Blackduck Settlement in South-Western Manitoba:

Land Use and Site Selection

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Abstract

The occupation of south-western Manitoba by Blackduck people from approximately A.D. 700 to at least A.D. 1300 is poorly understood by archaeologists. While many Blackduck archaeological sites are documented on the landscape, few have been properly excavated and interpreted.

Ray (1974) identified a seasonal round of resource exploitation for Blackduck, in which it is proposed that Blackduck people occupied the aspen parkland during the fall and winter, and returned to the boreal forest in the spring. Archaeologists have largely accepted this model and this explanation has served as the foundation of similar models of Blackduck settlement. However, recently discovered Blackduck archaeological sites in southern Manitoba challenge the general acceptance of these models.

Through an assessment of environmental variables related to site placement on the landscape, those most significantly influencing site selection are identified and used to interpret site seasonality. The research is conducted through a combined qualitative site survey and quantitative GIS evaluation.

In this study, a new model of year round Blackduck settlement in south-western Manitoba is proposed, in which Blackduck groups moved between the plains physiographic regions of south-western Manitoba in the summer and the upland physiographic regions in the winter. It is also proposed that separate groups of Blackduck people occupied the prairies and boreal forest areas. These groups interacted with one another along the aspen parkland/boreal forest fringe, where social networks were maintained and ideas and trade items were exchanged.

Acknowledgements

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Introduction

In order to meet the basic necessities of life, societies have adapted over thousands of years to new and changing environments. As environmental contexts change, societies adapt to optimize the pursuit of a desirable lifestyle. The structure of a society, the technology a society employs, and the cultural patterns a society follows are all influenced by the environment within which the society is situated, combined with existing culture. As Kroeber (1953:6) notes: "environment does not produce a culture, but stabilizes it". The cultural traditions embedded within society are not based on random attempts at maintaining a lifestyle but rather reflect a conscious decision making process to adapt to the environment (Jochim 1976). These adaptations result in economic and subsistence patterns that were sustainable on the north-eastern plains prior to the industrialized era. Evidence of the sustainability of these adaptations is visible in hunter-gatherer societies, where the environment including food and non-food resources and the physical landscape, plays a major factor in influencing cultural traditions.

Dincauze (2000:xxiv) defines the term environment as: "all physical and biological elements and relationships that impinge upon an organism". This definition stresses consideration of the interaction between individuals and the physical elements that affect an organism, but fails to adequately emphasize the dynamic cultural relationships between individuals and groups. From an anthropological perspective, the importance of these relationships cannot be overlooked. While specific and local adaptations to the physical and cultural environment are dynamic and exhibit considerable variability, there

is one constant reflected in the economic and subsistence patterns of hunter-gatherer societies: the choices and decisions made are reflections of environmental considerations. In a discussion of Cree society, Fisher (1973) finds that:

> *"Ecological considerations are of the utmost importance in determining the social and economic structure of Cree communities. Ecological considerations are tied to local plant-animal resource communities…"*

In adapting to the physical environment, hunter-gatherer societies are subject to constant change, as fluctuations in resource availability influence economic and subsistence patterns. A further element of change is introduced by the dynamic human relationships that exist between individuals and communities. This constant variability forces hunter-gather societies to rely on a mixed resource extraction strategy (Butzer 1982) involving performing more than one activity at a time, taking advantage of several localities rather than a single location, and sequential change in the activity being performed and/or the locations being exploited (Jochim 1976). In an effort to better understand these mixed resource extraction strategies and strive towards more sustainable economic and subsistence practices in the modern era, some researchers are looking towards traditional knowledge for answers (Striplen and DeWeerdt 2002).

In the pre-contact past the environment was no doubt manipulated and managed in order to provide resources, very much the same as it is today. Examples of this kind of manipulation can be seen in the deliberate burning of prairie areas (Boyd 2002) or the burning of forest patches to produce better moose hunting areas by the Anishinaabe in north-western Ontario (Davidson-Hunt 2003). A major difference is seen however, in the philosophy towards resource extraction and land management practises between the modern and pre-contact eras. In the pre-contact past, groups that lived on the land were

responsible for its governance and as such practised resource extraction strategies that were sustainable. Natural resources were harvested regularly, but only in sufficient quantities to match the needs of the local consumers of the products. In the modern era, management of the landscape is governed by corporate shareholders far removed from the environment from which they draw resources. As such, the responsibility of sensible governance of the landscape and its resources has been lost. Increasingly, researchers are advocating a return to a more responsible management of resources through the integration of traditional knowledge and modern technology. Some see the best opportunity for this type of integration in community based resource management strategies and practises (Davidson-Hunt 2003). Unfortunately, industrialized society has greatly influenced the traditional lifestyles of modern hunter-gatherer communities, making it difficult to distinguish between more traditional economic activities and those that have changed significantly. A method of studying traditional subsistence activities without the influence of modern society may be possible through the study of hunter-gatherer communities of the pre-contact past in North America.

Archaeologists and ethno-historians study many facets of pre-contact society, including the influence of the environment on society (Rogers 1963; Fitting and Cleland 1969; Syms 1977; Snortland-Coles 1979; Nicholson 1987; Flynn 2002) and the adaptations that societies make to the physical and cultural environment. Archaeologists identify cultural groups by recognizing similarities in material culture, the physical objects an archaeologist studies to make inferences about past life-ways and human-environment interactions. Members of the same cultural group have tools that are diagnostic of that culture and share similar adaptive strategies, reflected in material culture.

However, adaptations to the physical environment are not always reflected in material culture. An example of this is seen in the story of John Tanner who recalls a tale in his life when he met up with a group of traveling Ojibwa Indians in the aspen parkland. This particular group of Ojibwa was relatively new to the parkland and as such found themselves in a considerable state of starvation, not being familiar with the resources available in a new environment. Tanner, knowing that a herd of bison was nearby, took several of the Ojibwa hunters out on a hunt, but the new hunters were unsuccessful in their attempts. Tanner discovered that although the hunters were skilled in hunting other animals, they did not know which part of a bison to shoot at to successfully kill the animal. After being instructed by Tanner on where to shoot, the hunters were successful and able to procure food for themselves (James 1956:224-225). The result of this adaptation to a new environment is invisible in the material culture of the event, as would similar events be invisible in the archaeological record.

Although these adaptations may not be reflected in the archaeological record, the locations of where these diagnostic tools are found on the landscape may indicate adaptation. Examples of this kind of adaptation might be seen in the early but controversial identification of two different adaptations to the aspen parkland by the Manitoba Focus (an early name for people of the Blackduck culture). Ray notes that William J. Mayer-Oakes identified two different types of Manitoba Focus sites; bison kill sites and fishing sites. The same diagnostic tools were evident at both types of sites. Mayer-Oakes believed that this represented two different phases of the Manitoba Focus, a grassland phase and a river/lakeside phase, representing different groups of people with a common ancestry. Ray's commonly accepted explanation is that the identical diagnostic

artifacts recovered from the two different types of sites represent seasonal adaptations to resource concentrations in the aspen parkland by the same group (Ray 1972). By comparing the different site locations where these diagnostic artifacts were recovered, it can be deduced that the Manitoba Focus group, or Blackduck, took advantage of seasonal fluctuations in resource availability by practicing a mixed resource extraction strategy in which multiple resources were exploited in a scheduled seasonal round.

A Description of Blackduck

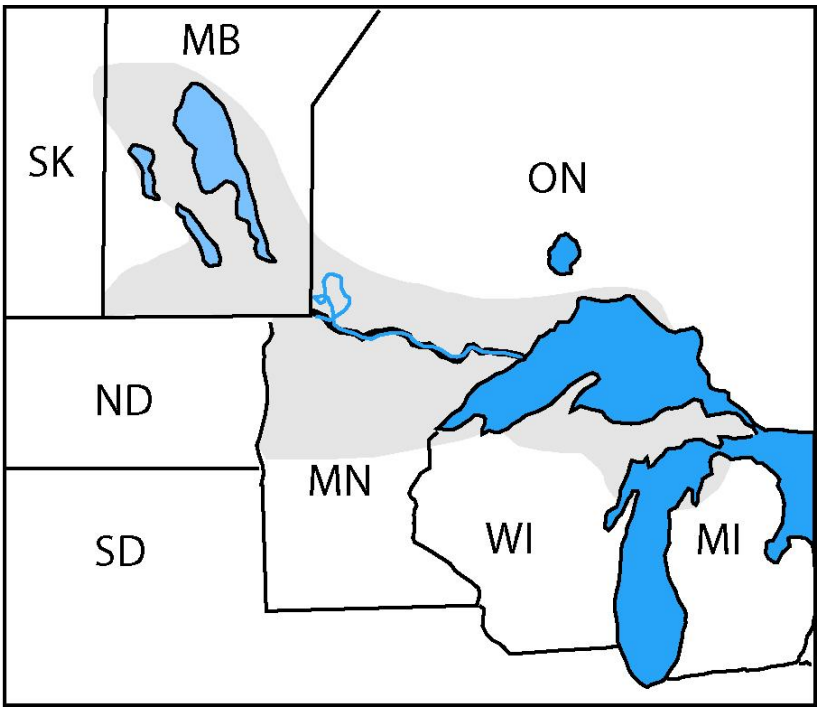

Figure 1-1. The geographical distribution of Blackduck (after Anfinson 1979:25)

The term "Blackduck" has traditionally referred to a group of sub-arctic generalized foragers (Meyer and Hamilton 1994) whose earliest sites date to between 700 and 800 A.D. in the boundary waters area of northern Minnesota (Lugenbeal 1979; Buchner, et al. 1983; Lenius and Olinyk 1990; Meyer and Hamilton 1994). The Blackduck people occupied parts of central and northern Minnesota, the aspen parkland and prairie regions of Manitoba, and the boreal forest of central Manitoba and north-western Ontario (Figure 1-1). Although several sites have been identified in the boreal forest of north-eastern Saskatchewan, these sites are relatively few in number and are

considered to be outside the commonly accepted geographic range of Blackduck (Meyer, Hanna and Frey 1999). While Blackduck sites have been documented in south-western Manitoba, few are mentioned in the published literature aside from the Stott site (Hamilton and et al. 1981). The Province of Manitoba's Historic Resources Branch database indicates that Blackduck occupation of south-western Manitoba is more significant than indicated in the published literature and recent research indicates that in at least some instances, Blackduck people in south-western Manitoba were practicing a specialized form of communal bison hunting (Hamilton and et al 1981; Graham and Hamilton 2002; Graham and Nicholson 2003). According to Syms (1977) evidence of Blackduck occupation north of Lake Winnipeg is insignificant, but continued mitigation efforts arising from developments in the north are leading to the discovery of more Blackduck archaeological sites (Riddle, personal communication, 2004). People making Blackduck pottery persisted until the early historic period in the boreal forest north of Lake Superior (Meyer and Hamilton 1994; Nicholson 1996), but Blackduck pottery has yet to be recovered in association with historic materials in Minnesota (Lugenbeal 1979). Additionally, there is no evidence of Blackduck pottery being produced by people occupying the prairies of southern Manitoba after 1300 A.D.

Blackduck Ceramics

Blackduck archaeological sites are frequently associated with triangular or plains/prairie side-notched projectile points (Figure 1-2). Unfortunately, these styles of projectile points were manufactured and used by several Late-Woodland pre-contact cultural groups and as such are not necessarily indicative of Blackduck cultural affiliation at an archaeological site.

The faunal material recovered at Blackduck archaeological sites varies depending on the activity performed at sites. As mentioned earlier, there are bison kill sites and fishing sites (Ray 1972), as well as small campsites with less obvious functions. The evidence for these different types of activities taking place is often found in the faunal material associated with the archaeological site and the faunal materials recovered can be used to infer seasonality and site function. However the faunal assemblage cannot be used to confirm a Blackduck cultural affiliation at an archaeological site as several pre-contact groups in southern Manitoba adopted similar subsistence strategies.

