lake, August 18, 1999.
[7] Interview in Fox Lake, August 24, 1999.

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Every time there is oil companies coming in there and you're trapping, and right away, seems like the animals just disappear right. They don't move, they probably stay in their dens, or whatever they do, I don't know. But they just more or less disappear.

Lorne Tallcree[8] noticed that marten do not stay wherever there are roads. He further observed the following:

On a fresh skidoo trail, that has just been driven, red voles die right on the spot. [Lorne noticed this twice!] *You see a dead mouse right on the trail.*
The smell from a skidoo trail will get [drive] moose right away from the trail. Moose will stay away from a fresh skidoo trail. Because of this, hunters change their clothes after a skidoo ride to get rid of the skidoo smell.

Malcolm Auger[9] also thinks that skidoo exhaust negatively impacts the environment. He believes that along his trapline skidoo exhaust causes plants to die. At a certain location it seems to particularly affect wild mint, in other areas the grass turns brown. Skidoos use a mixture of gasoline and oil; therefore Mr. Auger assumes that skidoo exhaust fumes are worse than ATV (All Terrain Vehicles) fumes, since ATVs use plain gasoline. Skidoos leave black marks on the snow. Mr. Auger links his observation that animals generally do not like to feed along skidoo trails to the environmental pollution caused by exhaust fumes. He believes that plants along the skidoo trail taste differently and that animals do not like their taste.

Isadore Laboucan[10] further voiced concern over the pollution of the water of the Peace River:

If you go to the river you don't dare drink the water. In fall and winter there are open areas where the water evaporates. The evaporation carries the bad stuff and dumps it somewhere else, where it pollutes the place.

Participants in the Northern River Basins Study also voiced concerns over pollution. In the overall summary of survey data of the report by Bill et al. (1996, CD-ROM), the statistics showed that pollution was a major issue for Northern Alberta aboriginal residents:

Pollution, either in general (38%) or specifically water pollution (49%) was the major way that industry had affected respondents' health. Respondents also cited concerns of: an increase in illnesses and sickness (8%); and, respondents could no longer get food from the land or that the food supply had changed in a negative way (8%).

[8] Interview in John D'Or Prairie, September 08, 1999.
[9] Interview in the Caribou Mountains, June 22, 1999.
[10] Interview in Fox Lake, August 17, 1999, translation by Leslie Jo Laboucan.

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Forestry[11]

The effects of forestry activities on ungulates as observed by TEK experts were homogeneous. As will be described in more detail below, participants found that animals generally would leave an area for the time that logging occurred. After the logging was over, different ungulates responded differently to the new environment. As outlined in the previous chapter, woodland caribou respond negatively to the changes. They avoid cutblocks and lose large parts of their late winter/early spring habitat since arboreal lichen disappears with the old growth spruce trees. If scarification is minimal, however, logging has less of an impact on terrestrial lichen than fire. Moose, in contrast, benefited from the changes. They are frequently encountered in cutblocks, especially during late fall and winter, where they feed on early succession shrubs like willows. Indirectly, however, moose numbers in logged areas might actually decline because of their predictability for hunters and the easy vehicle access. Occasionally, bison of the Wentzel Lake and South-Western Park herds are also observed foraging in cutblocks during winter. In contrast to moose, however, human hunting pressure generally leads bison to abandon an area that might otherwise be attractive as a foraging habitat.

Photo 7.2: Malcolm Auger in a dry beaver pond on his trapline. The area used to be covered by spruce trees before logging turned it into an aspen habitat.

[11] Includes passages taken from Schramm (2002, p. 28-29).

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Logging has long affected the traditional lands of the LRR Cree. Participants, especially the trappers, contributed many observations in regard to forestry impacts. Many participants observed negative long-term impacts of logging on their traplines. Malcolm Auger[12], for example, observed that beaver moved in after spruce trees had been logged close to small creeks south-east of the Caribou Mountains. The beaver activities lead to flooding of the area. At the time of the interview, the beaver pond had dried up. In a period of approximately 12 years, this particular piece of land underwent four radical transitions: from *old growth spruce habitat* to *aspen-willow succession* to *beaver pond* to *dry beaver pond.* Mr. Auger thinks that the environmental changes would not have been so radical if the forestry company had left the spruce trees standing along the creek. The protection of riparian areas is a forestry practice requirement today, but was not practiced in the past.

Lorne Tallcree[13] also made an observation in regard to logging and beaver invasion. Before the logging started in the Caribou Mountains, the creeks in the affected areas used to be small (approximately 50 cm wide). After the logging, beaver established dams and the creeks became much wider. He thinks the logging and dams changed the local water tables. Paul Tallcree[14], who holds a trapline in Wood Buffalo National Park, also relates changes in water table to clear-cut logging. He noticed that the sloughs dried up in the areas where logging had occurred. There were no trees to hold the water, and no shade. This affected waterfowl (ducks and geese), as well as muskrats, which have declined in numbers since the sloughs dried up. The sloughs are an important summer habitat for muskrats since they raise their young there and feed on cattail during this season. Like Malcolm Auger, Paul Tallcree also thinks that the logging effects would not have been so severe if the companies had left the trees along the lakes and creeks. In the Northern Rivers Basin Study many First Nation participants relate the changes in water table in Wood Buffalo National Park to the effects caused by the Bennett Dam (Bill et al. 1996). This view is also shared by Metis elder Frank Ladouceur (1990). As mentioned earlier, former Little Red River Cree consultant Vern Neil also believes that the Bennett Dam affected water tables in the project region and led to a decrease in prairies and an increase in shrubs. In my interviews, the impacts of the Bennett Dam were not discussed. The overall increase in aspen-willow succession habitat (both from logging, beaver activity, and water table disturbance) benefits moose, and to a certain degree bison.

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[12] Interview in the Caribou Mountains, May 6, 1999.
[13] Interview in John D'Or Prairie, September 8, 1999.
[14] Interview in Garden River, August 7, 1999.

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Many participants shared the view that logging destroys habitat for animals. TEK experts generally emphasized that logging destroyed food and shelter habitat for squirrels, and caused lynx and marten to leave the area. All three furbearer species used to be important in the trapping economy and therefore were of special concern to local trappers. Elder Angela Laboucan[15], for example, voiced her opinion on logging and its impacts on animals as followed:

> *The animals starve. The squirrels – even the moose. Their home has been taken away. The squirrel, it's food is up there in the spruce. When it is cut down, everything is gone. Even all the plants are gone. Squirrels have their dens. When logging companies move in they destroy their home. Nothing is left. People depend on squirrel for their livelihood. They trapped it and had it for food and to feed the dogs. Now the animals are being destroyed for no reason. Long time ago they used to respect this animal for dog food. People used wildlife for the dogs.*
> *If a logging company goes by it is very difficult to bring back life to that place because everything is destroyed. Because of man made errors. It is difficult for people to go back to the land because it has been destroyed the way it was.*

To Paul Tallcree[16], proposed logging activity just west of the south-western corner of Wood Buffalo National Park are of special concern. There, small islands of spruce habitat are marked for logging. Mr. Tallcree is worried for the wildlife, which would lose its shelter habitat. Since the proposed sites are isolated spruce bluffs, the animals would not have alternative shelter habitats.

As pointed out, participants think that logging activities cause wildlife to leave the region – partly because of noise and human activity, and partly because of loss of habitat. John Laboucan [17]observed that logging therefore also impacted local subsistence hunting. Substantial logging occurred south of the Peace River near Fox Lake. He believes that the activity scared the wildlife away and consequently forced local residents to travel further away from the community and hunt in muskeg country, in which it is difficult to travel.

In addition to the environmental impacts that logging has on wildlife, participants brought up a variety of issues on how logging and forestry management impacts their use of the forest and their activities on the land. When clear-cut logging occurred in the south-western part of Wood Buffalo National Park, for example, one participant[18] noticed that the logging company (CanFor) left behind considerable amounts of cut timber on the ice. When the ice melted, the trees jammed up the local creek, from its source lake all the way down to the Peace River. Before the logging

[15] Interview in Fox Lake, August 17, 1999. Translation by Leslie Jo Laboucan.
[16] Interview in Garden River, August 7, 1999.
[17] Interview in Fox Lake, August 18, 1999.
[18] Interview # 26.

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occurred, the trapper was able to travel the length of the creek by canoe. Today, half of the creek is blocked. He believes that the Park seems uninterested in cleaning up the effects of logging in this previously navigable creek.

Of particular concern to many participants was the negative effect of logging on medicinal plants. Medicinal plants are gathered in undisturbed places, away from people and trails/roads.[19] If disturbed or destroyed through human disturbance the site will be permanently lost to the person who uses the plants. Some plants are very difficult to find and loss of a plant site is a deep personal loss for the individual user.

Many participants believe that tree planting is a good attempt to limit the damage caused by logging. Most insist though, that the habitat will never be the same as it was before logging commenced. They also believe that planted trees are potentially weak and vulnerable to disturbance (e.g., tornadoes), whereas naturally regenerating trees placed in the landscape by the Creator are considered to be strong and long lasting.

Also of concern was the introduction of management regulations that affect traditional activities on the land. For thousands of years, native hunters have used campfires to dry meat, prepare food, and warm themselves. Fire bans, which are introduced to protect valuable timber resources from wildfires, also apply to aboriginal hunters. Fred Tallcree[20] complains:

> *Now we can't even go in the bush, make fire, smudge – we get into trouble. Forestry people come. We were told not to go in the bush and to make fire.*

National Park protection regulations likewise affect traditional activities. One participant[21] describes a case, where a Native hunter ended up paying a fee for engaging in a traditional Cree camp activity:

> ***X.X.:*** *There was a man going to a meeting in Fort Smith. He camped in a campsite. We normally cut a tree down, a willow to put our pot over the fire, you know. You cut a tree down, just a little poplar. Just to put his teakettle on there. 50-dollar fine he paid. It's something, you know, he does all his life. It was out there, he cuts down a tree and put his pot over the fire, hangs it, you know? Just a normal thing for him.*
>
> ***T. S.:*** *Was that in the Park?*
>
> ***X.X.:*** *Yeah. It was in the Park. And he paid a 50-dollar fine for that. He say: "Come on, I didn't know about it, you know. That's my life, you know."*

---

[19] Research results on local medicinal plants, including a regional vegetation inventory for parts of the Caribou Mountains are expected from Department of Biology M.Sc. student Leslie Monteleone at the University of Alberta.

[20] Interview in Fox Lake, August 25, 1999. Translated by Fern D'Or.

[21] Interview # 13.

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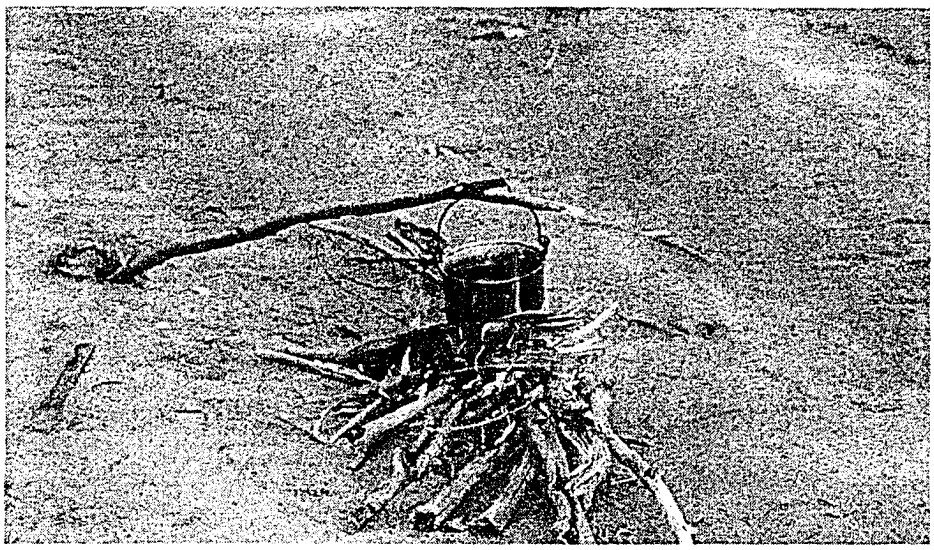

Photo 7.3: A campfire is part of every traditional Woodland Cree hunting camp

The double standard of the National Park, which allowed for large scale clear-cut logging by an outside industrial company on the one side, and, on the other side, fines a native resident for cutting down a willow for a campfire, must seem particularly unjust to local Aboriginal residents.