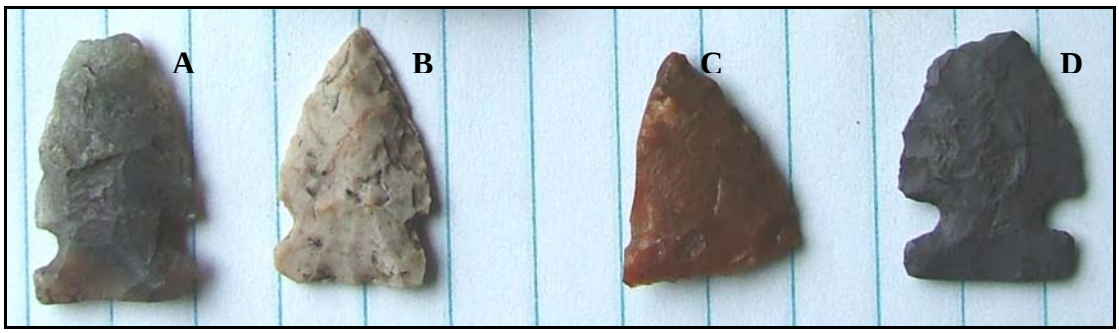

Figure 1-2. Projectile points from the Neufeld collection, Marais River Site (DgLh-5). Late Plains/Prairie projectile points (A, B, D) and a Triangular Un-notched projectile point (C).

The only aspect of material culture that can definitively be used to identify a Blackduck cultural affiliation are the ceramics recovered at a site (Figure 1-3). Ongoing debate between archaeologists over the exact manufacturing and decorative techniques associated with Blackduck ceramics have resulted in a small amount of controversy, but there are several general patterns resulting in a widely accepted typology for Blackduck ceramics. These characteristics are discussed in more detail in Chapter Three.

Models of Blackduck Settlement

For several decades seasonal resource exploitation models such as those proposed by Ray (1974), Syms (1977), Pettipas (1980), and Nicholson (1987) have been accepted as a viable means of explaining Blackduck land use and site selection strategies in Manitoba's aspen parkland. However, the Blackduck occupation of southern Manitoba has never been studied in any detail and these models remain untested in terms of their specific applicability to Blackduck.

Based on an evaluation of resources, a seasonal cycle of resource exploitation seems appropriate for explaining the occupation of both the aspen parkland and the boreal forest, but the generally accepted models in the published literature may not be applicable to Blackduck. Alternatively, these models may apply to certain periods during the Blackduck culture history, but not to other periods. Ray's model (1974), which in part contributed to Syms' work (1977), was based largely on ethnohistoric accounts of the Assiniboine and Cree, rather than on archaeological data. The ethnohistoric record provided by early explorers recorded the movements of groups after they had already been affected by the fur trade and had adapted to a certain degree to the presence of Europeans in both the boreal forest and the aspen parkland. Very little archaeology was incorporated into Ray's model, which is largely based on historical data that is assumed to reflect the movement of groups of people on the landscape in the pre-contact era. The danger of correlating early historic data with pre-contact patterns has been noted by Bamforth (1987).

The model proposed by Ray indicates that the aspen parkland of Manitoba would only have been occupied by the Blackduck people during the cold season, with the maximum

period of occupation extending from late fall and to early spring. When individual Blackduck sites have been studied in the aspen parkland, there has been a tendency to assign the seasonality of the site based on this model, rather than testing the model or developing a new model. Consequently, Ray's and Syms' models remain untested. Many Blackduck sites in southern Manitoba are located a considerable distance from the boreal forest in unsheltered environments and indicate that the occupation of southern Manitoba by Blackduck people may also have occurred during the warm season.

Figure 1-3. A Blackduck rim sherd from the Lord Site (DkLg-1) on the Red River.

An analysis of the resources available in the aspen parkland suggests that in early spring bison begin to move farther out onto the prairie and away from the forested areas preferred for pre-contact settlement. This period has been documented as a time of uncertainty for pre-contact hunter-gatherers as bison movements and weather patterns were unpredictable. However, Smith (1988) believes that the importance of fish in the pre-contact diet as a reliable food resource has been underestimated. Smith suggests that in the northern Plains, fish would have been a highly valued and predictable resource, and that the best times for fishing in the northern Plains would have been just as bison movements were becoming unpredictable. Given the abundance of this resource, it may be that Blackduck people had no reason to abandon the aspen parkland in the spring and return to the boreal forest.

Purpose and Objectives

The purpose of this research is to examine Blackduck settlement in south-western Manitoba, focusing on land use patterns and environmental variables influencing site selection. The research will be used to identify the cultural adaptation to the physical landscape adopted by Blackduck people when they moved into south-western Manitoba, and compared with the documented Blackduck cultural adaptation to the Great Lakes Forest and Boreal Forest areas to the east.

The study of how an archaeological culture adapted to a new environment can be applied to studies of modern cultural groups faced with adapting to a changing environment. Understanding how people interpret their cultural and physical environments is critical to resolving conflicts surrounding natural resource management and developing suitable management strategies.

Other archaeologists searching for Blackduck archaeological sites, particularly in south-western Manitoba, will be able to use the results of this study of land use patterns. Further, the results of this study can be incorporated into the construction of predictive models, not only helping archaeologists locate sites but also potentially protecting undiscovered sites from being impacted by residential, commercial, and recreational activities. The policy implications of a predictive model are particularly important in the context of large-scale developments that have a significant impact on the environment and a potential to disturb numerous archaeological sites.

The study of environmental variables associated with Blackduck archaeological sites in south-western Manitoba will be used to achieve the following objectives:

1) The geographical distribution and characteristics of Blackduck archaeological sites in south-western Manitoba will be examined through individual site assessment.
2) Blackduck culture and settlement patterns in south-western Manitoba will be more clearly understood.
3) Blackduck land use patterns in south-western Manitoba will be compared with land use patterns in the archaeological and anthropological literature.
4) A new model of Blackduck settlement in south-western Manitoba will be proposed.

The research methods employed are interdisciplinary. The literature review is based largely on the archaeological literature but also reviews the physiography of south-western Manitoba. The individual site assessments are based on resource and landscape assessment from an archaeological perspective and are facilitated by the use of a GIS (Geographic Information System). The data used in the individual site assessments are the product of several independent disciplines. The results of the research are useful for many disciplines, contributing not only to anthropology and archaeology but also to the study of human geography.

Chapter Two:

The Physical and Biological Environment

Climate

The climate of south-western Manitoba is highly variable, with a distinction between four seasons based on meteorological activities. The following information is taken from McGinn's (1988) analysis of the data collected from two weather stations on the outskirts of the city of Brandon for the period from 1951-1980. Although specific climate and temperature measurements across the study area may differ slightly from those recorded at Brandon, meteorological data from Brandon is assumed to be fairly representative of the general climate of south-western Manitoba (McGinn, personal communication, 2005).

The spring season in south-western Manitoba is generally regarded as a period of transition, beginning sometime in early April and ending in late May. Over the course of this period, mean daily air temperatures increase from 3°C to 20°C. Approximately 80% of the precipitation during this time period falls in the form of rain, recharging the soil moisture content following a relatively dry winter season. Although the wind direction is subject to frequent change, the prevailing winds are from the east-northeast averaging 20 km hr^{-1} but frequently gusting to 80-90 km hr^{-1} (McGinn 1988:43). Daily variations in spring weather conditions are considerable and likely created a period of uncertainty for pre-contact hunters and gatherers. As temperatures increased, cold weather forage became available in the grasslands of south-western Manitoba, prompting the move of bison from the sheltered uplands into the grasslands.

Summer is generally defined as the frost-free season of the year extending from late May through mid-September in south-western Manitoba, although incidences of frost have been recorded in each summer month. Summer in south-western Manitoba is characterized by long daylight hours, comfortable average daily temperatures of 25°C, and relatively low humidity, although 45% of the annual precipitation falls during the summer months (210-220 mm of rainfall and hail) (McGinn 1988:45). Uncommonly wet or dry conditions can occur in any summer month but most of the summer precipitation falls during June rather than in July or August. Prevailing winds are from the west or northwest and are of a relatively low average velocity, but generally unstable atmospheric conditions during the summer cause frequent shifts in wind direction. This instability results in severe thunderstorms characterized by high wind speeds, precipitation, and lightning, potentially causing severe damage to natural environments. Although lightning likely started numerous prairie fires that may have been hazardous to the inhabitants of the prairies, these fires at the same time served to maintain the grasslands that were the main forage for bison in the area. The climate of south-western Manitoba during the summer months is presumed to have been relatively comfortable for pre-contact hunter-gatherers.

Similar to the spring season, the autumn was a period of climatic transition in south-western Manitoba. Beginning in early or mid-September and ending in late October, average daily temperatures gradually dropped to 0°C. During this period most of the precipitation falls as rain, although there is usually at least one snowfall during October. Wind speeds are highly variable during the autumn, prevailing from the west and northwest. During the late autumn, hunters and gatherers likely observed the return of

bison from summer ranges to the south and west of Manitoba as cold weather forage rejuvenated.

In south-western Manitoba winter temperatures are consistently below $0^{o}C$, with an average daily temperature of less than $-15^{o}C$. From November through April south-western Manitoba receives an average of 20 mm of snow per month, with most of the accumulation occurring in a few major events. In addition to snowfall, one or two days of freezing rain are recorded each month during the winter. Prevailing winds are from the west or the northwest averaging 16 km hr^{-1} but can gust up to 80 km hr^{-1}. Records regarding the frequency and severity of blizzard conditions are unavailable but 17 to 28 blowing snow days are recorded each winter where high wind speeds and snow combine to reduce temperatures and visibility. The winter climate in south-western Manitoba is harsh and relatively inhospitable in the grassland areas but the shelter afforded by the forested upland areas provided localized respite from the prevailing winds.

The climate of south-western Manitoba is highly variable in all seasons. While the weather in the summer months is relatively comfortable, the constant threat of thunderstorms and prairie fires would have created unpredictable hazards. Winter is characterized by frequent precipitation and cold temperatures, which would have made travel across the landscape treacherous. The spring and autumn seasons are highly unpredictable, frequently exhibiting characteristics of the summer and winter seasons. During the spring and autumn the unpredictable nature of the weather would have created periods of uncertainty for hunters and gatherers.

Surficial Geology

The physical geography of south-western Manitoba exhibits considerable variability across the study area. The area is composed of a mix of glacial lake plain with upland glacial end moraine complexes and glacial spillways standing in dramatic contrast to the surrounding level prairies. These uplands stand out as isolated "islands" of forest vegetation and their unique physiography is exemplified by their identification as unique physiographic regions in southern Manitoba. In total there are eight separate physiographic regions within the study area, each identified by unique geomorphic histories and unique topographic expressions.

Location

The study area encompasses the territory from the Red River Valley west across the bottom of former glacial Lake Agassiz to the Manitoba/Saskatchewan border, and north from the Canada/United States border to the Assiniboine River. Although much of south-western Manitoba is considered to be aspen parkland, mixed grass prairie was largely present on the glacial till-plains of southern Manitoba while tall grass prairie covered the glacial Lake Agassiz basin (Wiseman, personal communication, 2005) (Figure 2-1).

The physical environment of the selected study area is sufficiently different from the adjacent biomes to necessitate a different cultural adaptation to the environment. To be clearer, the dominant cultural adaptation within the study area and in the adjacent biomes is hunting and gathering, but the expression of this adaptation is necessarily different between the geographic regions due to the general differences in geography. The ecotone

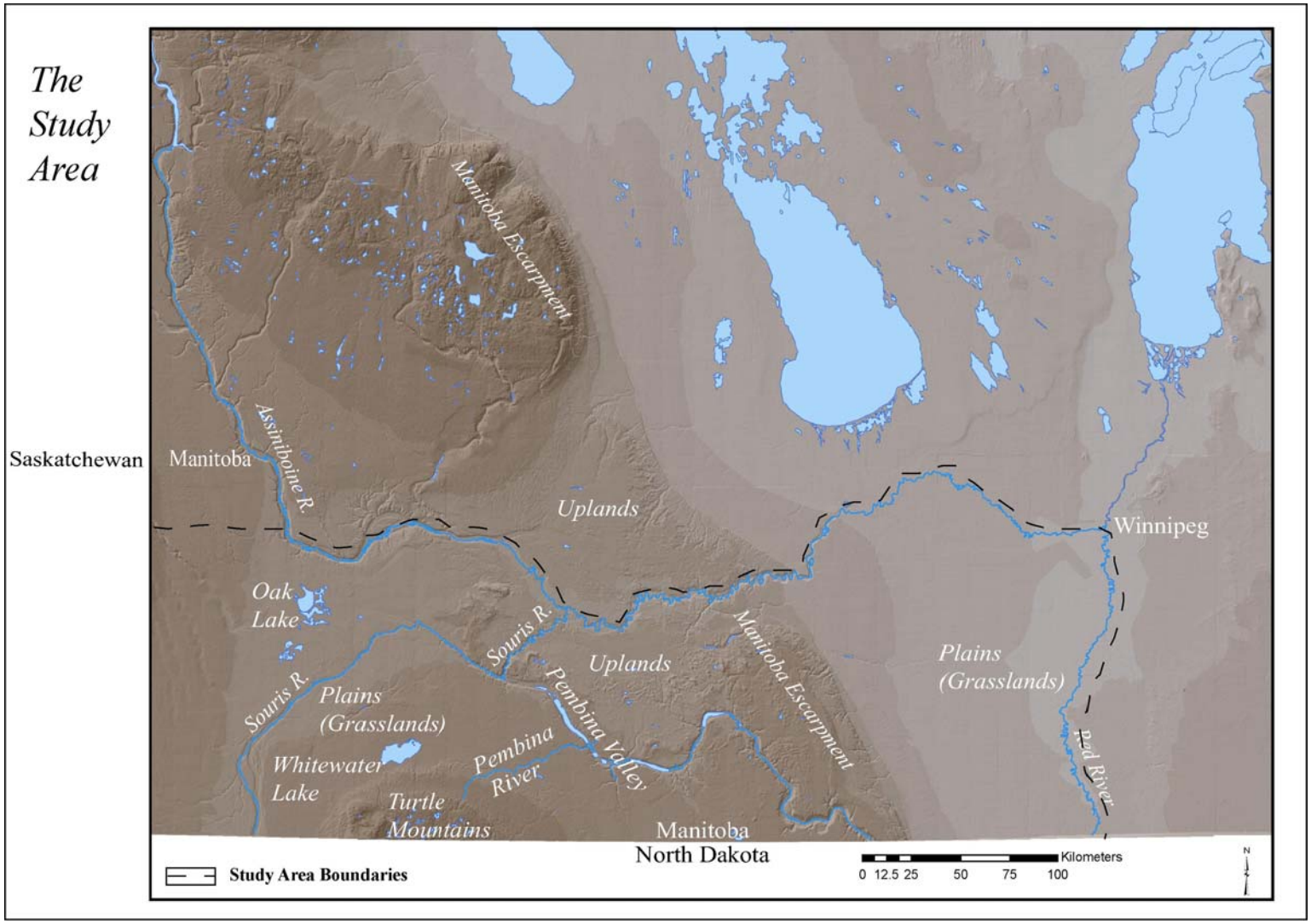

Figure 2-1. The study area encompasses the area from the Red River west to the Saskatchewan border and from the North Dakota border north to the Assiniboine River.

of the aspen parkland in the study area is noticeably different from land north and east of the study area where the boreal forest biome significantly influenced cultural adaptations. Similarly, the land south and west of the study area more closely approximates an environment suitable for a purely grassland adaptation. Blackduck occupants of southern Manitoba had the opportunity to exploit either forest or grassland environments but focused exclusively on neither. Rather, Blackduck occupants of south-western Manitoba practised a diversified subsistence pattern reflecting proficient adaptations to a diversified ecotone representing elements of both major adjacent biomes and higher biodiversity than either biome.

Physiographic Features

Several physiographic features within the study area stand out as unique elements, often corresponding to the identification of unique physiographic regions. These features influenced pre-contact human settlement and travel across southern Manitoba and as such are given consideration here. A brief description of each is provided, focusing on the relevance of each to pre-contact hunters and gatherers.

In the pre-contact era, water resources were an important consideration, both for the selection of site locations and for their use as travel routes (Figure 2-1). The importance of water resources as a source of drinking water is obvious; equally as important is water as a source of other important resources. Lakes and rivers provide predictable amounts of freshwater fish, particularly during spawning seasons, as well as providing homes to several aquatic mammals including beaver and muskrat. Non-aquatic animals were also attracted to water bodies as a source of drinking water, providing ambush opportunities

for pre-contact groups. Several types of aquatic vegetation have been documented as resources important to pre-contact groups (Shay 1980), and riparian zones along water bodies act as ecotones, providing habitat for animal and plant species of adjacent areas and other species that are unique to the riparian zones proper. The importance of water bodies can further be seen in their use as travel corridors and waypoints, linking different resource areas and directing travel across the landscape.

Upland areas were also important to pre-contact groups in south-western Manitoba. Generally, the uplands are isolated and are unique from the surrounding prairie, both in terms of topography and the variety of plant and animals species found in the uplands. Examples of uplands in south-western Manitoba include the Turtle Mountains, the Tiger Hills, and the Pembina Mountains (Figure 2-2). These areas contrast significantly with the surrounding plains and provided shelter, firewood, and unique opportunities for hunting and gathering. The exploitation of these unique environments likely occurred as part of a seasonal round where hunters and gatherers made scheduled visits to different areas as part of a yearly schedule to take advantage of varied resources.

The Souris River: The headwaters of the Souris River are found in south-eastern Saskatchewan where the river flows south into North Dakota before turning north again and entering Manitoba in the southwest corner of the province (Figure 2-1). The discharge of the river is heavily influenced by local topography across the province. In the southwest corner, the river is identified as one of the few major water sources in a well-drained plains area. There are several tributaries to the river in the southwest corner of the study area but most of these are intermittent water sources. In the southwest corner

of the province the river meanders within a broad, shallow glacial spillway. The river trends north and east for approximately 100 km across the Souris Plain and glacial Lake Hind basin until it reaches the town of Souris, Manitoba, where the river turns and flows through the Pembina Valley towards the south and east. From the town of Souris, the Souris River passes southeast for approximately 35 km through the Tiger Hills glacial end moraine before turning at the elbow of capture of the Souris River in the Pembina Valley. At the elbow, the Souris River turns northeast again for approximately 30 km before emptying into the Assiniboine River (Figure 2-1).

The Souris River was as important to pre-contact groups as it is to the contemporary residents of southern Manitoba for its resources. To pre-contact groups the Souris River was a valuable and predictable source of fresh water and freshwater resources, including fish, freshwater clams, and aquatic mammals. Furthermore, the Souris River was attractive to terrestrial mammals and as such, areas along the river were attractive hunting locations. The Souris River was a particularly important feature in the Souris Plain where it represents one of the only major water sources and has created a riverine habitat in the middle of the grasslands. As important as the Souris River was for its resources, it was likely equally important for its function as a travel corridor. The watercourse traverses a large portion of the province, connecting the southwest corner of the province with the sandhills in the glacial Lake Hind basin and the town of Souris where pre-contact travellers could have moved northwest along Plum Creek to Oak Lake. Following the Souris River southeast would bring travellers into the Tiger Hills and the Pembina Valley, and continuing along the river past the elbow of capture would connect travellers with the Assiniboine River. These physiographic features were important to pre-contact

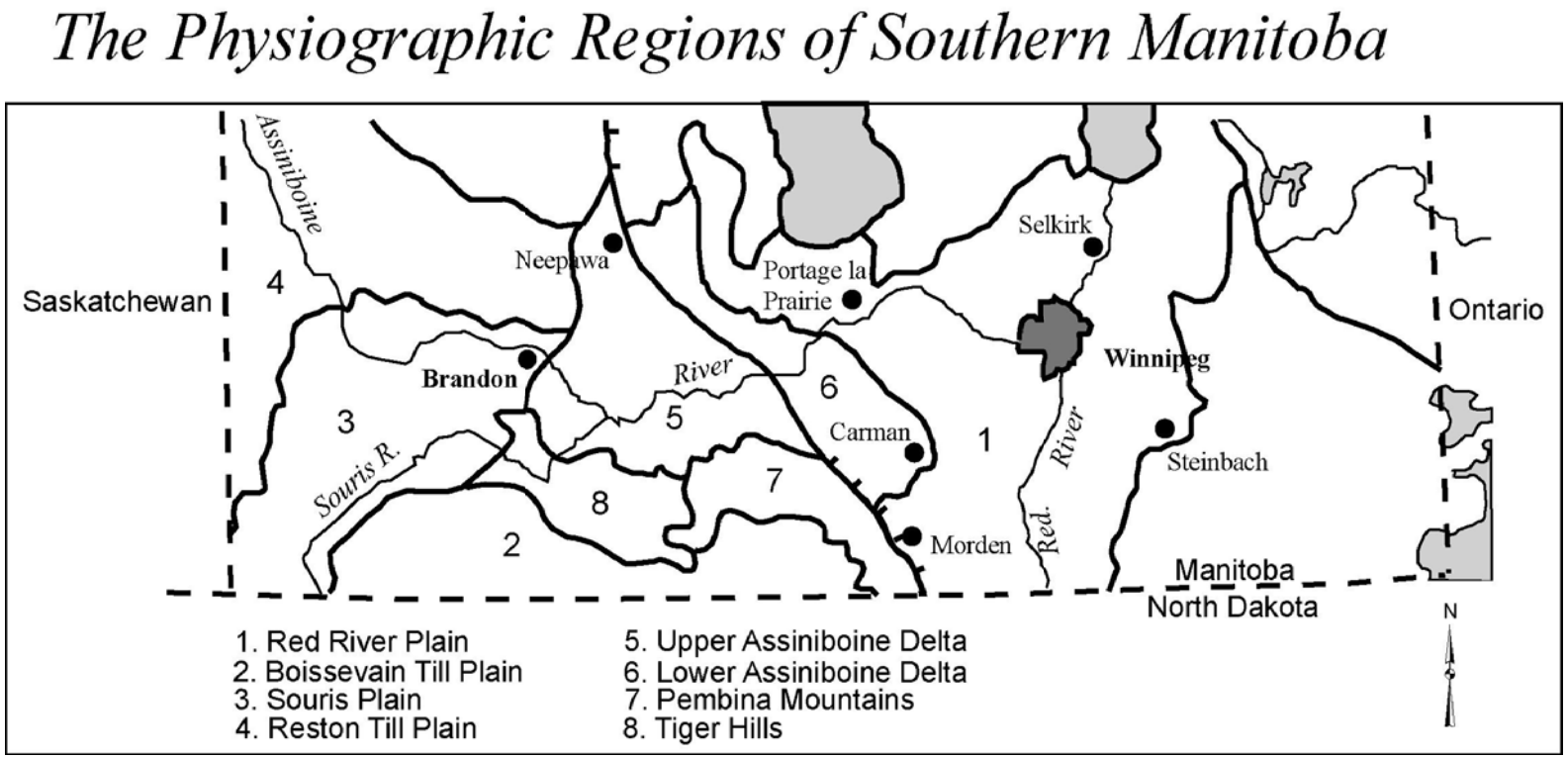

Figure 2-2. The physiographic regions of southern Manitoba (after Weir 1960).

groups in south-western Manitoba, providing several different opportunities for resource exploitation in varied environments.

The Sandhills of South-western Manitoba: Since the early 1990's archaeological research beginning in the Makotchi Ded-Dontipi area near the town of Lauder, Manitoba has shown that the sandhills in the glacial Lake Hind basin were important to pre-contact settlers. A high water table combined with drifting sand sheets in the mid-Holocene led to the creation of several dune fields, where it has been shown that there was an increased density of pre-contact archaeological sites since the period of dune stabilization approximately 3,500 B.P. (Graham and Nicholson 2003; Graham and Running IV 2003). The density of archaeological sites within the sandhills is explained by the creation of interdunal wetlands resulting in a rich and varied environment between the dunes (Boyd 2000) (Figure 2-3). The moisture gradient radiating out from these wetlands creates several recurring ecotones of habitat for a wide variety of plants and animals, or resources for pre-contact inhabitants. Furthermore, the sandhills stand out as isolated "islands" of forest relative to the surrounding grasslands, offering fuel for fires and shelter from inclement weather. The sandhills are accessible from the Souris River or the southern shores of Oak Lake.