Ungulates and Natural Disturbances

Natural disturbance, especially through fire and flooding is an important factor in the cycle of environmental changes in northern Alberta. Lewis (1982) documented the importance of aboriginal burning practices for the maintenance of prairies in Alberta's North. With the introduction of fire suppression policies, fire bans, and fees, native northern residents stopped the practice of prescribed burning. In my interviews, participants did not refer to prescribed burning; instead, the elders participating in my study were generally all trained as fire fighters. The suppression of aboriginal burning is starting to alter the landscape. Due to the long-term fuel build-up large summer fires now tend to have severe destructive impacts. Elders were aware that different fire intensities had differing modifying impacts.

Ungulates respond differently to fire and its habitat modifications. As in the case of logging impacts, moose tend to benefit from the habitat changes brought on by fire. As previously

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mentioned, moose tend to feed on early successional shrubs and therefore are attracted to a burn site relatively shortly after a fire. An intense fire in spruce habitat can turn this previously unattractive habitat for moose into a favourable habitat due to the growth of deciduous shrubs. Bison can benefit from low intensity fires (especially when they are spring fires) in prairie patches because it encourages the growth of fresh grass. It is quite likely that until recently, local residents maintained the large prairies near John D'Or Prairie as horse pastures through prescribed spring burns. Participants mentioned that these prairies used to also be frequented by bison.

Caribou will leave an area affected by a fire. They return to the area the year after to see if some of the caribou lichen patches survived. In case of severe fire, caribou lichen habitat is lost for decades, because the fire destroys the roots of lichen and because of their extreme slow growth. Malcolm Auger further suggests that the thick ash layer that covers lichen after a severe fire might also negatively impact on its growth. The successional plants are mosses that are of little value to caribou. In the Caribou Mountains, the large fire of 1995 severely affected large parts of the caribou spring range in the white spruce zone.

Elders reported that some animals that follow early plant succession created by fire might be more plentiful relatively shortly (1-3 years) after the event. Mice and hares, for example, will return shortly after a fire and feed on the fresh grass and leaves. The presence of mice further attracts marten into the region. Fire can be favourable for beaver, especially when previous spruce habitat becomes dominated by aspen-willow succession.

Flooding is a natural disturbance that further affects the boreal north. The topic of beaver activity and flooding of traplines and roads was discussed frequently. The effects of this disturbance can be beneficial to all three ungulate species. Moose like to forage on the willow shrubs that tend to grow along beaver ponds. In summer, they also feed on aquatic plants in the ponds and find relief from biting insects. Both moose and caribou use ponds and lakes as escape routes during wolf attacks. Bison frequent beaver ponds after freeze-up to feed on sedges and graminoids. Due to the low prices for beaver pelts, local trappers have not been as active in trapping beaver than before the crash of the fur economy in the late 1970s/early 1980s. Consequently, beaver activities have increased in the project region.

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It is interesting to note that two participants considered wind-related disturbance as a human-caused disturbance. As described in *The Story of the Little Tree* (Chapter 5, p. 84), Clifford Ribbonleg's grandfather believed that planted trees are not as strong in withstanding storms and tornadoes as naturally growing trees are. His spiritual interpretation is that the naturally growing trees are strong because the Creator put them there. Florence Nanooch thinks that loss of forests and the occurrence of tornadoes are related:

> *And I think that a lot of times tornadoes are so big in the south because there is so much opening. There's not enough trees. Like... the same thing will happen here too in the communities. In Canada there will be tornadoes and stuff like that in the future if there is not enough trees around. 'Cause I guess now the wind can just go anywhere. There is no [...] [nothing] to stop them. That's how I look at it, I don't know if that's still the way it works.*

Conclusions

This chapter presented the results for knowledge contributed by TEK experts on the effects of human and natural disturbances on ungulates. Hunting, travel corridors, noise, pollution and logging were identified to affect ungulates and their habitat in different ways. Elders also identified natural disturbances such as fire, flooding, and wind as habitat-altering. The outlined human and natural disturbances vary in their impact on critical ungulate habitat. Specific disturbances can have positive effects on one species and negative ones on others (e.g., fire and logging can be positive for moose but negative for caribou). The resulting environmental planning and management strategies therefore need to be different for each ungulate species.

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8 DISCUSSION

The primary purpose of this study was the documentation of Woodland Cree traditional environmental knowledge (TEK) of critical ungulate habitat in the Caribou Mountains region of northern Alberta. It included the documentation of seasonal patterns of habitat use, and local distribution and movement of woodland caribou, wood bison, and moose. To better understand the dimensions of this knowledge contribution, I have reviewed literature on history, economy, wildlife management and ecology of Alberta's North, provided an overview on the traditional environmental knowledge debate, Cree cultural concepts of TEK and environmental relationships, as well as relevant bio-scientific publications of critical habitat research for woodland caribou, wood bison, and moose. The study further discusses the impacts of human and natural disturbances on ungulates and their habitat and examines a variety of regional natural resource conflicts involving hoofed mammals and their environment.

The study acknowledged TEK as a knowledge system in its own right, which required an open approach for the development of the methodology for its documentation. The aim was to document knowledge of ungulates and their habitats that TEK experts considered important. This was achieved by developing the research agenda with representatives from the Little Red River Cree Nation and consulting the participants on how they preferred their knowledge to be documented. The gathered interviews were analyzed with the help of the qualitative data management program QSR*NUDIST.[1] Map data provided by TEK experts was digitized and transferred into the geographic information system (GIS) ArcInfo and analyzed in ArcView with the help of relevant forest inventory data. Graphic products of this analysis process were the creation of habitat maps and cycle diagrams for moose, caribou and bison.

In this study, the TEK results for woodland caribou and wood bison were particularly exciting. Observations of seasonal woodland caribou migrations raise questions about the current taxonomic classification of the Caribou Mountain caribou. The accounts of a single encounter of a very large herd of woodland caribou in the Caribou Mountains and the past existence of large caribou in the Birch Mountain region could inspire a variety of new research questions in the field of wildlife research. The TEK expert descriptions of behavioural, morphological and habitat selection differences between the local bison herds call for urgent protective measures and

[1] The sorting of interview passages into theme groups and the search option of the program allowed for an efficient analysis of the original data.

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challenge some of the assumptions in the political debate about bison eradication. The results for the moose component showed that different knowledge systems (TEK and science) are able to independently reach similar conclusions. In the following sections I will provide discussions of the results of the TEK and ungulate component, as well as ongoing natural resource conflicts. Further, the relevance of the incorporation of TEK in environmental management will be discussed. The chapter closes with a recommendation section on important environmental and cultural management considerations.

This dissertation treats TEK as a knowledge system in its own right. TEK and science are influenced by the religions, philosophies, and worldviews of the cultures that formed them. Both knowledge systems are legitimate sources of knowledge but one is not necessarily superior to the other. In the context of integrating TEK and science, I previously discussed how science-filtered TEK studies can contribute to Aboriginal disempowerment. Based on this background I have generally tried to be very cautious when it came to comparisons between results from bio-scientific studies and results from my TEK study. I believe that the comparison of my TEK results to scientific results is necessary to identify similarities, differences, and knowledge gaps. However, I have avoided comparisons of my TEK results to bio-scientific results for the purpose of testing the accuracy of Traditional Environmental Knowledge. I believe that an approach like this assumes that the scientific way of knowledge generation is superior to other approaches, which ultimately would support a 'takeover' of TEK by science. Instead, I prefer to keep the results of both knowledge systems separated on the research level. In an adaptive management process, however, the goal should be to integrate both knowledge systems as two complementary bodies of knowledge. The direct integration of TEK and Aboriginal natural resource management systems in adaptive management programs can contribute to Aboriginal empowerment and culturally more appropriate management approaches.

Discussion of TEK of Critical Ungulate Habitat

It soon became evident that the results of my moose component were very similar to results from the reviewed literature on moose and critical habitat. This can be partly explained by some similarities in methods used by Native hunters and biologists. Since the moose is the most important ungulate species in the local subsistence economy, local hunters need to have detailed knowledge about moose behaviour and habitat selection in order to be successful. Information

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and observations about moose are accumulated directly with focus on the species (during tracking at moose hunts) and indirectly during all other activities on the land (e.g., trapping, fire fighting, tree planting, commuting by vehicle or boat). Apart from radio or satellite-collar data collection, many biologists use tracking and direct observation as methods in ungulate research. In the case of moose, scientists and Native hunters have the common goal to study the moose, but for different reasons. In the case of caribou and bison, the traditional environmental knowledge accumulation process differs for Native hunters. Since most local hunters do not actively[2] hunt for bison and caribou, observations on these two ungulate species are mainly accumulated through activities on the land and expanded by information provided by older generations who used to live on the land year round or during the trapping season. Also, in the boreal forest everyone can make observations on solitary moose at any time, whereas observations on the two herd species, caribou and bison, tend to be made primarily by trappers who hold traplines in the herd ranges and who spend much time on the land. Most trappers are not on their traplines for the specific purpose of tracking bison or caribou, therefore their observations tend to come from chance encounters. Consequently, traditional environmental knowledge on moose seems to be collected somewhat more systematically than TEK on bison and caribou. The issues of interest inferred from TEK are therefore also different. Whereas TEK experts provided detailed information on general moose behaviour and habitat, which was generally free of unusual observations, they tended to include more information on atypical events or unusual observations for the two herd species. These atypical events (e.g., the sighting of a very large herd of woodland caribou in the Caribou Mountains) and unusual observations (e.g., the Mikkwa herd looks and behaves very different from the other two bison herds) have become of particular interest to me since almost no matching scientific data exists on these events and observations. The following discussion of key findings of TEK of ungulates and their critical habitat reflects the diversity of information provided for the different species. The discussion thereby particularly focuses on new and unusual insights, which leads to more intensive discussions on caribou and bison topics than on moose topics.

Caribou

Throughout most of the year, the Caribou Mountain caribou stay around the lakes of the plateau with the exception of early spring when they migrate into the white spruce zone of the southern

[2] *Actively* refers to a hunt with the particular aim to shoot a bison or caribou; in contrast to a chance encounter where a hunter might opportunistically decide to kill a bison or caribou.

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rim to avoid the packed ice conditions of the plateau and to feed on arboreal lichen.[3] This white spruce zone also contains the most valuable timber resources of the region and much of the proposed logging is slated for this area. Together with the impact of the 1995 fire on the south-western rim of the Caribou Mountains, only a small patch of the old growth white spruce zone around Foggy Tower still remains intact and connected to the plateau (see Map 4.4, p. 71). It is likely that the loss of this habitat will have negative effects on local woodland caribou populations since it deprives the caribou of a vital food source (arboreal lichen) during a particularly critical time of the year (at the end of the winter before the snow melts and terrestrial lichen become accessible, and before new plant growth occurs). The loss of this habitat not only means that caribou lose access to a vital food source but it also means that they need to spend more energy foraging and travelling during unfavourable conditions on the plateau. Pregnant cows and calves would be particularly vulnerable, which could lead to lower birth weights and body weights for calves, thereby negatively affecting the calf recruitment rate.