The Assiniboine River: The importance of the Assiniboine River to pre-contact groups occupying and travelling through south-western Manitoba was significant. The Assiniboine River is important not only for its resources but also for its function as a travel corridor. The river flows south along the western edge of the Riding, Porcupine, and Duck Mountains on the west side of the province. For the purposes of this study, the

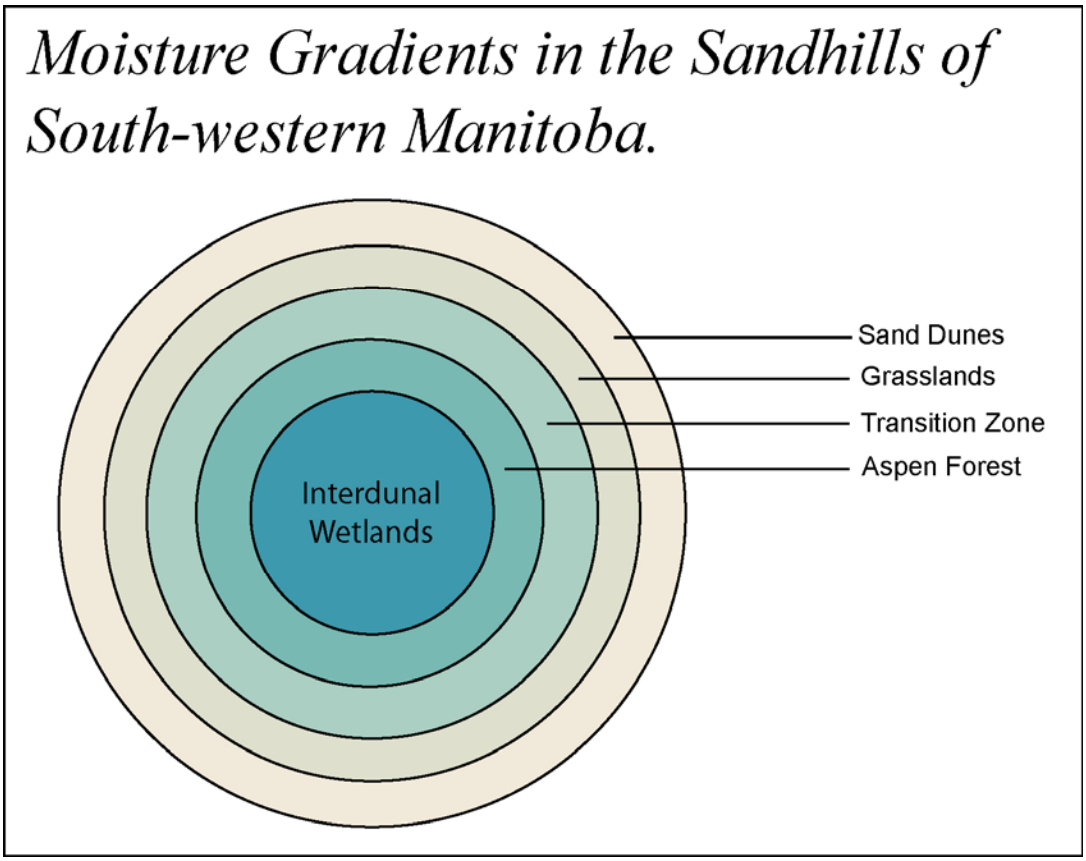

Figure 2-3. Interdunal wetlands in the sandhills of south-western Manitoba create several ecotones over a relatively short distance. The concentric rings of progressively drier soil create habitat for a wide variety of plants and animals.

importance of the Assiniboine River as a physiographic feature is from where it enters the Souris Plain, turning from south to east across the province. The river passes through several physiographic regions in south-western Manitoba, including the Souris Plain near Brandon, Manitoba; the Upper Assiniboine Delta; the Lower Assiniboine Delta west of Portage La Prairie, Manitoba; and the Red River Plain from Portage La Prairie east to Winnipeg (Figure 2-1). These physiographic regions are all characterized by different landscapes and resources and the importance of the river to pre-contact groups was probably influenced by the surrounding landscape. Similar to the Souris River, the Assiniboine River was important to pre-contact groups as a source of water, fish, and

other fresh water resources, and was also important for its function as a travel corridor connecting the eastern and western ends of the study area.

The Turtle Mountains: The Turtle Mountains lie at the southern edge of the study area, on the Boissevain Till-Plain along the Canada-U.S. border, where the elevation of the mountains causes them to stand out against the flat to rolling expanse of the surrounding prairie (Figure 2-1). According to Bamburak (1978), the Turtle Mountains were part of the general mid-continental uplift during the Pleistocene era and represent an outlier of the Missouri Coteau. The upland forested areas provided unique subsistence opportunities for pre-contact occupants of south-western Manitoba.

Although the Turtle Mountains were dramatically affected and reworked by past glacial activity, the climate of the mountains has remained relatively stable for the last 4,000-5,000 years. During this period there have been alternating warm/dry and cool/wet episodes causing variance in the vegetation and biota of the Turtle Mountains, but the overall composition of the area has remained the same (Carmichael 1981).

The Turtle Mountains rise approximately 240 m (800 ft) (Eilers, Hopkins and Smith 1978:3) above the surrounding prairie, creating a local climate that is cooler with a lower evaporation rate and increased precipitation (Eilers, et al. 1978; Carmichael 1981). The lower slopes of the mountains are covered with grasslands, with an increasing change to forest vegetation as elevation increases. The upper forested areas are composed of deciduous trees and shrubs, with an understory of herbs and grasses. The availability of animal food resources for pre-contact groups in the Turtle Mountains is similar to the resources available in the surrounding prairies, with a few notable additions. Carmichael

notes that “antelope, deer, elk, buffalo, rabbits, gophers, coyotes, waterfowl, muskrats, skunks, badgers” would have been present in the surrounding prairies, but that in the Turtle Mountains “moose, caribou, beaver, bear, porcupine, otter, and lynx” can all be added to the resource list (Carmichael 1981:30). The presence of these additional species provides unique subsistence opportunities for pre-contact groups in south-western Manitoba.

In addition to the unique animal species found there are several other advantages provided by the Mountains. The Turtle Mountains are located directly south of the Pembina River, providing access to a number of important areas in south-western Manitoba including the Pembina Valley, the Tiger Hills, and the Souris River. The function of the Turtle Mountains as a destination may have been important, as from this vantage point much of south-western Manitoba is visible. In addition to other topographic features on the landscape, grazing bison herds on the plains below would have been visible. The Turtle Mountains also offer shelter from inclement weather for pre-contact travelling groups, creating an excellent winter occupation area.

The Turtle Mountains were important to pre-contact groups in south-western Manitoba because of the unique opportunities they provided. Similar to other upland localities within the study area, the Turtle Mountains stand out as an isolated island of unique topography and opportunity when contrasted with the surrounding prairie.

The Pembina Valley: Along the south-western flank of the Tiger Hills lies the Pembina Valley (Figure 2-1), marking the boundary between the Tiger Hills and Boissevain Till Plain physiographic regions. Formed as a glacial spillway, the Pembina Valley was the

outlet for various glacial lakes in the past, including glacial lakes Souris, Hind, and Brandon, all eventually draining into glacial Lake Agassiz (Stewart 1975). Pelican Lake is the most notable feature in this part of the Pembina Valley, but the valley actually has its beginnings further northwest near the town of Souris, Manitoba. From Souris, the valley courses southeast through various chain lakes to Rock Lake, where the course of the Pembina River turns northwards towards Swan Lake. From Swan Lake the valley again turns southeast and enters North Dakota at Windygates. The total length of the Pembina Valley is estimated to be approximately 240 km (150 mi) (Stewart 1975), and on average 61 m (200 ft) deep, but reaches depths of 152 m (500) ft in some areas (Stewart 1975). The sides of the Valley vary from steep to gently sloping depending on the nature of the bedrock that the watercourse has cut through.

Stewart (1975) notes that many archaeological sites can be found along the Pembina Valley and that the valley has a long history of human occupation. Stewart writes that sites are:

> *scattered along the whole length of the Valley, especially near Rock Lake. Here south-facing slopes provided sheltered winter camp sites, and the nearby Tiger Hills provided good hunting grounds and high hills for look-out points, for ceremonials, and for burials.* (Stewart 1975:4)

As a physiographic feature on the landscape, the Pembina Valley was important to pre-contact inhabitants. As a significant feature, the Pembina Valley provided several important resources to pre-contact inhabitants in south-western Manitoba. The bottom of the Valley is home to both the Souris and Pembina Rivers and the floodplains associated with these watercourses, and the sheltered nature of the valley bottom created an excellent wintering ground for both people and animals. Many types of flora and fauna

are observed in the Pembina Valley and adjacent Tiger Hills that are not observed in the surrounding grasslands in significant concentrations. Stewart (1975) notes that many different species of animals have increased and decreased in abundance since the area was intensively settled. Among the species that have increased Stewart notes deer, racoon, beaver, porcupines, and fox. Aside from the obvious decimation of the bison population, Stewart notes that there are fewer coyotes than in the earlier part of the century. In the pre-contact era, chronic prairie fire combined with constant grazing by bison herds maintained the grassland areas at the expense of forest land. With the advent of Euro-Canadian fire suppression the aspen forest has greatly increased its expanse, an effect felt by animal species as well as settlers. In his review of early surveyors' notes of the region, Stewart finds that "Only the valley and deeper coulees were wooded" (1975:5).

Physiographic Regions

Much of the forthcoming analysis of settlement patterns and the evaluation of environmental variables in this work are classified by physiographic regions. The identification and naming of physiographic regions is consistent with the regions used by Manitoba's Historic Resources Branch and follows the outline of Weir (1960) (Figure 2-2).

The Red River Plain: The Red River Plain marks the area formerly occupied by glacial Lake Agassiz and is bounded within the study area by the Red River on the east, the Manitoba-North Dakota border on the south, the Pembina Mountains and Lower Assiniboine Delta on the west, and the Assiniboine River on the north (Figures 2-1, 2-2).

The glacial lake bottom of the Red River Plain is characterized by flat to very gently rolling prairie and clay rich soils, and would have been covered by tall grass prairie vegetation in the pre-contact period. Fresh water sources are few and most forest vegetation would have been limited to the areas surrounding pothole sloughs, marshes, and the banks of the major watercourses. Although the tall grass prairie on the Red River Plain was frequently ravaged by recurring prairie fires it supported large bison herds in the pre-contact past.

The Upper and Lower Assiniboine Deltas: The Upper and Lower Assiniboine Deltas were formed when glacial meltwaters flowing through the Assiniboine spillway into glacial Lake Agassiz, depositing vast quantities of gravel, sand, and silt. The Upper Assiniboine Delta, within the study area, stretches from just east of Brandon, Manitoba to an area along the Assiniboine River approximately 35 km south-west of Portage la Prairie, Manitoba. (Figure 2-2). Blackduck occupation of the Upper Assiniboine Delta is relatively sparse compared to occupation of the adjacent Lower Assiniboine Delta, but this may be related to the Lower Assiniboine Delta's proximity to the Red River Plain. Furthermore, the Upper Assiniboine Delta occupies a comparatively small percentage of the study area. The drainage patterns of the Upper Assiniboine Delta are similar to the Lower Assiniboine Delta resulting in substantially more forest vegetation than in the Red River Plain or the adjacent Souris Plain.

The Lower Assiniboine Delta is a relatively small physiographic region distinctive from the Red River Plain in large part because of its past geomorphology. The soils of the lower Assiniboine Delta are coarse sands underlain in areas by the clays of the Red River

Plain. Where the clay prevents rapid drainage the water table of the Lower Assiniboine Delta is higher than that of the Red River Plain, and this has resulted in the presence of substantially more forest vegetation than in the adjacent plain, particularly in the areas surrounding the numerous pothole sloughs. The increased soil moisture has promoted the growth of forest vegetation and in part preserved existing forest vegetation by lessening the catastrophic effects of prairie fires. The result of these topographic variables created what is characteristically known as aspen parkland vegetation. The traditional concept of the aspen parkland is a combination of forest and open prairie representing a transitional ecotone between the plains and the forested uplands of southwest Manitoba. In the pre-contact past, a diversity of plant and animal species were found in the Lower Assiniboine Delta among the interspersed forest and prairie areas. The forested areas provided shelter for people and bison during the cold season and provided an ample supply of firewood.

The Boissevain and Reston Till Plains: Both the Boissevain and Reston Till Plains are essentially composed of ground moraine, with gently rolling topography, although each is punctuated by several features. Elson (1954) defines ground moraine as:

> *Till that was deposited during the retreat of the ice margin consists mainly of lodgement till which may have a layer of superglacial till above it…topography is undulating to gently rolling and has numerous shallow undrained depressions (sloughs). In Manitoba, the local relief varies from 1 to 8 feet.* (Elson 1954:5)

Altogether, this is an accurate description of the Boissevain and Reston Till Plains. A key feature of the Boissevain Till-Plain is the Pembina River, connecting pre-contact occupants of the plain with the Pembina Valley from which several key travel corridors and physiographic features of south-western Manitoba are accessible. The Boissevain

Till-Plain is gently rolling (Eilers, Hopkins and Smith 1978:4), consistent with Elson's (1954) definition.

Only one Blackduck archaeological site is documented on the Reston Till Plain in the Historic Resources Branch database. Similar to the Boissevain Till Plain, the area is covered with ground moraine, but in this area the topography is more undulating than smooth. The area is noted for its poor drainage and the only notable waterways of the Reston Till Plain within the study area are intermittent proglacial streams formed in small, shallow, ice-marginal valleys. These features include the Stoney, Jackson, Graham, and Gainsborough creeks (Eilers, Hopkins and Smith 1978:4).