The TEK experts observed seasonal migrations of resident woodland caribou from their fall and winter habitat on the plateau to their late winter/early spring habitat on the southern rim of the Caribou Mountains. To the scientific community, seasonal migrations like the above are characteristic for the mountain caribou ecotype rather than the woodland caribou ecotype (Dzus 2001). This observation raises the question whether the caribou in the Caribou Mountains should be regarded as mountain ecotype rather than the woodland ecotype. McLoughlin et al.'s (2004) genetic diversity study supports a geographic link also proposed by TEK experts in that it shows a closer genetic link between the Caribou Mountain caribou and BC mountain caribou than between Caribou Mountain caribou and woodland caribou from the Red Earth herd. Unlike the mountain caribou of western Alberta, however, the Caribou Mountain caribou do not have different summer and winter ranges, but only migrate in late winter and late spring.

Another interesting observation is the occasional migration of non-resident caribou into the Caribou Mountains. TEK experts (Charles Hemlin, John Dumas, Daniel Loonskin) mentioned past and present observations of 'small caribou' (i.e. barren ground caribou) in the northern and western part of the Caribou Mountains. Since it is well established that barren ground caribou from the Beverly and Qamanirjuaq herds occasionally migrate through Wood Buffalo National Park, it is likely that the observed 'small caribou' belong to this herd. In the 1960s, Henry Hemlin

[3] Szkorupa (2002) also found a connection between snow conditions and mountain caribou utilization of tree lichen.

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observed a very large herd of woodland caribou, which, according to past observations might have migrated into the region from British Columbia. As previously mentioned, the findings of McLoughlin et al. (2004) on the genetic diversity of woodland caribou in six ranges in northern Alberta support that woodland caribou in the Caribou Mountains are much closer related to caribou in north-eastern British Columbia than to caribou from the Red Earth region. One of the questions that arises from these observations is whether the occasional migration of large numbers[4] of non-resident caribou into the Caribou Mountains could negatively affect the quality of the critical habitat for the resident woodland caribou. Since lichen, the main food source of caribou, is very slow growing, large non-resident herds might potentially deplete this critical resource for the resident woodland caribou. Morneau and Payette's (2000) approach to determining fluctuations in caribou populations by examining debarking lesions (trampling scars) could provide an interesting approach for future research in this area.

In the Caribou Mountains, the wood bison of the Wentzel Lake herd are additional competitors for the slow growing lichen resources. However, the bison rarely migrate west into the woodland caribou range, likewise the woodland caribou rarely migrate east into the bison range, although suitable food resources exist for both ungulate species in both ranges. The avoidance of the bison range by caribou could be explained through the avoidance of potential encounters with wolves that are associated with the bison herds. It could also be that lichen resources in the bison range are not as plentiful since bison, which are forced to stay in the more remote lichen habitats due to increased hunting pressure, already heavily utilize them. An explanation for the avoidance of the caribou range by bison, however, is still lacking. When I discussed the issue with Malcolm Auger[5] he replied, "They don't bother each other". I asked Mr. Auger if the two species communicate, and he replied that they did. This is an aboriginal explanation of the phenomenon where an agreement exists between both ungulate species to stay out of each other's ranges. The aboriginal concept of ungulate co-existence and direct communication between the species is different from the mainstream bio-scientific concept, which assumes competition between ungulate species that utilize the same food sources. [6] Other works (e.g., Fienup-Riordan 1990,

[4] E.g., a herd of 1000 woodland caribou (Henry Hemlin, Interview at North Tallcree, September 9, 1999), and observations of herd sizes between 20 and 30 animals (Malcolm Auger, Personal communication June 2002).
[5] Malcolm Auger, personal communication February 2002.
[6] Inspired by TEK, Pierotti and Wildcat (2000) also briefly discuss the concept of cooperation between potential competitors. They draw from their own research on foraging cooperation between marine mammals and marine birds (Pierotti 1988a, 1988b) and Minta et al.'s (1992) research on hunting associations of badgers and coyotes.

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Brightman 1993) in the circumpolar and boreal North have documented Aboriginal cultures, where animals possess souls and are able to communicate mainly in the spirit world amongst each other and with humans. In the case of the caribou and bison ranges, Native interpretation of the phenomenon suggests cooperation between ungulate species rather than competition.

The reference to the past existence of *large caribou* in the Birch Mountain region of the project area is an example of the strength of TEK in that knowledge of previous generations is included in the contemporary knowledge pool. Although it was not possible for me to get more details on the issue (e.g., last encounter, first-hand observation), the fact that Deh Cho elders are speaking of similar caribou in the Horn Plateau region near Great Slave Lake, NWT points towards the potential existence (or recent extinction) of a scientifically unknown ecotype or subspecies of caribou. The fact that elders at the workshop at Fox Lake[7] pointed out that people had encountered the same type of caribou in the Slave Lake region points towards a verbal exchange on the issue between Dene and Cree.[8] The observation of large caribou raises a number of questions about the fate of the herd and specifics about its habitat requirements.

Finally, I want to finish the subsection on caribou with a short discussion of an interesting related finding. On the subject of barren ground caribou, participants introduced the topic of the *small wolves*. These wolves follow the barren ground caribou herds and are noticeably smaller than the resident timber wolves (*Canis lupus*). Henry Moberly described them to be the size of dogs, with a larger colour variation (white, grey, back, and red-brownish) than the timber wolf (which is mainly grey or black in the region). They are known to have larger pack sizes than the resident wolves and are also described to be more aggressive. The observation of small wolves in Northern Alberta raises the question if the wolves following the Beverly and Qamanirjuaq herds are different from the Alberta timber wolves. One possible explanation could be that eastern Canadian wolves (*Canis lupus lycaon*) are following the caribou herds. The eastern Canadian wolf, which is genetically more closely related to the red wolf (*Canis rufus*) and the coyote (*Canis latrans*) than to the timber wolf (Wilson et al. 2000), is smaller in size than the timber wolf and has a larger colour variation. Its range is known to expand as far west as Manitoba.

[7] Workshop at Fox Lake August 2, 2001.
[8] Anne Gunn (wildlife biologist, Department of Resources, Wildlife and Economic Development, Yellowknife, Northwest Territories) is conducting research on the large caribou of the Horn Plateau region.

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Bison

Much controversy and politics are involved in the management of the bison in and around Wood Buffalo National Park. Although federal interests in wood bison protection led to the establishment of the Park, agricultural expansion and the protection of neighbouring re-introduced disease free wood bison herds dominate decision-making at this point in time (see literature review on wood bison in Chapter 6). The influence of these lobbies is obscured by the fact that scientific research is approached from the perspective of these lobbies (e.g., APFRAN's 1999 disease risk assessment). McCormack (1992, p. 367) pointed out that although Parks Canada presented management strategies as biologically based, they were actually "conditioned by external political and economic considerations".

The residents of the three Little Red River Cree communities are often caught in the middle of decision-making power struggles and tend to be careful in voicing their opinions on controversial issues.[9] Apart from providing critical habitat information for three bison herds, people expressed considerable concern about non-resident trophy hunters, the decline in bison numbers (particularly in the Wentzel and Mikkwa herds), bison diseases, and the proposed bison eradication program.

In this study, the most interesting research result on bison habitat is that habitat preferences seem to be different for all three herds and cannot be generalized. Also, there is no common pattern in the formation of winter and summer herd sizes. Combined with the observed morphological differences between animals of the three herds, the results of this study can inspire a large variety of future research topics. The Little Red River Cree TEK experts link morphological differences to habitat preferences. According to their observations, the Wentzel Lake herd (bison with wood bison morphology in boreal habitat) is at one end of the scale and the Mikkwa herd (bison with plains bison morphology in prairie habitat) is at the other end. The South-Western Parks herd is somewhere in the middle, displaying more of a wood bison morphology but also interacting with the Mikkwa herd. The observed morphological differences between the Mikkwa herd and the Wentzel Lake herd raises a number of questions. Geographically, the Mikkwa herd is among the herds furthest away from the original plains bison release site at Hay Camp within Wood Buffalo National Park, nevertheless, it seems to be the herd with the strongest plains bison characteristics

[9] For more on the nature of political decision-making in First Nations and the politics over power in natural resource management see subchapter *Ongoing Natural Resource Conflicts* p. 182.

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in the whole region. It seems unlikely that this herd can be directly linked to the release of introduced plains bison because the other herds that are closer to the release site all show dominance of wood bison characteristics. Elders at the workshop in Fox Lake stated that the Mikkwa herd has always been in its current location and that exchange of animals between the Mikkwa and South-Western Parks herd is a regular occurrence. Currently, very little is known about this herd. The TEK experts' observations could potentially lend support to Valerius Geist's (1991) theory that wood and plains bison are actually ecotypes.

In the past, the area between the Wabasca and Mikkwa Rivers used to be dominated by sedge meadows and/or prairie (the term used by participants). As previously mentioned (Chapter 4, p. 70), North Tallcree elder Tibeyimisuw (Jimmy Meneen) remembered 'the land between the Wabasca Lakes and his North Tall Cree Reserve when it "used to look like prairie – there were no trees" ' (Meili 1991, p. 59). In a comparison of recent and older aerial photographs of the region, Vern Neil also noticed a 40-60% loss of herbaceous habitat to willow succession, which he attributes to changes in the local water table, caused by the construction of the Bennett Dam.[10] These environmental changes could also possibly be linked to the absence of prescribed burns, which were practiced in the North until the middle of last century (Lewis 1982) and the absence of bison on most of the prairie patches outside of Wood Buffalo National Park.[11] Applying Geist's theory would mean that the Mikkwa herd displays plains bison morphology because it stays in prairie habitat and the Wentzel Lake herd displays wood bison morphology because it stays in a boreal habitat.

The observation of plains bison characteristics in the Mikkwa herd could also raise the question whether this herd might be a remnant plains bison herd that so far has been overlooked. This hypothesis is particularly interesting in the light of historic accounts from the region that state that bison between the lower Peace River and the Nyarling River were divided into two distinct herds, the northern being wood bison and the southern being plains bison (Soper 1941, p. 358, see quote on page 123, Chapter 6). If the Peace River/Wood Buffalo National Park region indeed was a transition zone between wood and plains bison, hybridization between the two bison types occurred naturally long before the Wainwright plains bison were released in the Park. In the biological debate about "pure" or "hybrid" wood bison this would mean that hybridization was a

[10] Vern Neil, Little Red River Cree environmental consultant, personal communication, May 2002.
[11] Cid et al. (1991) documented vegetation changes in a mixed-grass prairie site after the removal of bison; and Knapp et al. (1999, p. 39) found that bison grazing and fire conserved and restored the biotic integrity of tallgrass prairie.

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natural factor and that the protection of so called "pure" wood bison in favour of "worthless hybrids" is an artificial construct.

As much as the Mikkwa herd prefers prairies, the Wentzel Lake herd prefers woodland habitats. Daniel Loonskin's[12] remark that the Wentzel Lake bison are like moose because they stay in poplar stands, feed on willows, and are 'wild' due to their secluded range and lack of interaction with herds that have plains bison characteristics (for quote see Chapter 6, p. 128) also matches historical sources of early explorers. In 1810, Alexander Henry the younger wrote in his journal that the wood bison are "more shy and wild than those of the plains;" (Roe 1970, p. 44). In the same year he described the bison near Rocky Mountain House (Roe 1970, p. 45):

> These are of the strong wood kind, and as wild as moose; they never resort to the plains but delight in the mountain valleys, where they feed on the short grass which seems to be of an excellent quality, as horses soon get fat on it [...].

In 1856, a guide informed James Hector from the Palliser Expedition about some wood bison he had observed (Roe 1970, p. 46):

> They were of the thickwood variety, which are larger and blacker, and with more spreading horns, than those of the prairies. They run swiftly through the woods, and are quite as wary and difficult to hunt as the moose deer.

It is interesting to note that the early explorers, who encountered both plains bison and wood bison chose the same terminology as the Little Red River Cree TEK experts to describe the differences in habitat choice and behaviour of both types of bison.