In large, both plain areas are covered by grasslands, with forest only present along river valleys or in the Turtle Mountains. During the warm season the plains areas supported large herds of bison, antelope, and other grassland species, but during the cold season little to no shelter would have been available. The primary sheltered areas on the Boissevain Till Plains would have been the Turtle Mountains and the Pembina River Valley, while on the Reston Till Plain temporary shelter may have been sought in the small creek valleys. In either instance, occupation of the plains proper would have been extremely difficult during the cold season.

The Souris Plain: The Souris Plain includes the area formerly occupied by glacial Lake Hind and the Lauder Sandhills. Characterized by flat or rolling expanses of grassland, perennial fresh water and shelter are best found in the forested river valleys. The major physiographic features within the Souris Plain are the Souris River and the Lauder Sandhills of south-western Manitoba. In the past, the Souris Plain supported large

populations of bison and other grazing animals in its grassland areas and supported smaller numbers of forest dwelling animals along waterways and in the sandhills.

The Tiger Hills and Pembina Mountains: Essentially products of identical geomorphology, the Tiger Hills and Pembina Mountains represent the major end moraines produced during periods of glacial stagnation in south-western Manitoba. The following definition of an end moraine is taken from Elson (1954):

> *End Moraine: Deposited at the stationary edge of an ice sheet when the melting is equal to the out-flow, end moraine consists of lodgement till, superglacial till and ice-contact stratified drift. Topography is rough with many knobs and kettles and the slopes are steeper than in ground moraine. The relief ranges from 8 to 100 feet. Ideally end moraine takes the form of a ridge up to 100 feet high and from several miles to a few hundred feet in length.* (Elson 1954:5)

Together, the Tiger Hills and Pembina Mountains combine to form the southern extent of the Manitoba Escarpment. Bounded on three sides by lake plains and on the east by the Pembina Mountains, the Tiger Hills stand out as an isolated upland in the midst of the prairies (Nicholson, et al. in press), while the Pembina Mountains lay adjacent to the Lower Assiniboine Delta and Red River Plain. The constant re-working of the environments by various erosion processes has resulted in the creation of a large number of recurring microhabitats, ranging from open grasslands to closed forest canopy (Nicholson, et al. in press). Several different varieties of animal species are noted including animals found in both the grasslands and forested areas. Both upland areas played an important role in the seasonal resource exploitation schedules of pre-contact groups in south-western Manitoba. Although fresh water resources are relatively few

within the Tiger Hills and Pembina Mountains, the forested areas of the uplands provided an ample supply of firewood and opportunities to seek shelter from winter storms.

Faunal Resources in the Boreal Forest, Aspen Parkland, and Grasslands

Land use and settlement patterns have been studied by several researchers with relation to the biomes of the boreal forest, aspen parkland, and grasslands of Manitoba (Ray 1974; Syms 1977; Nicholson 1987). Studies of the land use patterns employed by different groups in the pre-contact and proto-historic periods in these biomes, combined with an assessment of the resources available to pre-contact groups inhabiting the study areas can provide inferences towards land use patterns and hence, enable a prediction of where archaeologists may look for undiscovered pre-contact occupations.

Boreal Forest Resources: Resources in the boreal forest are diffuse (Nicholson 1987) compared to those of the aspen parkland (Ray 1974). Although Rogers (1963) considers bear to be an exploited food resource, Syms (1977) identifies moose and woodland caribou as the only two species of large game available in the boreal forest. Rogers (1983:93) further notes that the more northerly "Indians" often killed many caribou in a single event. Particularly in the southern boreal forest, people exploited many species of smaller game animals. Marten, lynx, porcupine, wolverines, fisher, otter, mink, muskrat, beaver, waterfowl, wild rice, and fish are listed as resources that could have been procured by boreal forest dwellers. Rogers (1963) emphasized the importance of hare to the diet of a historic Cree group living near Round Lake, and further adds grouse to the list of available species. Furthermore, Rogers (1963) found in his study that there was little in the way of vegetal foods in the diet. Syms (1977) focused the majority of his work on the aspen parkland and as such there is a bias in the amount of detail provided

with regard to seasonally available faunal resources. Still, his summary of the resources available in the adjacent boreal forest and grasslands is useful. Syms found that in the spring, concentrated boreal forest resources were limited to the southern areas of the boreal forest and included migratory waterfowl, spawning fish, and woodland caribou. In the spring, the boreal forest in general lacked a large game concentrated food source such as the bison that were available in the adjacent aspen parkland. In the summer there were no concentrated animal resources, as both fish and waterfowl had dispersed. These resources were available to some degree in the autumn, but the winter months were a time of scarcity in the boreal forest (Syms 1977; Nicholson 1987:51-52).

Aspen Parkland Resources: This apparent scarcity of resources contrasts with the resources available in the adjacent aspen parkland. According to Syms (1977), the aspen parkland had a higher availability of resources than the boreal forest in all seasons. The transitional aspen parkland between the boreal forest and the grasslands provided pre-contact groups with all of the resources of both biomes, with the exception of woodland caribou (Ray 1974). Concentrated species available in the aspen parkland include bison, elk, deer, and pronghorn antelope, with smaller more diffuse species spread across the area. In the spring, birds and spawning fish were concentrated, and pronghorn antelope were migrating from the uplands into the grassy areas of the aspen parkland (Syms 1977). At this time of year, bison were migrating from the sheltered areas of the parkland into the more spacious grassy areas of the parkland as forage became available (Morgan 1980). In the summer, bison moved south and west to the open grasslands (Syms 1977) and were no longer available in concentrations (Hanson 1984) although were available in south-western Manitoba throughout the year in smaller numbers. Migratory birds and

fish dispersed, and nesting water birds and pronghorn were the only concentrated animal resources. The autumn was a season of abundance in the aspen parkland, as bison returned from the grasslands to winter in the forested areas and elk and deer were concentrated in the forested edges of the parkland. The late fall and early winter are documented as the most favourable times of the year for bison pounding but Arthur notes that pounding took place throughout the year (Arthur 1975:106).The winter was again a season of scarcity for pre-contact groups, but bison were concentrated in smaller wintering groups (Morgan 1980), as were deer and elk (Syms 1977).

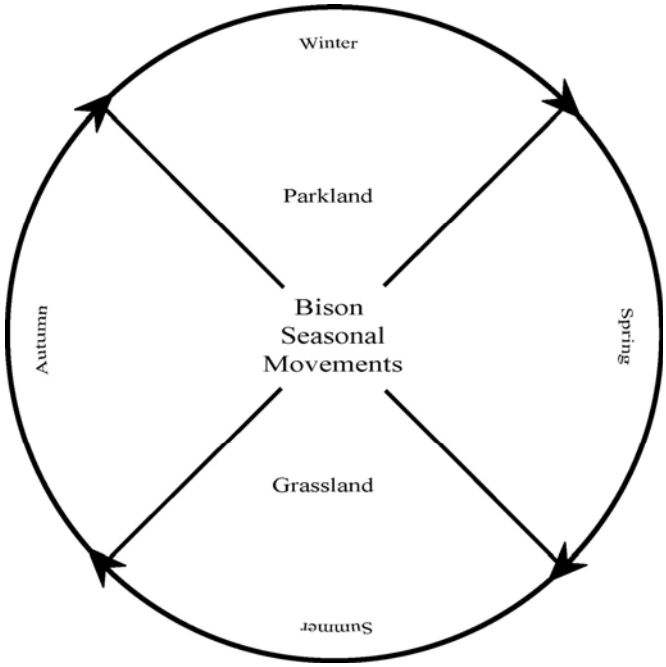

Figure 2-4. Bison seasonal movements on the north-eastern Plains (after Ray 1974:33)

Grassland Resources: The grasslands are similar in resource potential to the boreal forest in that there are both seasonal abundances and periods of scarcity. The eastern portions of the grassland shared some of the resources of the aspen parkland, but in diminished abundance. The spring season in the grasslands had few concentrated species of animal resources, but concentrations of migratory birds and nesting waterfowl were available in the wetlands, as were beaver and muskrat. Small and medium mammals were largely confined to the river valleys and forested uplands, except for predator species such as fox and coyote.

Later in spring bison became more abundant as they made their way from the aspen parkland to the grasslands (Syms 1977; Morgan 1980). Summer in the grasslands was a time of resource abundance, as bison herds concentrated in the xeric grasslands (Morgan 1980), and herds of antelope were abundant. In the fall, the bison returned to the aspen parkland transitional zone, although river valleys and sheltered areas supported smaller herds of local bison. Migratory waterfowl and nesting birds once more become available. Winter in the grasslands is again a time of scarcity. Wind sweeping across the plains confined small, diffuse, herds of bison to sheltered areas. The river valleys and sheltered areas would have remained home to a variety of smaller animals, but these are rather diffuse resources (Syms 1977).

From the writings of Syms (1977), it is possible to rank each of the biomes under study by season according to potential animal resource availability. The aspen parkland is characterized by abundant seasonal concentrations of animal resources in all seasons, more so than the boreal forest to the north and east, or the grasslands to the south and west. The one exception to this rule is seen in the summer, when bison herds aggregate in the grasslands (Morgan 1980), resulting in an increased resource potential. While several researchers have argued that bison were equally available in the aspen parkland during the summer season (Hanson 1984), it is believed that the overall population of bison in the grasslands was higher, and in larger concentrations. The grasslands proper have a relatively low concentration of animal resources available, with the exception of the summer bison herd aggregation. General observations indicate that the boreal forest, while diffuse in its distribution of resources, consistently has some concentrations of animal resources available.

Summary

The topography of south-western Manitoba is highly variable, ranging from flat or gently rolling plains to isolated uplands of forest vegetation. Several features on the landscape that were important to pre-contact occupants of south-western Manitoba include rivers, glacial spillways, and glacial end-moraine complexes. The diversity that characterizes the study area provided unique opportunities for hunter/gatherers. In the different physiographic regions of south-western Manitoba, different geomorphological histories resulted in different landscapes creating a wide variety of different local habitats. While local vegetation patterns have changed considerably in the post-settlement era, the general patterns are relatively the same. The prairies that were maintained in the past by grazing bison herds and chronic prairie fires now support more aspen forest surrounding potholes and in planted wind-breaks. Conversely, considerable clearing of the land has taken place in the upland areas. The overall net result of fire suppression and land clearing has been a general expansion of the aspen forest.

Faunal resources have changed considerably in south-western Manitoba in the settlement period. Once home to roaming bison herds and antelope, there has been a marked increase in forest adapted species and a general decrease in grassland species. However, the faunal resources in the boreal forest have remained almost the same due to large expanses of the boreal forest remaining virtually untouched. Unfortunately, this virgin wilderness is under constant threat from continual natural resource extraction activities. Commercial logging and mining activities are not only a threat to wildlife through habitat loss, but these activities also present a threat to the cultural heritage of the boreal forest. Many areas of the boreal forest are identified as having a “low potential” for

archaeological sites, and sites in these areas are destroyed through these commercial activities. These areas are not in fact “low potential” but rather reflect a lack of survey in the interior of the boreal forest. Relatively little is known about boreal forest settlement patterns, but even less is known about settlement patterns in south-western Manitoba.

Chapter Three:

The Blackduck Cultural Environment and Adaptations to the Physical Environment

Blackduck Ceramics

The Blackduck culture is identified on the basis of its ceramics, although the description of these ceramics has been highly variable. Considerable controversy has been generated over the decorative attributes of Blackduck pottery, due to significant variation in the attributes of Blackduck ceramics. This variation is due to the fact that Blackduck was present over a large and varied environment including the grasslands, boreal forest, and aspen parkland, and existed over a considerable time span. Although there are concentrated samples of Blackduck ceramics recovered from areas near urban centres, most of the Blackduck range is composed of rural areas where many sites have been documented but few have been excavated and interpreted. Even fewer sites have had in-depth analyses of the ceramics. The end result is that considerable variability in decorative attributes is expressed over a large study area.

CWO (Cord-wrapped object) is the most common and well-recognized attribute associated with Blackduck pottery. In the past, ceramics with CWO in any form or in association with any other form of decoration were identified as belonging to the Blackduck culture. As more Blackduck sites were identified, ceramics with decorative trait combinations inconsistent with the original definitions of Blackduck were consistently recovered. At these sites, “aberrant” sherds were found in higher proportions

than traditional Blackduck ceramics. These variants have led researchers to propose the existence of groups that were related to, but different from Blackduck, such as the Rainy River Composite. Proposed by Lenius and Olinyk (1990), the Rainy River Composite has been effective in provoking researchers to re-consider the traditional definitions of Blackduck.

Fundamental to the discussion of Blackduck cultural dynamics is a working definition of Blackduck ceramics. For the purposes of this study, the definition of “early” or “classic” Blackduck ceramics is accepted. This definition follows the example of Anfinson (1979) who finds that Blackduck ceramics are generally composed of combined CWO decoration and punctates, and occasionally exterior bossing. Lugenbeal (1979) notes that oblique CWO and oblique over horizontal CWO are the most common design decorative elements on Blackduck ceramics. Lip decoration is not widely discussed in the literature, but Blackduck ceramics can also be recognized by oblique or chevron-style CWO on the lip of the vessel. Occasionally, the interior of the rim is sparsely decorated with vertical or oblique CWO impressions. Vessels are described as globular in shape, with constricted necks, out-flaring rims, and thickened lips. Lugenbeal (1979) finds that there are three categories of Blackduck vessels. Large storage vessels may have partially pointed or sub-conoidal bases, while medium-sized cooking vessels are more globular. Small mortuary vessels have been recovered from burial mounds. It must be recognized that there is variation in the description of the attributes characterizing Blackduck ceramics and that slight variation from these generalizations does not reject the identification of a Blackduck cultural affiliation at an archaeological site.

The acceptance of an “early” or “classic” definition of Blackduck ceramics does not imply a whole-hearted acceptance of the proposed Rainy River Composite. The idea of the Rainy River Composite proposed by Lenius and Olinyk (1990) is valuable and offers an explanation for the variability in the ceramic record. Neither is this discussion an outright dismissal of the Rainy River Composite. Rather, the proposal of the Rainy River Composite is acknowledged here as a recognition that the cultural dynamics during the “late” Blackduck period are poorly understood, and that these cultural dynamics may be observable in the ceramic record. Further research surrounding the proposed Rainy River Composite would shed light on the interactions between Blackduck and other groups during the Late Pre-contact Era.

Cultural Dynamics

The definition of Blackduck ceramics accepted here is not a universal definition. Considerable disparity exists between researchers over the defining characteristics of Blackduck pottery, leading to differing opinions of the geographical distribution and chronological time frame of the Blackduck culture. As such, some researchers conclude that inferring cultural dynamics through the critical examination of decorative attributes and geographical distribution may be a futile endeavour. That being said, these examinations have generated some useful hypotheses that frame a discussion of Blackduck cultural dynamics.

Carmichael (1977) analyzed the Blackduck ceramics from the Wanipigow site and studied change in Blackduck ceramic decoration over time. Carmichael found that some modes of decoration on Blackduck ceramics were consistently recovered in lower stratigraphic levels, while other modes were consistently recovered in upper stratigraphic

levels. This change in ceramic decorative attributes over time may be used to provide a relative means of dating Blackduck archaeological sites, although this is an as-yet untested method that would require significant further research.

Researchers examining Blackduck ceramic attributes have hypothesized that Laurel and Blackduck pottery producing peoples were contemporaneous (Anderson 1979; Dawson 1983; Lenius and Olinyk 1990), and that this co-existence indicates that Blackduck people migrated into the area from the south (Dawson 1983). Other advocates of the migration hypothesis find that Blackduck pottery has its origins in the Princess Point Culture at the western end of Lake Ontario (Buchner, et al. 1983).

Syms (1977) believes that the emergence of Blackduck represents the relatively rapid movement of people throughout much of the boreal forest, the aspen parkland of Manitoba, and the edge of the plains. Evidence of this migration is seen in the similarities between ceramics across a large study area. It has been suggested that the differences between Blackduck ceramics and the Kathio and Clam River ceramics recovered further south in Minnesota and northern Wisconsin are so few that they can essentially be interpreted as spatial variations of the same culture (Anfinson 1979). Syms (1977) suggests that the appearance of Blackduck on the prairies coincides with a shift in resource utilization and a cultural adaptation involving at least seasonal exploitation of plains resources. The rapid adoption of a bison subsistence strategy may indicate that bison hunting was not an activity learned quickly on the Manitoba prairies, and that it was a subsistence strategy brought into the aspen parkland by ancestral Blackduck people living on the woodland/plains fringes to the southeast. Syms (1977) suggests that Blackduck people migrating from the boreal forest to the prairies would not have been

pressured to adopt a new subsistence strategy suddenly, and that food resources available in the boreal forest would also have been available in river valleys and forested areas of the aspen parkland. An example of how the Ojibwa adapted to southern Manitoba by pursuing moose, as they did in the boreal forest, is provided by Tanner (James 1956:223).

The Rainy River Composite: Since its publication in 1990, "The Rainy River Composite: Revisions to Late Woodland Taxonomy" by Lenius and Olinyk has provoked interest from archaeologists studying the cultural dynamics of the Late Woodland Period (approximately 600 to 1800 A.D.) (Syms 1977: 135). Most affected are those researchers studying Blackduck archaeological sites, since the authors propose major revisions to what had been traditionally classified as Blackduck ceramics.

Lenius and Olinyk (1990) propose the following to explain the variability and distribution of ceramics in the Boreal Forest:

> *The authors hypothesize that the Rainy River Composite was formed from a coalescence of the Blackduck and the Laurel cultures. From at least A.D. 700 to 1,000, both cultures coexisted but maintained distinctive pottery forms with limited borrowing of traits between them. However, at or near A.D. 1,000, both Blackduck and Laurel ceramics disappear in the Rainy River region and the Rainy River Composite ceramics emerge.* (Lenius and Olinyk 1990:82)

The evidence of this coalescence is seen in the representation of both Laurel and Blackduck ceramic motifs on vessels. The authors proposed that in the coalescence of the two groups, the ceramic attributes of oblique and horizontal CWO, a globular shape, and textile impressions were retained from the Blackduck culture; while stamping, a plain or smooth surface, and decoration on the shoulders or body of the vessel represent the retention of Laurel ceramic attributes. The Rainy River Composite area is proposed to have extended east to Lake Superior, south to the Mississippi headwaters, and north and

west through the aspen parkland to the Pas, Manitoba. The authors recognize a collapse of the Rainy River Composite sometime around 1350 A.D. back to the Rainy River region, but feel that the composite existed until approximately 1650 A.D. (Lenius and Olinyk 1990). The proposal of a Rainy River Composite stretching across parts of north-western Ontario and into Manitoba is tenuous at best. There are several problems with the article as it relates to Blackduck in south-western Manitoba.

Before discussing the implications of the proposed cultural dynamics on Blackduck settlement in south-western Manitoba, it is appropriate to acknowledge that the authors intended their work to focus on the Rainy River region of north-western Ontario, south-eastern Manitoba, and northern Minnesota. However, the reassessment of cultural dynamics during the Late Woodland Period has implications for the cultural dynamics across the entire Blackduck cultural area.

The authors base their analysis on ceramics, but failed to analyze ceramic collections from south-western Manitoba. The closest analyzed sites to the study area are the Stott site (DlMa-1**),** the Lord Site (DkLg-1**),** and the Forks area (DlLg-33). All three of these sites represent sites along the borders of the current study area (Figure 3-1) highlighting a lack of any analysis of Blackduck archaeological sites between the Assiniboine River and the Canada-U.S. border. To infer cultural dynamics without analyzing collections from across the entire area occupied by a cultural group is an oversight. An analysis of Blackduck ceramics from south-western Manitoba may have provided valuable insight into the validity of the proposed cultural dynamics, and may have resulted in the generation of new hypotheses.

The authors use a collection of radiocarbon dates from various Blackduck sites to propose both an early beginning of the Blackduck cultural period and an early end. Citing fourteen radiocarbon dates, the authors propose that the Blackduck cultural period began about 510 A.D. and ended at approximately 962 A.D. Unfortunately, these 14 radiocarbon dates represent only 5 Blackduck archaeological sites. Eight of the dates were taken from the Stott Site alone, while three of the sites come from the Forks. There is one radiocarbon date from each of the Lord, Smith, and Pic River sites. Five Blackduck archaeological sites can not be assumed to represent the range of radiocarbon dates for the Blackduck culture. Furthermore, no Laurel or Rainy River Composite archaeological sites were dated from south-western Manitoba. The closest site belonging to either of these cultures is the Aschibokahn site on the west shore of Lake Winnipeg (Lenius and Olinyk 1990:81) (Figure 3-1).

There is a lack of clear evidence for the Rainy River Composite beyond the Rainy River region. The authors note the original identification of two Duck Bay ceremonial vessels beyond the Rainy River region that are now no longer considered to be Duck Bay vessels. The authors do however note that the vessels are part of the Rainy River Composite but the basis of this identification is unexplained (Lenius and Olinyk 1990:83). Even the authors seem to admit the vagueness associated with the Rainy River Composite when they note that although there are no radiocarbon dates associated with the Rainy River Composite after 1350 A.D., they hypothesize that the composite likely persisted until 1650 A.D. in the Rainy River region (Lenius and Olinyk 1990:84).

The objective of this discussion is not to cast doubt on the proposal of the Rainy River Composite. Rather, the objective is to illustrate that the Rainy River Composite is

Figure 3-1. The study area and selected archaeological sites.

tentatively described at best, and that the composite may have never extended into south-western Manitoba. In order to more clearly understand cultural dynamics during the Late Woodland period, ceramic collections and radiocarbon dates from across the entire Blackduck cultural area must be included in the analysis. The pioneering efforts such as those undertaken by Lenius and Olinyk with regards to the Rainy River Composite should be encouraged and are part of the driving force behind the study of cultural dynamics.

Blackduck Settlement in the Boreal Forest and Aspen Parkland.

A summary of the previous research regarding Blackduck settlement in the boreal forest, aspen parkland, and grasslands, is necessary to fully understand the range of possible adaptation strategies available to Blackduck people in the pre-contact era. Previous research on settlement strategies of the Blackduck people in the boreal forest and aspen parkland is discussed in the following section.

Very little research modeling the locations of sites has been conducted in either the boreal forest or south-western Manitoba. In most instances, measurements of slope and distance to water are cited as the most reliable means of correctly predicting site location (Northern Lights Heritage Services 2003; Manitoba Hydro 2003). Other variables generally included in location analysis are aspect, elevation, vegetation zones, and soil characteristics (Dalla Bona 1994). Several attempts have been made at modeling settlement in the boreal forest but there is an inherent bias in the research due to the nature of boreal forest exploration activities. Most recreational activity in the boreal forest takes place along major rivers and lakes, resulting in a high incidence of site recording in close proximity to water bodies. While mining and timber harvesting

activities are frequently located inland from major water bodies, the lack of expertise that would be facilitated by retaining an archaeologist on staff causes many sites to go unrecorded. Furthermore, sites that are accidentally discovered during the course of natural resource extraction frequently remain unreported in fear that the recording of archaeological sites will negatively impact commercial activity. These compounding factors result in fewer sites being reported inland creating a bias in the archaeological record. As a consequence of this bias in site recording activities, the results of predictive modeling in the boreal forest must be viewed with considerable scepticism. For a complete discussion of modeling site location in north-western Ontario's boreal forest, readers are directed to the CARP Project (Centre for Archaeological Resource Prediction) (Hamilton and Larcombe 1994).

The point of this discussion is to illustrate how poorly boreal forest pre-contact settlement patterns are understood. Several researchers have described models of how pre-contact hunter gatherers made decisions about where to live, how people moved through the landscape, and what may have influenced a decision to live in one area or another (Jochim 1976; Winterhalder 1983), but very little of this research has been conducted specifically for the boreal forest. Even less research has been conducted in the aspen parkland of south-western Manitoba. An examination of the Historic Resources Branch site database illustrates a concentration of archaeological sites where extensive site reconnaissance surveys have been conducted in anticipation of commercial development and through individual research efforts. In south-western Manitoba, the same bias exists of sites being over-represented along waterways and highways, combined with a lack of site reporting away from these high-traffic routes. The "interior" areas of Manitoba were

extensively occupied by pre-contact hunters and gatherers but comparatively few sites have been adequately recorded, excavated, and interpreted to provide much knowledge about general pre-contact land use strategies in south-western Manitoba. Considering the pace of development around major urban centres within the province, and secondary urban centres' efforts at promoting development, this is a problem that clearly needs to be addressed. In order to preserve Canadian cultural heritage in both the boreal forest and south-western Manitoba, research efforts need to be re-directed towards modeling pre-contact human settlement patterns. Rather than being at odds with one another, researchers and commercial industry leaders should collaborate on projects that will preserve our national heritage.