In regard to the habitat selection of the Wentzel Lake herd, a number of interesting results occurred. In the past the range of this herd was much larger and included the prairies to the south of the Caribou Mountains near John D'Or Prairie (see map 6.3. p. 140). The building of roads and settlements led to increasing hunting pressure, which climaxed with the influx of outside trophy hunters. In response, the herd retreated into the south-eastern Caribou Mountains. The herd displays seasonal differences in habitat use and food preferences, which TEK experts often linked to weather and travelling conditions. Generally, the bison of the Wentzel River herd tend to stay on high ground during the summer, where they can travel easily without sinking in. They frequently visit prairie patches, meadows and cutblocks to feed on green graminoids. In addition, they also browse on young willow leaves. In winter, the Wentzel Lake herd stays around small lakes, dry creeks, and old beaver dams because of the abundance of dry grassy forage in these

[12] Interview in Fox Lake, August 24, 1999.

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areas. They also feed along river cutbacks because forage is more accessible along the edges. During parts of the winter, the bison tend to stay in lichen habitat, because foraging and movement is easier. The TEK experts' observation of lichen foraging in winter due to easier accessibility than other foods differ from Larter and Gates' (1991) observations at the Mackenzie Bison Sanctuary where bison forage on lichen during late summer and early fall. Larter and Gates relate their observations to the nutritional value of lichen, which is easily digested. Like the Mackenzie Bison Sanctuary bison, the Wentzel Lake bison also benefit from the nutritional value and the good digestibility of lichen. The TEK experts' observation and rationalization, however, provides a good hypothesis why the Wentzel Lake herd forages on lichen in winter rather than in summer or early fall.

It is possible that in the past the selection of different summer and winter habitats by the Wentzel Lake herd might have been more pronounced. The bison then had undisturbed access to the large prairies near John D'Or Prairie and near the Lawrence River, where in spring nutritious green grass grows much earlier[13] than in the Caribou Mountains. The impacts of human disturbance on bison through hunting and travelling have already been discussed in more detail in Chapter 7.

The migration of animals between different herds is an important subject in light of the local cattle disease issue. TEK experts stated that migration occurs between animals of the Wentzel Lake and Garden River herds and between the South-Western Parks and Mikkwa herds. None of the TEK experts mentioned that animals of the Mikkwa and South-Western Parks herds cross the Peace River from south to north. However, map data for wood bison herds in Alberta (e.g., Mitchell and Gates 2002) group the animals north and south of the Peace River in the western part of Wood Buffalo National Park into one herd, which they refer to as Garden River herd[14]. It is likely that some north or south migration can occur, particularly in winter, when the Peace River is frozen. One TEK expert mentioned that bison from the Wentzel Lake herd occasionally used to come as far south as the Peace River. Gates et al. (2001a) also documented a bison sighting near Beaver Ranch on the north side of the Peace River. This sighting indicates that either occasional northward migration of Mikkwa bison occurs or that bison from the Wentzel Lake herd occasionally migrate south-west of their normal range. Due to the presence of cattle ranches in the south-eastern parts of the Caribou Mountains (near Beaver Ranch), the presence of

[13] Combined with the practice of prescribed burns (documented in the past by Lewis, 1982, for the prairies near John D'Or Prairie but rarely practiced in the region today) green graminoids used to be plentiful even earlier in the spring season.
[14] See Chapter 6, page 126, footnote 43.

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the Wentzel Lake herd and its unproven risk as a potential carrier of cattle diseases creates concern amongst local ranchers. TEK experts did not mention any regular westward migration of the Wentzel Lake herd bison. Two brothers[15] used to operate a trapline in the south-central Caribou Mountains and trapped there for 50 years. During this time, only one of the brothers once tracked a group of four bison on this trapline. Since migrating bison from the Wentzel Lake herd would have likely crossed their trapline, this observation is a good indication that westward migration of Wentzel Lake bison is extremely rare. The observation of the two brothers is in strong contrast to a risk assessment developed by the Animal, Plant and Food Risk Analysis Network (APFRAN 1999). This mathematical model, which calculates probabilities of contact between cattle and potentially diseased bison (based on statistical numbers from 1998) assesses that there is a 95% probability that every 2.7 years bison from Wood Buffalo National Park and area encounter neighbouring cattle of the Fort Vermilion/La Crete region. This solely mathematical model fails to take geographic features, habitat preferences, and hunting pressure into consideration. Its results, however, reflect the fears of local ranchers and lobbyists who support the bison eradication program and readily quote the study. Gates et al. (2001a) published a report on bison migration and distribution in northern Alberta, which includes a bison movement corridor model. The model is primarily based on a greenness map (derived from a phytomass or Leaf Area Index from Landsat data), topographic data, and distance to water. The prediction of the model in regard to movement corridors for the Mikkwa and south-western Parks herds correspond with observations TEK experts contributed to my study. The results of my study, however, do not support Gates et al.'s prediction that bison outside of WBNP and north of the Peace River are highly likely to move through the settlement of John D'Or Prairie. The calculations for Gates et al.'s bison movement corridors are based on the density of least-resistant pathways and do not consider bison avoidance of human hunting and human settlements. TEK experts participating in this study, however, emphasized that human hunting pressure was the most important factor in limiting the range of the Wentzel Lake herd, and that animals from this herd avoid roads and settlements.

So far, there has been no scientific field research done on either the Wentzel Lake herd nor the Mikkwa herd, primarily because both herds are located outside Wood Buffalo National Park and therefore do not fall within the management and research responsibilities of Parks Canada. However, the observations of the TEK experts raise many research questions and the decline in

[15] Charles and Henry Hemlin, Interviews in North Tallcree, September 02, 1999, translated by Celestan Nanooch.

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numbers of animals in both herds (due to their non-protected status in Alberta) calls for urgency in research and protection.

Moose

Almost all the observations that Little Red River Cree TEK experts contributed on moose and their critical habitat can be matched to results of scientific moose studies. For example, the observation of moose cows preferring birthing sites close to water, especially islands and peninsulas, is shared by Schwartz (1998) and Bubenik (1998b). There is also an overlap in results on moose and natural and human disturbances (the importance of habitats dominated by early succession). The TEK expert impression that the combination of linear disturbance and hunting leads to a decrease in moose in an area is matched by Rempel et al. (1997) data, which show a statistic significance for lower moose densities when both factors are matched.

Current moose harvesting management plans tend to favour the harvesting of bulls over the harvesting of cows. Unless moose populations are considered near carrying capacity, more hunting licences for bull moose are granted than for cows. This management strategy assumes that the birth rate and calf recruitment rate are not too negatively affected by this practice. As Pyc (1998) also found in her study, Little Red River Cree TEK experts do not share this assumption. To them, the presence of a healthy strong male moose population is as important to the survival of the species as the presence of a strong cow population. Research by Ginsberg and Milner-Gulland (1994) suggests that female ungulate fecundity can be related to the presence of a well-balanced adult male population.

It is interesting to note that the observations of the elders that moose tend to seasonally migrate into and out of the Caribou Mountains is close to Hauge and Keith's (1981) results on moose seasonal migration in the Birch Mountains.

Most observations on moose contributed by TEK experts can be matched by individual studies on specific research questions. In contrast to most scientific studies, which focus on one or two research themes, the participants in this study held in-depth knowledge of interactions of different factors such as moose reproductive activities, physiological changes, behaviour, predator avoidance, seasonal environmental changes, food availability, and diseases. As reflected in the cycle diagrams, this holistic ecosystemic approach is one of the main strengths of TEK.

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Ongoing Natural Resource Conflicts

During the interviews it became evident that many ongoing resource conflicts directly or indirectly affect local residents and their relationship to ungulates and the boreal forest environment. Main conflicts include the ethics of hunting, the effects and ethics of forestry, and different priorities in wildlife management (e.g., the bison disease issue). Most of the conflicts involve local Aboriginal residents and outside resource companies (e.g. forestry companies), individual non-resident users (e.g. outfitters), and/or government management institutions (e.g. fish and wildlife division). When talking about resource conflicts with outside users, in particular industry and governmental agencies, Native participants often expressed an underlying sense of helplessness (e.g., outside resource users do as they please, government institutions discriminate against Treaty rights, and it is difficult as an individual to challenge corporations and other powerful outside institutions). This sense of helplessness is not unfounded. In over thirty years of Progressive Conservative party rule, Alberta has seen an unprecedented focus on economic development and natural resource extraction (for more information see Schneider 2002, and Fluet 2003). For example, the timber resources of Alberta's boreal north have been divided between large multinational corporations (e.g. the allocation of FMAs to supply pulpmills) without consulting northern Alberta's subsistence-dependent Aboriginal communities. Due to their high economic contributions, forestry, and oil/gas industries have developed strong ties with the government (Fluet 2003). First Nations, in contrast, are often perceived to stand in the way of economic progress (e.g. the Lubicon Cree, see Pratt and Urquhart 1994, also Fluet 2003) and have often been overlooked in the decision-making process.

For local Native residents, conflicts over natural resources become more difficult when their individual interests are different from local band policies. This is particularly the case with logging and in the debate about bison disease eradication. Since the Little Red River Cree Nation holds the right to industrially harvest local timber resources, it is uncomfortable for local residents to voice their opposition. The unease of disagreeing with band decisions (especially in front of outsiders) is rooted in traditional social systems that are non-confrontational and consensus-based. Before the signing of the Treaties, families and bands used to appoint leaders based on seniority, leadership skills, experience, and/or spiritual knowledge, oratorical skills and ability to act as an arbitrator (Hansen 1987). The current appointment of leadership (democratic

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election of chief and council) is a process enforced on Native communities by the Indian Act. During elections this process tends to bitterly divide Native communities (personal observation). Nevertheless, community members ultimately tend to accept the leadership and abide by decisions, treating their leadership with respect. Boldt and Long (1984, p. 278) write: "But in Indian tribal society individual self-interest was inextricably intertwined with tribal interests; that is, the general good and the individual good were taken to be virtually identical." This respect toward decisions made by the band leadership is reflected in the statement of one participant[16] who explained that if he were to take action against logging he would go against his own band, thereby indicating that he was not willing to go against the accepted general good.

The Little Red River Cree Nation is aware of the concerns about hunting, forestry, and its impacts on wildlife, Little Red River Cree lifestyle, and use of non-timber harvest products. These concerns have since been addressed in a study by Hickey et al. (2004). The results of their systematic research on natural resources and community sustainability with the Little Red River Cree Nation are very similar to the information participants provided on these issues as a background to the present study.

Forestry

Generally, the negative impacts of logging were of particular concern to most participants. Statements like '*Mother Nature is losing her dress*' reflect this apprehension over negative environmental impacts. Participants were particularly concerned about forestry impacts on wildlife, the water table, and medicinal plants. Another issue was the lack of direct consultation by outside resource users[17], which gave many participants a sense of helplessness. The lack of compensation for lost income, equipment, and recreational enjoyment of the land were further concerns. Logging occurs at the same time as trapping. Often traps are being destroyed when heavy machinery moves on to a trapline. During the time of timber harvesting, trappers are not able to harvest any animals, which leads to a short-term loss of income. There is, however, also a long-term loss of income when logging leads to changes in habitat and there is an attendant decline of valuable furbearers.

[16] Interview # 15.
[17] During my fieldwork it was common practice with the Little Red River Cree Nation for political representatives to negotiate with government and industry on behalf of the Band. The political representatives in turn discussed resource issues with a selection of local elders, hunters and trappers.

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Increasingly, forestry companies develop strategies that address Native concerns over their harvesting practices. In 1995, for example, Elmer Ghostkeeper presented an outline of Alberta-Pacific's (Al-Pac) new management policy on Aboriginal affairs. It included details about communication and consultation processes between the forestry company and the Aboriginal residents in their FMA. It also included policies for trapper compensation, Aboriginal training and employment. Al-Pac has since implemented many of the policies. It employs Aboriginal liaisons who communicate between the company, communities and trappers. It has established a Native camp where foresters can be educated about Native values of the land, and which can also be used for other cultural activities. Al-Pac's model is promising since it combines a consultation and compensation process with educational opportunities for foresters and Aboriginal residents, thereby enabling all stakeholders to work towards culturally appropriate management of forest resources.