Summer settlement in the Boreal Forest: A review of the literature related to Blackduck settlement in the boreal forest reveals that our knowledge of boreal forest settlement patterns is rather limited. Several researchers document the use of a seasonal round to exploit varying resources (Dawson 1983; Larcombe 1994; Dods 2003) and Dawson (1983:79) finds that "families sometimes moved several hundred kilometres during the year in search of food". The depiction of the seasonal round is largely limited to the description of summer and winter activities correlated with site location. The terms summer and winter refer less to calendrical dates or times of the year and more to general warm and cold-seasons. Dods (2003) describes two major site location patterns in the boreal forest. In the first pattern, Dods describes site locations as situated on the shorelines of lakes or on islands in larger lakes. Dods finds that when the sites are located on islands they are situated to face the nearest shore of the mainland. This pattern of site location is further confirmed by Dawson (1983) who finds that most sites in the boreal

forest are located close to major lakes and rivers because the canoe is the dominant method of transportation in the boreal forest and because fish are regarded as boreal forest people's most predictable food resource. The second pattern of site location that Dods describes finds sites located along rivers or streams between lakes of different resources. These sites are described as being located "in optimal environmental location in relation to numerous types of ecozone as well as the associated ecotones" (Dods 2003:23). These optimal site locations are further described as being in relative proximity to all the various available water environments as well as the forest and the forest edge. Furthermore, Dods finds that this second pattern of site location is not limited to the boreal forest, but is also applicable to the adjacent aspen parkland. Dods does not discriminate between summer and winter site location in the discussion, but it is assumed that Dods referred largely to warm season sites.

Other authors, such as Dalla Bona (1994) and Larcombe (1994) model site location based on the different subsistence activities performed during the warm and cold seasons and as such model site location differently between the seasons. During the summer (or warm season), both authors note the aggregation of family groups around major lakes where the primary subsistence activity was fishing (Dalla Bona 1994:3, Larcombe 1994:13). This is re-affirmed by Fitting and Cleland (1969) and Rogers (1963) in their ethnohistoric accounts. Dalla Bona notes the importance of other activities associated with site location during the warm season, such as "berry picking, firewood collecting, and some opportunistic large game hunting" (p.3), while Larcombe includes the proximity of "food and medicinal plants and herbs" and "the availability of plants used for construction materials" (p.14) as important. Both authors note that an important consideration in site

location during the summer is that the site be either well-ventilated or sufficiently removed from a marsh or swamp to alleviate the continual nuisance of mosquitoes and blackflies. In addition to these more detailed attributes, Dalla Bona (p.3) notes the general characteristics of site location as "aspect, flat land, dry land and proximity to water" as useful to modeling suitable summer site locations.

Winter settlement in the boreal forest: Several researchers cite the movement of boreal forest dwellers through a seasonal round where pre-contact groups aggregated along water bodies in the warm season and then dispersed inland to individual hunting grounds for the cold winter months (Dawson 1983; Winterhalder 1983; Dawson 1987:152; Hamilton and Larcombe 1994). Unfortunately, the relative paucity of sites recorded in the interior of the boreal forest prevents the accurate modeling of the locations of these interior wintering areas. As Hamilton and Larcombe note:

> *While major seasonal aggregation sites are unquestionably located along watercourses, we must recognize that little or no archaeological work has been done in the huge areas removed from the lakes and streams.* (Hamilton and Larcombe 1994:39)

This disparity in the archaeological record leads to one of two conclusions: that predictive modeling in the boreal forest interior is next to impossible because so little structured survey has been conducted there; or, that the generally accepted model of bands dispersing inland to individual hunting grounds is inaccurate. If the latter conclusion is favoured, it is more likely that the term "inland" only need be more accurately defined. Inland may refer to only a slight increase in the distance between site location and water bodies. A pre-contact occupant of the boreal forest would not have to travel very far "inland" to be sheltered from the winter winds blowing across the frozen

lakes. Furthermore, if inland locations were still located relatively close to major waterways, frozen lakes and rivers could still act as travel corridors for both people and animals.

As discussed above, little is known about wintering sites in the boreal forest, however Dalla Bona (1994:3) notes that winter was a time of maximum population dispersion and that in order to harvest the diffuse resources available pre-contact occupants were constantly shifting locations. This is supported by Rogers (1963) who states that boreal forest dwellers were constantly moving during the winter, and that people sometimes resorted to eating lichens to avoid starvation. Fitting and Cleland (1969) in ethno-historic research found that people in the boreal forest moved inland to fall and winter camps, which is supported by both Dalla Bona (1994:3) and Larcombe (1994:21) who finds that winter sites are "well" inland from water bodies, as much as one to two hundred yards. Larcombe (1994:21) further notes that winter camps tend to be placed inland and on the east side of major water bodies. This is believed to be because the eastern side of the water bodies offers more protection from the prevailing winds out of the east. Larcombe notes that when winter sites are located on the west side of major water bodies they tend to be further inland. Both authors acknowledge not only distance from shore as a key attribute of winter site selection but also the selection of a sheltered area, such as against the base of a hill or in dense tree stands. Dalla Bona (1994:3) notes that because firewood and faunal resources were depleted quickly near winter camps, the camps were only occupied temporarily, perhaps for as long as a month. Larcombe (1994:21) further notes that winter camps were rarely re-occupied in subsequent years for the same reasons.

Wintering sites possibly located further inland from the main transportation routes of the lakes and rivers likely remain largely undetected. It is clear from a review of the literature that comparatively less is known about winter site selection in the boreal forest than summer site selection.

Food resources for Blackduck people in the boreal forest included moose, woodland caribou, beaver, migratory waterfowl, wild rice, and bear (Hamilton 1982; Meyer 1993; Nicholson 1996). These resources are relatively diffuse in concentration across the landscape (Nicholson 1987), with seasonal exceptions of woodland caribou, waterfowl, and fish (Syms 1977). The diffuse nature of these resources necessarily affected the social organization of boreal forest groups.

Social Organization and Subsistence Activities

The information related to the social organization of Blackduck people is largely extrapolated from ethnographic accounts taken from the earliest boreal forest explorers. As such our knowledge of the social organization of Blackduck people is speculative at best, but Dawson notes that in the boreal forest "sites are consistent in size with…Algonkian peoples noted in the ethnohistoric records" (Dawson 1977:167), indicating that Dawson believes it appropriate to make these extrapolations from the proto-contact into the pre-contact era.

Dawson (1977, 1983) and Larcombe (1994) believe that the type of social organization most appropriate for adapting to the diffuse and highly mobile resource base in the boreal forest is to organize into small hunting groups. These loosely tied band societies were organized into extended family hunting groups and were the political and economic basis of the society. Although these groups were relatively autonomous, they are believed to

have maintained extensive social networks with adjacent groups (Larcombe 1994). The various bands were linked together by "marriage, language and way of life…bound together by geographic continuity, habits of association and common survival strategy" (Dawson 1977:169). Larcombe (1994) notes that these social connections were maintained and strengthened by the frequent exchange of people between bands. These social connections are viewed as necessary to create a "safety net" in the event of hunt failure or resource collapse. The diffuse nature of boreal forest resources creates an element of unpredictability that, without appropriate food storage technologies, can only be counteracted through extensive social connections. In addition to small highly mobile extended family hunting groups with extensive social connections, Dawson (1983) sees evidence of an adaptation to this diffuse and constantly shifting resource base in a relatively common tool technology, lacking any real specialization. A very basic tool technology allowed boreal forest occupants to adapt to a variety of subsistence opportunities. Furthermore, Dawson explains the variability in the boreal forest ceramic record as evidence of these highly mobile, loosely related groups (Dawson 1977:169).

Hamilton (1982) believes that the diverse array of animal resources intensively exploited reflects a more rigorous lifestyle in the boreal forest. This rigorous but generalized boreal forest subsistence strategy can be contrasted with plains/prairie subsistence strategies, which focus almost exclusively on bison procurement and utilization. There are several different types of Blackduck adaptation to the prairies to be examined. The published body of knowledge regarding Blackduck adaptation to the prairie is relatively limited and consequently needs to be expanded. The following is a brief discussion of several adaptation strategies open to Blackduck occupants of south-western Manitoba.

There are several examples of Blackduck archaeological sites in southern Manitoba that demonstrate a full adoption of the bison dominated prairie subsistence strategy. Notable among these are the Hokanson (Graham and Hamilton 2002) and Stott sites (Hamilton and et al. 1981). Both of these sites are examples of communal bison hunting strategies, involving the construction and use of pounds to capture large numbers of bison in single events. The use of a bison pound as a subsistence activity is not unique on the prairies. Several plains culture groups made use of the pound technique and members of the Sonota/Besant culture are known to have excelled at the technique. What makes the Blackduck adoption of bison pounding techniques in south-western Manitoba remarkable is the change in social organization required to successfully coordinate such an event (Nicholson, et al. in press).

Hunting activities in the boreal forest were carried out by single individuals or a small group of individuals organized into a specific task force. Success in hunting depended largely on the skills of the individual hunter rather than the coordination of the group. The exception to this norm may be seen in the construction of fish weirs during the warm season. While several groups may have aggregated at fish weirs, the scale of co-ordination was relatively minor compared to that necessary in the construction of bison pounds. To construct and use a bison pound requires the coordinated effort of a large group specifically aggregated for the event. More importantly, the direction of the activity likely fell to a single group leader or core of leaders assuming authority over the operation (Nicholson, et al. in press). Therefore the move to the prairies by members of the Blackduck culture resulted not only in new physical adaptations to the landscape but also caused at least a short-term social adaptation. Following the communal bison hunt,

Blackduck groups dispersed to winter/spring hunting grounds as individual hunting groups. An example of such a winter dispersal site is the Gosselin Site (DiLv-30).

Sites such as Gosselin (Hamilton 2003) and Crepeele (Graham and Nicholson 2003), demonstrate a Blackduck adaptation to the prairies without a full adoption of the prairie subsistence economy. The Gosselin site is well sheltered within the Tiger Hills approximately 1.6 km (1 mile) west of the Hokanson site in position to take advantage of the both forest and grassland resources, but there is no evidence of communal bison procurement at the Gosselin site. At the site, faunal recoveries indicate that while bison was the primary food source, the sparse recoveries indicate that only a few animals were captured and used to support a much smaller group. The Crepeele site has a Duck Bay component, the nature of which has yet to be fully explored. Preliminary investigations suggest that the site is situated on the landscape in order to take advantage of the wide variety of resources available in a stabilized aeolian sand dune environment (Graham and Running IV 2003). The Lauder Sand Hills are a stabilized aeolian environment containing a variety of resources for pre-contact peoples that have been exploited for at least the last 3000 years (Graham and Running IV 2003). Investigations at both of the Gosselin and Crepeele sites are still at a preliminary stage (Graham and Nicholson 2003; Hamilton 2003) but the location of these sites in position to take advantage of several ecozones and ecotones is similar to the second pattern of site location in the boreal forest outlined by Dods (2003).

Summary

The cultural dynamics of a group with a wide geographical range and considerable time span are difficult to infer through the remains of a material culture the definition of which is controversial at best. A lack of consensus regarding the defining characteristics of Blackduck ceramics results in disagreements over which ceramics actually belong to the Blackduck culture and which ceramics might belong to another archaeological culture. Ceramics similar to Blackduck but with some consistent differences have been attributed to the Rainy River Composite (Lenius and Olinyk 1990) by some researchers, but the composite is poorly understood across the Blackduck culture area. More research must be conducted before the Rainy River Composite can be accepted without reservation.

There were several Blackduck adaptation strategies to the aspen parkland environment, and the range of site types, locations, and functions, may represent a transition between the initial peopling of the aspen parkland/prairies by the Blackduck people and their full adoption of the prairie subsistence economy. Conversely, these different adaptation strategies may represent adaptations to specific seasons or geographical areas of south-western Manitoba. Unfortunately, the preliminary state of research surrounding Blackduck settlement in south-western Manitoba prevents any firm conclusions from being reached. Only through continued research will the cultural adaptations of the Blackduck people in south-western Manitoba be fully understood.

Chapter Four:

Methods

The following chapter outlines the methods employed in the analysis of environmental variables related to Blackduck settlement in south-western Manitoba. Methods for both the qualitative and quantitative evaluation of Blackduck sites are provided. A brief discussion of the data used in the analysis is provided, as well as a description of how these data facilitated the study.