As previously mentioned, the situation with the Little Red River Cree Nation becomes more complicated since the Nation holds a variety of rights to timber harvest. The advantage is that the Nation is able to secure revenues from the timber, which the Province would have allocated for harvesting anyway. Also, the Little Red River Cree Nation is very committed to the development of local job opportunities in this process. The fact, however, that the Little Red River Cree Nation owns certain timber harvesting rights brings problems to affected local trappers who suddenly feel that they cannot oppose the activities of their own band.

The Little Red River Cree Nation is aware of these problems and has since supported a study on natural resources and community sustainability (Hickey et al. 2004). The authors developed a series of criteria and indicator recommendations[18] (p. 21-25), which include:

1. Modify forest management operations to reduce negative impacts on wildlife species
2. Modify forestry operations to ensure community access to lands and resources
3. Provide protection to all areas identified by community members as having biological, cultural, and historical significance
4. Recognize and protect Aboriginal and Treaty rights to hunting, fishing, trapping and gathering activities
5. Increase forest-based economic opportunities for community members
6. Increase the involvement of community members in decision-making

[18] Some of the more specific recommendations included in the report (e.g. to increase the involvement of community members in decision-making) have also been previously suggested by Treseder (2000), and Schramm and Krogman (2001). Schramm (2002) also recommended the protection of the Caribou Mountains slopes as critical caribou and bison habitat.

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The report includes some detailed management recommendations on forestry, resource development, cultural site and environmental protection, protection of subsistence activities, as well as training and capacity-building. For the last recommendation, the local value "equitable participation of community members in policy and decision making" has the following goals (p. 26):

- Direct communication between industry and community members
- Industry goals and management plans are communicated to each of the three Little Red River communities
- Pluralistic participation on Management Board
- SMA management objectives are made more accessible to community members
- Local ecological knowledge is given an equitable role in management and planning decisions.

This dissertation strongly supports the recommendation that traditional ecological/ environmental knowledge needs to be given an equitable role in management and planning. The incorporation of TEK into the natural resource planning and management processes is the key to culturally appropriate resources use on Woodland Cree traditional lands. A more detailed discussion of the importance of the incorporation of TEK in natural resource planning and management follows.

Hunting

The ethics of hunting were discussed in almost every interview. Trophy hunting and the waste of meat were of particular concern. The establishment of bear-bating camps by non-resident outfitters offended many residents. In the bear hunting camp at the Wentzel River, bear bait is left beneath a large spruce tree in which a hunter can safely hide to shoot his trophy bear. After the end of the hunt in 2001, the hunters did not clean up the camp and large amounts of bacon and grease were left behind to rot. As mentioned in Chapter 5, the local Cree consider trophy hunting disrespectful since the hunters tend to only take the heads and coats and leave the meat behind. Elders consistently stated that to kill an animal for the trophy is regarded as no valid reason to hunt. Native people are particularly offended since trophy hunting in the region targets bear and bison, which both are considered sacred in Woodland Cree culture. It is currently very difficult for the Little Red River Cree to initiate political actions against the way outside resource users use local wildlife resources. Since the Province of Alberta refuses to declare the wild bison of the region *wildlife*, there is currently no legal option available that could be used to protect the small bison herds from trophy hunting. Also, the waste of bear meat is currently legal under Alberta legislation, which excludes bear and mountain lion from the law that regulates the proper disposal

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of flesh.[19] In the Alberta Wildlife Regulations [20] bison are not listed as *big game* but classified as *livestock*, thereby exempting them from wildlife regulations. Although the trophy hunting activities and the disrespect shown toward the animal carcasses are legal, local residents often encounter a variety of illegal activities in the trophy hunter camps. Alcohol consumption while hunting was frequently mentioned, as were destruction of traps or equipment. Apart from being illegal, the consumption of alcohol in the hunting camps is also a big safety concern for local hunters and trappers who try to approach them. The accidental (or often perceived as intended) destruction of traps and equipment by hunters on skidoos creates tensions since most trappers are not compensated for the lost equipment or the lost opportunity to catch a valuable furbearer. In one incident, trophy hunters used the hay sleigh of the bison-monitoring program (which intends to protect the bison of the region) to transport their bison trophies back to the road. Although local Little Red River residents have no legal tools to prevent these incidents from happening, some residents continue to talk to outside outfitters and trophy hunters to try to encourage them to leave the region. The situation is further complicated by the fact that the nearest government representatives able to reinforce the law are situated in Fort Vermilion and High Level, which respectively are 90 and 120 kilometres away from John D'Or Prairie.

As a response to outside trophy hunters, local trappers installed log barriers to discourage the use of specific cutlines. Their attempts in controlling access have only partially been successful since most outfitters now carry chainsaws. Outfitters and trophy hunters have also changed their approach to accessing the land. Instead of dealing with the different local Native trappers they access the Caribou Mountains through the only trapline held by a non-Native, non-local trapper. The trapline is distinct from all other traplines in the region since it is surrounded by a large fence and a lockable gate (in contrast to native cabins and traplines, which are unfenced and accessible). The gate prevents local subsistence hunters to enter, but the trapline holder in turn supports the presence of outside trophy hunters.

Elders, however, also voiced concerns over the change in hunting and trapping ethics in their own communities. The fact that many younger hunters track moose along the roads rather than in the

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[19] Alberta Wildlife Act (2002) states in Part 4
(http://www.qp.gov.ab.ca/documents/Acts/w10.cfm?frm_isbn=0779727185) (last accessed in June 2004)
Prohibition against spoilage, etc., of skin and edible flesh
41(1) A person who has killed or is in possession of a game bird or big game animal, other than a mountain lion or bear, shall not allow its edible flesh to be wasted, destroyed, spoiled or abandoned.

[20] http://www.qp.gov.ab.ca/documents/Regs/1997_143.cfm?frm_isbn=0779729102 (last accessed in June 2004)

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bush (so called "crow hunting"), or take the hides of beaver without using the meat is disturbing to many people of the older generation. These actions reflect the lifestyle and cultural gap between the older and younger community members. The younger hunters and trappers did not grow up in the bush and generally never spent long periods on the land. Especially when they hold jobs, the time they can spend on the land hunting and trapping is quite limited. Food preferences have also changed. Many young people have grown up with beef, pork and chicken, although they still eat moose meat, wild ducks and geese. They tend not to consume other traditional foods such as beaver and muskrat. The fact that younger trappers leave the beaver meat behind reflects this food preference, but more importantly, it reflects a change in attitude towards local norms. It means that local principles of resource use are ignored and that local mechanisms of control (e.g., the spiritual belief in negative consequences when local principles are ignored) do not function well. It is possible that the change in attitude can be linked to a breakdown in communication between the older holders of TEK and traditional norms and the younger generation who grew up in reserve settlements, and have been more exposed to Western culture, schools and television.[21] Since Native elders generally do not impose their views on others, the younger hunters and trappers would need to take the initiative to approach the elders about traditional values. The younger community members in turn have grown up in a Western school system where they are told what they are supposed to learn. They may not be aware of the necessity to actively seek a traditional native education. The traditional Cree principles of resource use have been culturally sustained for a long time and it would be a significant cultural loss if they were to disappear. Communities like those of the Little Red River Cree Nation therefore need to find new ways to carry their environmental worldviews and principles of resource use into the Twenty-first century.

The Bison Eradication Program

In May 2000, the federal committee on the status of endangered wildlife in Canada (COSEWIC) assessed the wood bison in Canada as 'threatened'. In May 2004, COSEWIC added the plains bison to its list of threatened species.[22] It is ironic to note that the Province of Alberta officially

[21] Pyc (1998) described a generational shift in hunting practices and traditional environmental knowledge for Garden River. Tsuji (1999) describes cultural and technological changes that affect harvesting practices of the James Bay Cree. Osherenko (1988) discusses the widespread loss of rules and values between the generations and the role school education plays in the decline of knowledge of traditional practices in aboriginal communities.

[22] http://www.cosewic.gc.ca/eng/sct0/page/table7_e.cfm#endangered [last accessed September 2004].

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designates the wood bison as a threatened species[23] under the Wildlife Act (2001), yet, as soon as a wood bison sets a foot outside Wood Buffalo National Park into Alberta it becomes fair all-season hunting game. The failure to protect the wild bison of the Wood Buffalo National Park region on the grounds that they are hybrids and not pure wood bison is based on the assumption that hybridization did not occur naturally in the region. As the results of my research show, this assumption is questionable. It is further questionable whether Alberta's designation of Wood Buffalo National Park bison as 'livestock' is justifiable in light of the recent COSEWIC (federal) designation of plains bison as 'threatened'. The plains bison genes that contributed to the labelling of Wood Buffalo National Park bison as hybrids (and livestock) are from the same original population as Elk Island National Park bison now classified as 'threatened'. Since federally, the plains bison are now considered threatened wildlife (rather than livestock) and all wood bison already were classified as 'threatened', it is time for the Provincial Government to re-evaluate its bison classifications.

The proposed eradication of the wild Wood Buffalo National Park herds and their replacement with captive animals could lead to regrettable long-term consequences. It would destroy the only permanent and uninterrupted bison ecosystem in North America since the replacement proposal would have to leave the area free of bison for a number of years, thereby severely disrupting the local predator-prey system. It likely would further lead to a loss in genetic diversity since the bison of the Wood Buffalo National Park region have the largest bison gene pool in the world. However, projects like the Fort Resolution bison recovery project, which captured bison from local populations, and the proposed Little Red River project, can reduce the risk of genetic loss.

The fact that participants in this study emphasized the differences in behaviour and habitat choices between the local herds points towards the existence of environmental knowledge within bison herds. Otherwise, the different herds would display more similarities in habitat choice and behaviour. The capturing of wild bison and the creation of captive herds would lead to a loss of environmental knowledge that the wild bison herds carry. A released captive herd would have to relearn certain knowledge about the local environment and its predators and might subsequently shape its environment differently than current wild herds.

[23] The designation as threatened species applies in Alberta only to the re-introduced disease-free wood bison of the Hay Zama herd near High Level. These bison were taken from the genetically bottlenecked Elk Island National Park wood bison population.

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The Little Red River Cree Nation has long been involved in the debate surrounding the bison in and around Wood Buffalo National Park (See Chapter 6, literature review on bison). As mentioned earlier, the political position of the band has changed from vehement opposition of bison eradication in the early 1990s to official support of bison eradication in the late 1990s. On the political stage, the Little Red River Cree Nation lobbies for the presence of disease free bison as a food source for their growing nation. In the interviews on TEK of bison, it emerged that to Little Red River Cree elders the diseased bison issue was much more complex than the key goal to perpetuate disease-free herds for future hunting purposes. Elders vehemently opposed the handling of wild and domestic bison (with reference to handling of wild bison in Wood Buffalo National Park during anthrax vaccinations, and the presence of domesticated bison on a research farm in Fort Vermilion). In informal talks, local residents opposed the Fort Resolution Bison Recovery Project for its calf capture program, comparing it to their own residential school experience.[24] The presence of tuberculosis was also not seen as a reason to justify a bison eradication program - with reference to the fact that TB also is present in the local human populations and nobody would suggest that every resident would need to be killed, especially when it is known that the disease is curable. Participants also emphasized that much like diseases in human populations, not every animal becomes infected. The proposed slaughter of all free roaming bison therefore is met with opposition; since killing a disease-free bison would mean killing it for no justifiable reason. As described in the results of the bison component of this study in Chapter 6, local participants viewed anthrax as a far bigger threat than TB or brucellosis. It is likely that none of the proposed bison eradication and re-introduction programs will be able to propose a successful anthrax elimination component. Consequently, a disease elimination program that involves the replacement of local bison by introduced bison will likely be perceived as unnecessary and unsuccessful as soon as a new anthrax outbreak affects the introduced bison.

Especially among the elders, there also still exists a spiritual relationship with the bison. At the Research Advisory Committee meeting in Edmonton, March 2001, Little Red River Cree elder and bison monitor Malcolm Auger shared a very powerful story of a personal spiritual encounter with a herd of Wentzel Lake wood bison.[25] Mr. Auger's story was a strong testimony for the existence of a deep human-animal relationship that goes far beyond the general Western scientific concepts that emphasize a predator-prey relationship. It is important to note that the Native

[24] Janna van Kessel (2002), who studied the community response to the Fort Resolution Bison Recovery Program, also documented opposition to the capture, handling and eradication of wild bison amongst her informants.
[25] Also referred to in Carbyn (2003).

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residents in and around Wood Buffalo National Park are the only Native people in North America who were able to maintain a continuing subsistence and spiritual relationship with the bison. It is likely that an eradication program will seriously disrupt this relationship.

The Relevance of TEK in Natural Resource Management, Education, and the Future of the Little Red River Cree Nation

One of the first realizations of this study was that traditional environmental knowledge is alive and well among the members of the Little Red River Cree Nation. The nature of the knowledge was as defined by Johnson (1992, see Chapter 2, p. 12). People contributed their own observations and combined them with knowledge from past generations. I was granted insight into their principles of resource use, and their understanding of ecological concepts surrounding wildlife and the boreal forest. Although many participants shared the same knowledge (e.g. details on moose), other specific knowledge was provided only by certain people who had gained expertise in a particular field (e.g. bison, caribou, traditional teaching and learning). During the analysis it became important to keep the knowledge in its context and connected to the expert who provided it. An active hunter often provided different knowledge than an elder who retired years ago. It was also important to keep in mind where the informant lives and where he hunts and traps because the local ecosystems can be quite different.

Many participants were supportive in trying to help me understand how traditional knowledge is learned. As discussed in Chapter two, much emphasis was put on learning by doing, but personal observation, listening to storytelling and experiences of other people were also important sources. Many participants were frustrated that younger people did not learn TEK and traditional skills. They tended to identify the modern settlement lifestyle with television and Western food choices as barriers for children and young people to develop an interest in a traditional lifestyle. When referring to young people, elders often listed a perceived lack of respect for elders, lack of communication, or no interest in stories as reasons that widen the gap between the generations. Local schools make some attempts to teach TEK in bush camps or special projects. There is, however, a sense of frustration present that the opportunities to learn about traditional lifestyle are inadequate.

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The dynamic nature of TEK became occasionally evident, when participants or liaisons referred to newspaper articles or television reports on a particular related topic. The ability to adapt to new technologies and incorporate TEK into the new situation became apparent in examples like changing pants after a skidoo ride on a moose hunt so that the animal does not pick up the scent of the gasoline. It also soon became clear that the knowledge on ungulates was deeply imbedded in the local culture and its values (as described in Figure 2.1, p. 11). Knowledge of wildlife was often connected to hunting and trapping, which in turn was tied to local ethics, which again was connected to conflicts over resources. Consequently, a variety of thoughts arise when reflecting on the question of how TEK can be used to help resolve some natural resource conflicts.

The spiritual nature of TEK can become an obstacle in the research and management process. Cree people are very protective about their spirituality and are extremely reluctant to share details with the outside world. This protectiveness makes it very difficult to protect spiritually significant sites since people are reluctant to share details necessary to protect these sites. In wildlife management, for example, a certain area might be home to an animal that due to its size or colouring is considered sacred by local residents. There also might be areas of activity of usually invisible beings (in Western terms either classified as mythological beings or belonging in the field of cryptozoology), which are very present and active in Native lives and culture. Theoretically, these sacred places and activity zones would need to be part of any culturally sustainable approach to regional natural resource use and management. In practice, however, local residents are too reluctant to share this knowledge with outside planners and managers. In Alberta, Traditional Land Use and Occupancy studies deal to a certain degree with sacred sites such as graves and graveyards. However, no general model exists on how to manage sacred or spiritually active sites that involve spirit animals or other culturally significant beings. Other cultures, such as the Aboriginal People of the Northern Territory of Australia have been able to protect sacred sites under territorial law in cooperation with management institutions such as the Northern and Central Land Councils (Peterson and Langton 1983). There, sacred sites are managed through a highly classified database, which allows knowledge to be stored for legal purposes but limits access to information only to classified personnel. On maps, sacred sites and restricted zones appear with large buffers and no details as to the specifics of the place are given. Even a Western country like Iceland also acknowledges the presence of sacred or mythologically important sites and takes them into consideration in the planning of development projects.

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The spiritual nature of TEK also can become an obstacle in the transmission of knowledge between generations within the communities. In my observations in the Native communities I worked in I found that the teaching of spiritual values was the responsibility of each individual family towards its own members. Many Native communities are religiously divided between Catholic and traditional belief systems; and rituals and ceremonies tend to be slightly different in each family. Elders generally do not impose their knowledge or opinion on anybody. They tend to only take the initiative to teach the younger members of their own direct families but do not teach children from other families unless approached and asked to do so by other families. A large number of children do not get educated in TEK and its spiritual dimensions because they do not have a direct family relationship to a TEK expert who is comfortable teaching others' children his or her knowledge. Today, children on reserves grow up with school education where teachers tell them what they need to learn. Most children are not aware that they need to approach an elder and ask to be taught in order to learn traditional knowledge and cultural values. Elders, in turn, do generally not feel comfortable to share the spiritual dimensions of their knowledge in a classroom setting because they do not know if they have the permission of the other families to instruct their children. Consequently, when involved in school projects about traditional skills and lifestyle, most elders concentrate on teaching techniques and physical skills but leave out the spiritual principals that guide and regulate personal behaviour towards and use of natural resources. Elders in this study also noted that children were not interested in learning traditional knowledge and that they were more interested in pursuing a Western lifestyle inspired by television.

I personally believe that the dilemma of the generational gap of TEK knowledge transmission might partly be due to a communication misunderstanding between the youngest and oldest generation. The children, who were always told what to learn in the Western school system, are not used to taking the initiative to be taught; and the elders, who always wait to be approached as teachers, do not feel comfortable taking the initiative. If TEK and its values and regulatory principles should be transmitted to a broad range of Little Red River Cree children the schools need to be involved. During my field work in John D'Or Prairie I learned that the schools of the three Little Red River communities already have taken initiatives in teaching Cree classes and conducting cultural campouts and traditional skills projects.[26] Basic local cultural protocol is taught in Cree class, deeper spiritual dimensions of traditional knowledge, however, prove extremely difficult to teach because of the family monopoly in the area of spiritual value

[26] Florence Nanooch, interview in John D'Or Prairie, July 2, 1999, Clifford Ribbonleg, interview in Fox Lake August 18, 1999, Malcolm Auger, interview in the Caribou Mountains May 6, 1999, Bill McLean, teacher in John D'Or Prairie, personal communication May 4-7, 1999.

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education. In order for TEK education to be successful in the long term, however, both children and elders need to overcome the expectation to be approached. Children need to be aware that there is certain protocol involved when learning traditional knowledge from elders. Elders need to be aware that many children simply do not know about the proper protocol to ask for knowledge. The schools need to be aware that elders need explicit permission from all families to teach spiritual principles in a school setting. It is likely that more children can be taught TEK if a compromise between traditional and Western teaching systems can be developed individually for each First Nation or community, its elders, children, families and schools.

TEK Studies – A Two-Edged Sword

This study, as many other TEK studies, gives an insight into the depth of environmental knowledge still held by the traditional keepers of this knowledge. The results not only provide recommendations on wildlife and forestry management, they also provide new questions and inspire future research projects. In this process, however, a discussion on empowerment or disempowerment of the knowledge keepers continues to linger in the background. The question whether a study like this actually is beneficial to the people who participated needs to be addressed.

The fact that this study generated over 22 detailed interviews and many informal talks proves that a variety of Little Red River Cree TEK experts believed that the project was useful. However, an unknown number of TEK experts also declined to be interviewed[27], which shows that the level of comfort with the study was not homogeneous within the First Nation. A reason for this phenomenon could be distrust in the researcher (or the affiliated research institution) who is a stranger to the community, which might be driven by an underlying fear of disempowerment. This became evident at the beginning of my field season when one liaison told me that some people in Garden River refused to be interviewed because they thought that I was an environmentalist. To many elders, hunters, and trappers the Greenpeace campaign, which contributed to the crash of the fur market, is still a vivid memory. Most families in the boreal and arctic north lost a main source of income when the fur prices rapidly fell. Consequently, an outside researcher who shows an interest in wildlife can easily be perceived as a threat since it is generally not known how the researcher will use the information obtained from the study. The

[27] I do not know how many people declined to be interviewed since almost all interviews were arranged by local liaisons.

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underlying fear could be that the study results would lead to more restrictions of subsistence hunting rights of the local people if new wildlife protection measures were to be implemented.

The separation of traditional knowledge from the knowledge keepers and the inherent dangers of loss of power have been described by a variety of authors (e.g., Agraval 1995, Stevenson 1998, Nadasdy 1999,). Agraval (1995, p. 431), for example, notes that preserving indigenous knowledge by storing it in international and national archives helps undermine the control that the knowledge keepers exercise over their knowledge. In human cultures, knowledge is generally tied to power and prestige. Many cultures possess mechanisms to secure power and prestige through restriction of access to knowledge. Although it was beyond the scope of my study to prove or disprove this statement, I felt that I was restricted from access to certain specific knowledge areas. This usually tended to be the case when the subject involved spiritual or sacred knowledge. In many cultures, sacred knowledge is secret knowledge, which strengthens the position of the knowledge keepers in the community and surrounding regions. If this knowledge is turned into public knowledge, readily available to anybody, the status of the knowledge keeper might decline since it is no longer necessary to access the knowledge through him or her. The knowledge keeper in turn is not able to exercise any control over the way the knowledge is used and might fear that it can be used against him or her. The question whether the separation of knowledge from the knowledge keepers is to their disadvantage certainly also arises in this dissertation. It definitely would be a disadvantage if the results of this study would be used as an excuse to avoid direct consultation with local residents when it comes to resource planning and management. I therefore again would like to emphasize that this dissertation summarizes specific TEK of ungulates and their critical habitat. It cannot replace the depth of insight that a traditional knowledge keeper can provide due to his or her lifelong training in the subject.

In contrast to fears of disempowerment, I also encountered an amazing level of co-operation. It seemed to be important to many participants to clearly communicate their point of view and to make sure that I as an outside researcher understood their position. In these situations participants would use examples that were drawn from the living environment of a White researcher. Florence Nanooch[28], for example, compared the acquisition of TEK to a university education:[29] "There is two ways that you go to university: you go to school in the white man's way and there's a native way that you go to university." She continues to explain how people learn traditional

[28] Interview in John D'Or Prairie, July 02, 1999.
[29] For a longer quote of this passage please see Chapter 2, p. 19.

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environmental knowledge through observation, experience, stories, and consultation with knowledgeable people. Alexis Meneen[30] did the same when he compared the learning of TEK to university research:

> *It's very, very true how we look at things differently from the Natives' point of view and from other people. A lot of research is done by the white people and other people on animals and how they study them.* [...] *But in our own way* [the Native people] *they've done that for generations as well, 'cause we relied on it in order to know where to find the animals at certain times of the year.*

These examples show that the dynamics of the interviews were influenced both by the participant and the researcher. The researcher tried to learn about and incorporate Native ways of knowledge communication. Native participants, in turn, used images from the "White-man-world" to ensure that their message was understood. The TEK experts who participated in this project clearly sent the message that they wanted their knowledge to be utilized and their opinions to be heard. Today, however, there still are not enough mechanisms in place for indigenous Albertans to directly contribute their knowledge, expertise and opinion into the natural resource management process.

Towards Culturally Appropriate Natural Resource Management

This dissertation documents Woodland Cree TEK of ungulates and their critical habitat. It also includes a discussion of the main factors (e.g., human and natural disturbances) affecting ungulates and ungulate habitat. As the previous chapters have shown, Little Red River Cree TEK experts not only hold detailed knowledge on wildlife and the environment they live in, Cree culture also possesses natural resource use principles that regulate access to resources. On the Provincial level, however, natural resources continue to be managed predominantly by government officials who base their decisions on political strategies and scientific information. In Alberta, the planning process for natural resources continues to be substantially influenced by industries such as forestry, oil/gas, and agriculture, whereas the influence of local residents, especially aboriginal people, tends to be marginal.

Many aboriginal groups worldwide have developed local management systems that are sustainable and protect biodiversity (Colding and Folke 1997, Berkes et al. 2000). As shown in the contributions to this dissertation, Little Red River Cree TEK experts have substantial expertise to add to any natural resource planning and management on their traditional lands.

[30] Interview in Fox Lake, August 19, 1999. Translated by Celestan Nanooch. In this passage, the translator is the narrator.

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Furthermore, the Woodland Cree culture provides tools to redevelop and strengthen traditional resource management systems that have the potential to be more sustainable and culturally appropriate than the current management systems in place. Stevenson (1998, p. 6) points out:

> The textualization of TK, the co-optation of state management approaches, and related forms of acquiescence by First Nations and other Aboriginal groups in the context of securing land and resource tenures should be regarded only as interim measures within a larger strategy of social, cultural, economic, and political empowerment and self-determination. If the goal is to preserve TK for the benefit of present and future generations, the strategy should be to rebuild and strengthen those systems that give meaning and value to it.

Traditional environmental knowledge is a dynamic form of knowledge that developed because people depended on the environment they lived in. This knowledge is part of the cultural identity of aboriginal people. If aboriginal people of the boreal forest are not able to live a lifestyle that connects them to their lands, the volume of TEK present in any community will decline. As this study has shown, TEK provides interesting contributions to the overall human pool of knowledge, both in the generation of new questions as well as in the construction of hypotheses. In order to secure the cultural survival and the TEK of the inhabitants of Alberta's boreal North, existing government-controlled resource management systems need to change and allow for a meaningful participation of local aboriginal people who are affected by resource extraction and wildlife regulations. Since natural resource management is primarily a political process, a meaningful input of First Nations people in Alberta's natural resource management process can only be achieved if Aboriginal stakeholders are granted powers in political decision-making.

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9 RECOMMENDATIONS AND CONCLUSIONS

Important Environmental Management Considerations[1]

In light of the focus of the study on critical ungulate habitat in the Caribou Mountains I propose a number of environmental management considerations.

- Due to its mature white spruce stands, the southern slopes of the Caribou Mountains contain the most valuable timber resources in the Caribou Mountains region, and logging activities in the area have been going on for some time. According to the contributions of traditional environmental knowledge to this study, it is likely that any logging activity on the south-central slopes of the Caribou Mountains will seriously affect the local woodland caribou herd. I emphasised earlier the importance of the south-central slopes as critical caribou spring habitat. Logging of these last remaining old growth white spruce stands will not only deplete a vital food source necessary at the end of the difficult winter season, but the noise may also cause caribou to stay away from adjacent unspoiled areas. The recommendation to protect the old growth white spruce stands along the southern slopes becomes even more important in light of this year's large Lawrence Creek[2] fire, which affected the south-central Caribou Mountains. It is likely that the fire destroyed large areas of critical caribou habitat, increasing the importance of protection of the remaining intact areas. Hickey et al. (2004, p. 21) recommend a long-term harvesting rotation for this zone. If Hickey et al.'s recommendation should be implemented, I recommend that the harvesting schedule be based on the availability of arboreal and terrestrial lichen in neighbouring stands (which preferably should not be isolated). I further recommend that harvesting should not occur between late winter and spring (approximately end of February to end of April) to allow the caribou to utilize the zone without noise disturbance and human activities.

- Expansion of development in the Caribou Mountains should be minimized. Although the central plateau is currently not at risk from logging activities, it is necessary to emphasize its importance as woodland caribou habitat throughout most of the year. The areas around the

[1] Includes recommendations from Schramm (2002) and recommendations I prepared for Westworth Associates Environmental Ltd. (2002).
[2] Locally also known as Lawrence River.

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lakes are critical habitat during the summer for calf protection from wolves (the same applies for moose). During winter, the same areas seem to provide important parts of the caribou winter diet. The biggest disturbance affecting woodland caribou in the plateau region is likely noise. The airplane traffic to and from the Margaret Lake fishing lodge creates noise disturbance in summer, whereas skidoo traffic affects the region in winter. Although it is currently impossible to find alternative solutions for the noise disturbance it should be a factor of consideration for any development or expansion project in the region.

- The most urgent recommendation for the protection of the wild bison herds in the project region is a change of the Alberta Wildlife Act classification from *livestock* to *wildlife* and *big game*. This change would follow a lead by the Federal Government, which recently classified plains bison as *threatened*, thereby acknowledging that plains bison are wildlife. Classifying all of Alberta's wild bison as wildlife allows for protective and regulatory measures and could provide much needed time for additional research. If this change is not made, Alberta runs the risk of losing some of the most interesting and potentially genetically diverse bison herds in the region before research is able to explain their differences in morphology, habitat selection, and behaviour. The change in classification would not only regulate bison hunting and protection, it also would regulate the proper disposal of meat, which currently is one of the conflict issues in the region. While it is important to secure the disease-free status of the re-introduced wood bison herds at Hay Zama and in the Mackenzie Bison Sanctuary, it is not necessary to eradicate all wild bison herds outside of Wood Buffalo National Park. Existing bison-free buffer zones between the herds should be maintained, the core ranges of the Wentzel and Mikkwa herds (and other herds outside the Park), however, would need to be excluded from the buffer zones. In addition to monitoring programs, these buffer zones could be maintained through subsistence and recreational hunting and would provide an alternative for outfitters once the Wentzel Lake and Mikkwa herds were protected. The concerns of resident cattle and game ranching operations over disease control would need to be included in the management process.

- Protection of the south-eastern slopes of the Caribou Mountains. This area is part of the critical Wentzel Lake wood bison herd habitat. Due to the impacts of the construction of the road to John D'Or Prairie and Garden River (and increased hunting pressure) this herd already retreated into a fragment of its original territory. Logging activities on the south-eastern slopes might not directly affect local bison habitat in the immediate future; it will,

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however, increase access roads for hunters and thereby possibly endanger an already vulnerable herd. If logging or other developments should continue in the range of the Wentzel Lake herd, effective long-term measures to reclaim sites of linear disturbance would need to be impelmented.

- As part of the protection measures for the Wentzel Lake herd it could be an important goal to expand the range of the herd to its much larger former size. This would include protection of the salt licks along the Garden River road, and bison access to the prairies near the Lawrence River. The bison are likely to benefit from the early spring growth of grasses on the prairie patches and from use of the salt licks. The expansion of the range can only become a reality, however, if Native and trophy hunters observe a strict hunting moratorium along the road and it's vicinity.[3]

- Minimization of linear disturbance from salvage logging. The Lawrence Creek fire likely affects parts of the Wentzel Lake bison range. Although the bison are likely to benefit from the growth of graminoids and early successional brushes, access corridors created by salvage logging could lead to increased hunting pressure. Any salvage operation should minimize linear corridor impacts.

- Minimization of linear disturbance for moose protection. Whereas moose have been observed to respond to human activity by leaving the area, moose tend to benefit from the presence of early successional plants in cutblocks and sometimes achieve high densities in populated areas. Although moose will very likely frequent cutblocks, it is possible that moose populations might actually decrease due to increased hunting pressure from access via logging roads.

- Protection of riparian zones. Many TEK experts emphasized the importance of the Peace River zone for moose. The Alberta Government has proposed to allow harvesting within riparian areas (Alberta Environment 2001, Schneider 2002). During spring and early summer, cows and calves will stay on the river islands to avoid wolf predation. Bulls and cows will also frequent the river zone at the beginning of the rutting season. The river zone is also very

[3] Hickey et al. (2004, p. 21 and 23) recommend the "placement of protective zones along bison migration routes that run north-south between Fox Lake and Tall Cree" and that protective buffers should be placed around mineral licks that are located throughout the management area. This study agrees with their recommendation.

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important for black bears in August/September when they feed on berries to prepare for hibernation. Although tree harvesting will ultimately increase available browse for moose, the proposed logging in riparian areas can also create travel corridors for predators, thereby decreasing important refuge habitat for moose cows and calves. According to an account from Fox Lake, logging activities near the Peace River also causes wildlife to leave the area to move further away from the river, making it more difficult for Fox Lake residents to meet their subsistence needs.

- Rotation harvesting of parts of spruce tree islands. Spruce harvesting is scheduled for the area west of the southern part of the western border of Wood Buffalo National Park. In this region, spruce trees grow as small spruce islands in aspen dominated forests, providing important shelters for local animals. Due to the island-nature of the stands, logging of these small spruce islands will leave specialized conifer-dependent animals without any shelter habitat. If logging commences in these stands, only parts of these islands should be cut in a rotation schedule. However, this suggestion is likely not feasible for economic reasons.

Important Cultural Management Considerations[4]

- Control of access to traditional lands. The influx of outside trophy hunters and their impact on local bison and bear populations appears to be one of the biggest local concerns. Preventative measures are difficult to take as long as Provincial regulations allow for bison trophy hunting of animals that local residents want to see protected, and practices such as bear baiting and abandonment of bear and bison carcasses are legal in Alberta. Access into the Caribou Mountains through existing seismic lines could be limited through the installation of gates, with the consent of local trapline holders, placed under their guardianship.[5] This would give local residents more control over who accesses their traplines and could potentially limit outside trophy hunting of bison and bears. The installation of gates, however, is likely to be locally perceived as a restriction of subsistence activities. Community consultation and consent would be necessary.

[4] Includes passages I prepared for Westworth Associates Environmental Ltd. (2002).
[5] Hickey et al (2004, p. 24) propose the reclamation of access roads into the Caribou Mountains as a solution to limit non-local hunter access to critical ungulate habitat in the Caribou Mountains. This management measure, however, would also limit access for resident subsistence hunters.

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- Local distribution of meat from trophy hunts. The utilization of meat from trophy hunts by local residents is a useful temporary solution and has also been suggested by Schramm and Krogman (2001) and Hickey et al. (2003). To resolve conflicts between outfitters/trophy hunters and the First Nation in the long-term land control issues need to be resolved. This could lead to the exclusion of outside hunters from traditional lands as practiced in some of the northern Land Claim agreements, or the consideration of priority rights for Aboriginal outfitters (Schramm and Krogman 2001).[6]

- Environmental pollution is a major concern to local residents. For conflict minimization it is important for outside users of local natural resources to keep the environment clean. This includes proper camp cleanups, and the cleanup of spills and industrial waste after resource extraction. The maintenance of the brush-free corridor along the proposed all-weather road[7] to Garden River through the use of herbicides is likely to cause concern because moose are feared to feed on contaminated freshly sprayed leaves or twigs. Since local people consider wildlife a healthy and natural source of food, any contamination of wild foods is seen as threat to human and animal welfare. It is recommended that future management plans for the all-weather road avoid the use of herbicides in order to prevent local wildlife and herbs from being affected. Alternatively, the maintenance of the brush-free corridor along all-weather roads could be achieved through mowing and brush cutting, which could provide for occasional local employment.

- Tree harvesting and potential road construction projects will likely impact some local berry and herb gathering activities. Some easily accessible berry bushes and berry grounds might disappear due to these activities. Local herb experts usually never harvest herbs in the immediate vicinity of roads or disturbed areas. Many herb experts leave a three to five metre buffer away from the road before they harvest herbs. Logging and road construction might threaten the usability of a local herb if it is suddenly situated in the new buffer zone. However, consultation on the conservation of herb gathering areas is a difficult process, given the proprietary issues around traditional plants.[8] To each herb specialist the knowledge of herbs is a very private issue, to a point where an herb expert might even object to a consultation and documentation process. Affected senior trapline holders could be

[6] Hickey et al. (2004) suggests a priority use of wild ungulates for subsistence use.
[7] In 2003 INAC approved funding for the expansion of the existing all-weather-road to John D'Or Prairie to extend to Garden River and Fox Lake.
[8] Also noted by Hickey et al. (2004).

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individually consulted on the issue. Other local herb specialists should also be consulted individually with the help of a community liaison. The planning of a herb conservation consultation component requires great sensitivity and detailed knowledge of local culture and protocol.

- Trappers who hold traplines in timber harvesting zones or along the proposed all-weather road may experience a decrease in wildlife on their traplines due to increases in human activity and noise. Trappers along the proposed new road section to Fox Lake will be particularly affected since the travel frequency on their trapline will change from occasional quad and skidoo traffic on a seismic line to daily vehicle traffic on a road. Consequently, active trappers are likely to encounter a decrease in income. Additionally, logging operations often destroy traps or other equipment. Trappers should be compensated for the loss of income and equipment.[9] It is difficult to measure the loss of income since the current prices of pelt (e.g. $80.00 for a lynx) do not reflect the potential income possible if the fur market should recover (e.g. $ 600.00 for a lynx before the crash of the fur market). Currently, the forestry company Al-Pac is developing compensation models for trappers in their FMA near Lac LaBiche. The development of these compensation models involves Al-Pac biologists and aboriginal liaisons, as well as local trappers. Compensation through employment of trappers as monitors in bio-scientific research is one of the approaches taken by the company. In the project region a fair negotiation process would involve the affected trappers, and Chief and council of the Little Red River Cree Nation.

- As the results of this study show the incorporation of TEK into natural resource management is not only vital for the development of culturally sustainable management practices but hold promising suggestions for all stakeholders. A consultation process involving trapline holders, elders, and interested community members should not only take place within the Little Red River Cree Nation (as currently practiced), but should expand to include direct consultation between outside resource users and Little Red River Cree stakeholders.[10] As a starting point the Al-Pac consultation process and cultural camp approach could be very helpful.

- For the Little Red River Cree Nation the incorporation of traditional knowledge is not only important in the natural resource management and planning process, it also is an important

[9] Hickey et al. (2004, p. 24) also recommend the implementation of a trappers compensation program.
[10] A consultation process involving trapline holders has also been suggested by Hickey et al. (2004).

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consideration for other areas such as health, social services, education, and religion. It could be beneficial for the Nation to develop a common strategy as to how traditional knowledge can be taught, implemented and preserved in the different aspects of community life and well-being. The potential benefits of such a program could be an increase of community self-esteem. The verbalization and recognition of the uniqueness of the local traditional knowledge might lead to a better bargaining position when it comes to representing community positions in situations involving outside stakeholders.[11] The Little Red River Cree Nation possesses a deep and powerful traditional knowledge base. A stronger incorporation of this knowledge in education, health, and resource management can help the community to establish their own vision of culturally appropriate natural resource use and management as a contribution to the survival of their culture.

Suggestions for Future Research Topics

One of the original goals of this project was to generate research questions. In the following I would like to suggest a variety of bio-scientific and social-scientific research questions that arose from this study.

Bio-Scientific Research Topics

- Little Red River Cree and Tallcree elders contributed a large variety of observations and details about the caribou in the region, particularly for the central and eastern Caribou Mountains. The jigsaw puzzle of TEK of woodland caribou in the Caribou Mountains could become more complete if similar TEK studies were conducted in the other surrounding Aboriginal communities. It is likely that residents of those communities can provide woodland caribou knowledge details for the western and northern parts of the Caribou Mountains.

- TEK experts witnessed the occasional formation of large herds of woodland caribou in the past. In this context it would be interesting to explore whether mountain caribou or barren ground caribou occasionally migrate into the Caribou Mountains. Research on this issue is

[11] Treseder (2000), and Treseder and Krogman (2000) also proposed an emphasis on culturally-sustainable management as a strategy for the Caribou-Lower Peace Cooperative Forest Management Board.

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important because large non-residential herds would possibly have a long-term impact on caribou habitat, in particular on the slow-growing caribou lichen – and thereby endanger the food supply of the resident woodland caribou population. It might be possible to confirm this observation with dendrochronological research.

- The TEK experts' remarks on past sightings of large caribou in the Birch Mountain region provide for a particularly interesting research topic in light of similar sightings in the Horne Plateau. Specific interviews in surrounding native communities and guided field trips into the region would be a promising start to research on this topic.

- Woodland caribou in the south-eastern Caribou Mountains avoid an adjacent bison range even though the food resources in this area should be attractive to caribou. Likewise, the bison in the region tend to avoid the caribou range. A study of this phenomenon could increase knowledge about caribou and bison habitat selection. This research is particularly interesting in light of research done on spatial separation of boreal caribou and moose (e.g. Bergerud 1983, Bergerud et al. 1984, Seip 1992, James 1999).

- The observation of diseased moose generates some questions. If the pus found in the lungs of Wood Buffalo National Park moose was found to be an indicator for the presence of tuberculosis[12], would the presence of TB in moose not question the success of proposed bison eradication proposals?

- The observed morphological differences between the Mikkwa herd and the other two herds (Wentzel Lake and South-West Parks herds) raises a number of questions. Geographically, the Mikkwa herd is probably among the herds furthest away from the original plains bison release site within the Park at Hay Camp. Nevertheless it seems to be the herd with the strongest plains bison characteristics in the whole region. It seems unlikely that this herd can be directly linked to the plains bison release because the other herds that are closer to the release site all show dominance of wood bison characteristics. Elders at the workshop in Fox Lake stated that the Mikkwa herd has always been in its current location and that exchange of animals between the Mikkwa and South-Western Parks herd is a regular occurrence. Currently, very little is known about this herd. The TEK expert observations could potentially lend support to Valerius Geist's (1991) theory that wood and plains bison are actually

[12] Other diseases are also possible (e.g. hydatid cysts: Echinococcus granulosus; Pasteurella pneumonia,

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ecotypes. It could also raise the question if this herd might be a remnant plains bison herd that so far has been completely overlooked. This dissertation urgently recommends genetic research for the Mikkwa and Wentzel Lake herds followed by related research on habitat selection and morphology. As a starting point the two herds could be researched by using Wilson and Strobeck's (1999) approach of studying 11 microsatellite loci and allele frequencies in bison from different herds. The morphology could be researched by using van Zyll de Jong et al.'s (1995) method of comparing external characteristics in bison of different herds.

- The observation of bison feeding on muskrat houses in winter supports the view of bison as a keystone species in the Wood Buffalo National Park ecosystem. So far, the role of bison in controlling muskrat populations has not been evaluated.

Social-Scientific and Interdisciplinary Research Topics

Aboriginal principles of natural resource use and management

Many First Nations are increasingly involved in local natural resource management and harvesting. In many cases, however, the management strategies applied are dominated by Western resource management philosophies and ethics. The Little Red River/Tallcree First Nations manage local timber resources and are stakeholders in planning activities in Wood Buffalo National Park. In order to secure the future of the local subsistence economy, applying local Woodland Cree principles of natural resource use and management may be necessary to develop culturally appropriate resource management plans. Learning about these Woodland Cree principles would include research on local systems of control, harvesting ethics, human-environment relationships, and how these systems could be applied in a modern planning process.

Social impacts of bison disease management

In the final report for the Bison Research and Containment Program, Jane Chisholm (2001, A6-109), Wood Buffalo National Park, identifies research needs for 'socio-economic impacts of management options'. In my research, elders often opposed handling of, and interference with wild animals. I was left with the impression that local residents were much more concerned over anthrax than over the presence of TB and brucellosis in wild bison populations. They also seemed to be more concerned about the lasting impacts of anthrax vaccinations and the influence of industrial pollutants on the wild populations. I would propose the necessity of a formal cultural

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impact assessment that would determine how a proposed bison eradication and re-introduction program would culturally, spiritually and economically affect local aboriginal communities in and around Wood Buffalo National Park.

Conclusions[13]

The Little Red River Cree Nation and the Sustainable Forest Management Network (SFMN) originally proposed the research idea for this project to generate wildlife data based on TEK for the local natural resource planning and management process. During my field work with the Little Red River Cree I was left with the impression that the people who participated felt that their contribution could help to resolve some of the local resource conflicts by helping outsiders to better understand the position of the local residents.

I approached my research questions[14] by using the following objectives:

- Document TEK on ungulates and their critical habitat.
- Translate the TEK data into a format useful for planners, managers and scientists.
- Analyze natural resource conflicts (involving ungulates and their critical habitat) borne out of lack of recognition of cultural differences in natural resource use priorities between stakeholders.
- Develop management and research recommendations.

The documentation of TEK was achieved by using a methodology developed jointly with the Little Red River Cree TEK experts, which led to 24 interviews and 15 map overlays containing data on ungulates and their critical habitat. The project database further comprises information on key ecosystem and wildlife relationships as understood by First Nation traditional environmental knowledge experts. The interviews were transcribed and then coded and analyzed in the qualitative data management program QSR*NUDIST. The map overlays were digitized in ArcInfo and analyzed in ArcView in connection with relevant forest inventory data. As a result I created habitat and distribution maps for all three ungulates. I also created cycle diagrams for all

[13] Includes passages from Schramm and Krogman (2002b. p. 128-129).

[14] Principally, what kind of knowledge on ungulates in the Caribou Mountains region do Little Red River Cree TEK experts hold? How can this knowledge be translated into a format useful for planners and managers?

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three species, which describe seasonal activities, food, and habitat choices. The interviews, digital original map data, habitat maps, and cycle diagrams have since been returned to the Little Red River Cree Nation to be used in their own management decisions. In the study I identified Little Red River Cree principles of natural resource use and analyzed how these resource-use principles conflict with use priorities of non-local resource users. Finally, I provided a list of recommendations for management considerations and future research.

In this dissertation I tried to find a balance between presenting TEK in as original a form as possible, and presenting it in a format useful for scientists, planners and managers. In practice, however, it is impossible to present TEK close to its original format. The main reason is that TEK is part of an oral tradition whereas dissertations are part of a written tradition. My solution was to use the original sources in their context, which sometimes led to the citation of long interview passages. In order to allow the reader to form an informed opinion I provided several detailed literature reviews and presented my results separately. The cycle diagrams and maps, which were created during the analysis, became useful tools in displaying the results in a more graphic way. I discussed the relevance of the results, particularly in the light of local natural resource conflicts and provided management and research recommendations based on my research.

This study fills some of the knowledge gaps regarding critical habitat of moose, caribou, and bison in the Caribou Mountains and surrounding regions. The results provide important information that can aide in the planning and management processes for the Caribou Mountain region. The protection of woodland caribou early spring habitat, the occasional observation of large herds of woodland caribou in the past, the differences in bison herd behavior for the three local herds – and the political implications of these observations, and the effects of human and natural disturbances on ungulate populations are just some of the highlights. It is particularly important to note that this is also the first study that systematically documents details about the Wentzel Lake and Mikkwa bison herds and their behaviour, morphological differences, and habitat selection.

The traditional knowledge experts involved in this project contributed unique observations and insights, which open new doors for future research. I believe that one of the biggest contributions that this research has to offer lies in the creation of awareness towards the environmental knowledge that still exists in Northern Alberta's Native communities. Local hunters and trappers are often overlooked when it comes to decision making over local resource use. By involving

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local knowledge experts as legitimate stakeholders (e.g. in a setting like the Caribou – Lower Peace Cooperative Forest Management Board, or in direct consultation with forestry operations), better planning of culturally and environmentally sustainable resource management for all groups interested in the boreal forest is possible.

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