Methods

Fundamental to the initiation of any research endeavour is a comprehensive literature review of the topics relevant to the study. For the purposes of this research, topics included: bison ecology; Blackduck culture; the ecologies of the aspen parkland and boreal forest; Blackduck settlement in the aspen parkland and boreal forest; Blackduck ceramics; ethno-history; cultural chronologies; cultural adaptations; adaptive models and the geography of southern Manitoba. Furthermore, individual site reports were examined as were any published literature related to Blackduck sites within or adjacent to the study area. The study of these topics and more provided the framework with which to begin a study of Blackduck settlement in south-western Manitoba. With a more thorough understanding of the relevant literature, a proposal was designed and research commenced during the field season of 2004.

A study area was chosen that was suitable for the research. Blackduck sites in south western Manitoba south of the Assiniboine River and west of the Red River were selected for analysis because the overall physical environment within this area is sufficiently different from the nearby boreal forest and grassland biomes to necessitate a different cultural adaptation to the physical environment. For a more thorough discussion of the physical geography of the study area see Chapter Two of this volume (see also Elson 1958; Weir 1960; Bird 1961; Syms 1977; Nicholson 1987; Welsted et al. 1996).

The distribution of Blackduck archaeological sites across the eight physiographic regions of south-western Manitoba results in a relatively small sample of sites within each physiographic region. These small sample sizes bring into question the validity of any quantitative analysis of these sites within an individual physiographic region, negating the generation of broad observations related to Blackduck settlement. To account for this problem the sites from several physiographic regions were aggregated based on physiographic similarity, forming two separate sub-regions of the study area: a Plains Region and an Uplands Region. While the categorization of each landscape into different physiographic regions is an accurate reflection of their unique geomorphic histories, the similarity of these landscape categories is expected to result in similar adaptations within each category of physiographic region. The Plains Region includes the combined physiographic regions of the Red River Plain; the Souris Plain; the Reston Till Plain; and the Boissevain Till Plain (Table 5-1). The Uplands Region represents the combined physiographic regions of the Pembina Mountains; the Tiger Hills; and the Upper and Lower Assiniboine Deltas (Table 5-1). While the Upper and Lower Assiniboine Deltas are not “Uplands” in the classical sense, this broad grouping refers to physiographic

regions with considerable variation in local topography and an increased presence of forest vegetation. These two characteristics contrast considerably with the surrounding plains physiographic regions. This classification scheme is followed for the analysis of environmental variables for the remainder of the study.

Table 4-1
Aggregated Physiographic Regions

Plains Regions	Uplands Regions
Red River Plain	Lower Assiniboine Delta
Souris Plain	Upper Assiniboine Delta
Reston Till Plain	Tiger Hills
Boissevain Till Plain	Pembina Mountains

The Study of Environmental Variables Associated with Blackduck Sites

The study involves both a qualitative and quantitative evaluation of multiple environmental variables. The qualitative study involved the critical analysis of a sample of Blackduck sites within the study area, while the quantitative evaluation of environmental variables included all of the Blackduck archaeological sites. For the qualitative analysis the environmental variables at each site thought to influence site selection were individually examined, resulting in a comprehensive analysis of each site. The quantitative analysis was less detailed and was conducted in order to generate more general statistics about Blackduck settlement in south-western Manitoba.

The Qualitative Evaluation of Blackduck settlement

Site Selection: Using the database maintained by Manitoba's HRB (Historic Resources Branch), twenty-seven of the forty-two Blackduck archaeological sites within the study area were selected for individual study. A sample size of more than half of the Blackduck archaeological sites is assumed to be sufficiently representative of Blackduck sites in the study area. These sites formed the basis of the qualitative evaluation of sites, while the quantitative analysis incorporated these sites as well as the remaining Blackduck sites within the study area. There were several criteria considered in the inclusion of each Blackduck site for qualitative analysis:

1) *The sites studied must represent an even geographic distribution of sites from across the study area.*
2) *The sites studied must include those believed to have been occupied during different seasons.*
3) *The sites studied must include those believed to represent different activity types.*
4) *The sites studied must be positively identified as having a Blackduck cultural affiliation.*

The list of sites included in the analysis is representative of Blackduck sites from across the study area (Figure 4-1), in an effort not to emphasize any particular geographic region of the study area. For a map of all the Blackduck sites studied, see Appendix A. The list includes sites from each of the eight physiographic regions comprising the study area (Weir 1960; also this volume Chapter Two), and sites associated with a variety of topographic features, such as those associated with water-bodies and topographic relief.

The representative sample of Blackduck sites includes sites that are believed to have been occupied in different seasons. This variable is not outlined clearly in any available data

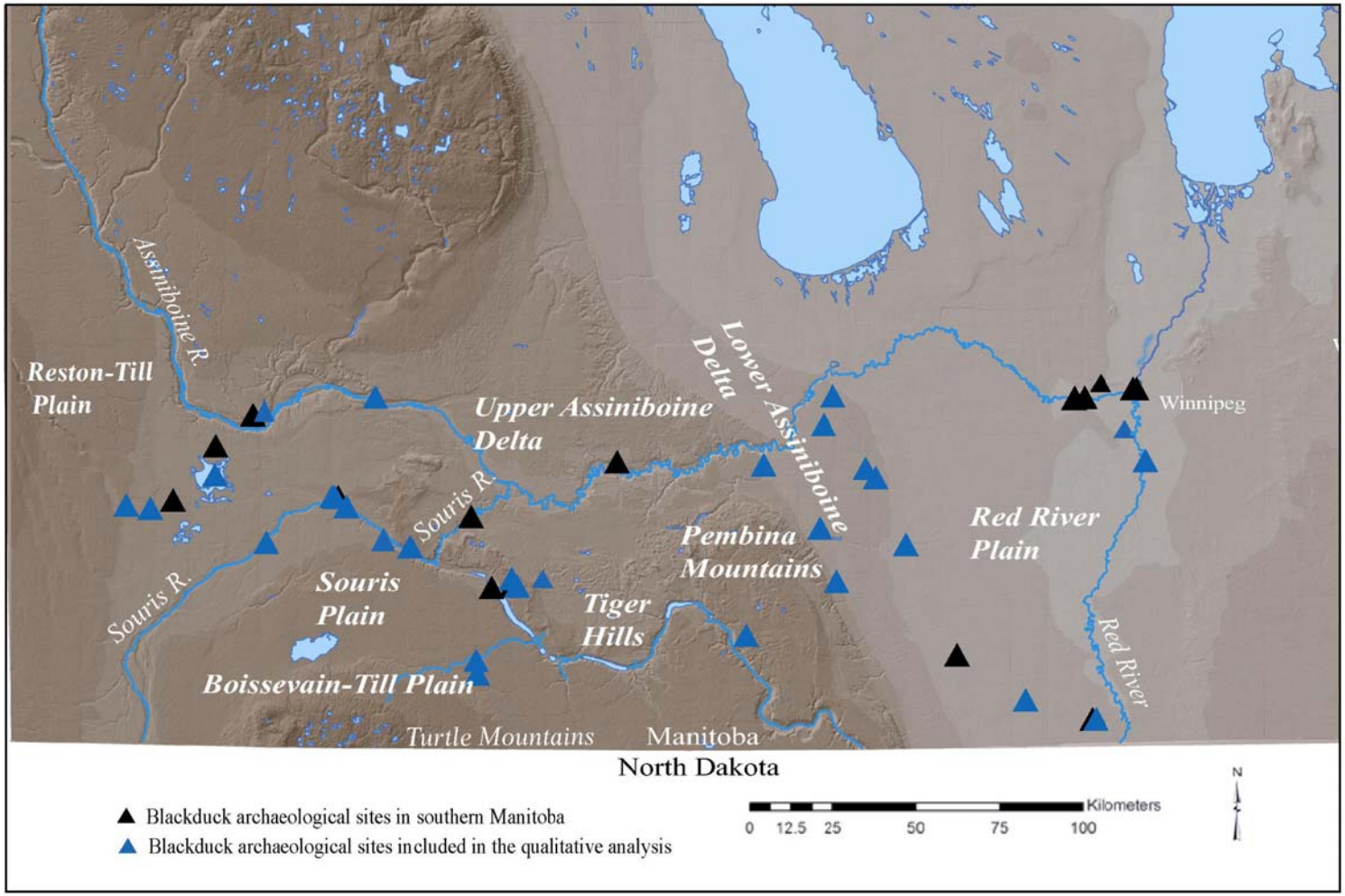

Figure 4-1. Blackduck archaeological sites in south-western Manitoba.

and as such was inferred through a critical review of site location. The current published literature proposes that people of the Blackduck culture were present in south-western Manitoba only during the cold season and for this reason sites within the study area have all been assumed to represent cold season occupations. If south-western Manitoba was only occupied by Blackduck groups during a single season, the environmental variables associated with these sites should exhibit considerable similarity reflecting a common adaptive strategy to that particular season. This study challenges that assumption, and the selection of Blackduck sites associated with a variety of environmental variables is anticipated to infer the occupation of south-western Manitoba by Blackduck people throughout the year.

There are several different types of activity sites associated with Blackduck archaeological sites documented in the HRB database. These include campsites, kill sites, and burial sites. Known burial sites are not included in the analysis. The documented kill sites in the database are assumed to represent bison kill sites identified by an abundance of faunal material. Obviously however, bison kill sites do not represent the full range of Blackduck subsistence activities. Subsistence activities related to generalized hunting rather than specific bison killing are not mentioned in the HRB database, nor are other subsistence activities such as gathering or fishing. The “campsite” category is assumed to be representative of these types of activities and others where there is less direct evidence of the activities that took place at the site. There are comparatively more campsites in the database than kill sites. This may be for several reasons including incorrect interpretation of the archaeological record, or it may indicate sites where processing or encampment areas have been identified and the associated kill sites have not been identified. More

likely however, is that there are actually fewer major bison kill sites in southern Manitoba than other types of sites such as those represented by the “campsite” category.

Each site included in the qualitative analysis was positively identified as having a Blackduck cultural affiliation. As discussed in Chapter Three, the definition of what qualifies as a Blackduck site has changed considerably over time in the published literature. Unfortunately, many of the site reports in the HRB database were completed before this changed definition was accepted. As such, some of the sites identified in the HRB database may not actually be Blackduck sites. Due to the possible discrepancies in the database a cursory examination of the ceramics from each site included in the qualitative analysis was conducted. Collections held by the HRB or local collectors and landowners were examined and cultural affiliations were confirmed. Blackduck ceramics were also discovered when visiting several sites, confirming cultural affiliation. This resulted in several sites being excluded from the final analysis, resulting in the analysis of a total of twenty-seven Blackduck archaeological sites.

The location of each site was entered into a GIS (Geographic Information System) and several different thematic maps were added to the analysis. In some instances, several different data sets were combined to examine the same variables. The advantages of using a GIS in the analysis are that it is possible to visualize several different data sets in one display and the analysis of environmental variables can be facilitated through the use of several spatial analysis tools. A brief description of each site included in the qualitative analysis is provided in the appendix following this volume.

Data: Digital 1:50,000 NTS (National Topographic Series) maps were used to examine modern vegetation cover, hydrology, and elevation. Hydrology was also analysed using 1:20,000 hydrography maps for each site, downloaded from the MLI (Manitoba Land Initiative) website (mli.gov.mb.ca). The increased level of detail of the 1:20,000 MLI data over the 1:50,000 NTS data greatly enhanced the analysis. Contemporary land use and land cover maps were analysed and used to infer information about the land cover type at each site in the pre-contact past. These maps were also downloaded from the MLI website, as was the 2 m resolution digital orthophotography used in the analysis. A DEM (Digital Elevation Model) of southern Manitoba was downloaded from the MLI website, and used to generate slope and aspect coverages with a 100 m resolution, as well as provide a general characterization of the topography in the area surrounding each site.

Dominion Land Survey maps were photographed at the Provincial Archives of Manitoba using a digital camera. These photographs were then georeferenced and incorporated into the analysis, providing information about land cover immediately prior to European settlement. This land cover information was used to infer land cover patterns during the pre-contact era. Combined, these data sets provide an overview of the environmental setting surrounding each Blackduck archaeological site.

Several researchers have noted that the environmental variables important to site selection are not limited to the immediate site environment (Jochim 1976; Winterhalder 1983). Economic resources of less immediate importance than those located at the campsite may be procured from some distance. For this reason, environmental features within a 10 km radius were noted and incorporated into the analysis. This 10 km

catchment area was chosen following the example set forth by Jochim (1976), who finds that 10 km is a reasonable distance to enable a one day round trip to procure resources. At several sites, particularly those in the Red River Plain, Reston Till Plain, or Souris Plain, it was noted that the landscape within a 10 km radius was relatively homogenous and few, if any variables were noted. This in itself is important in a study of the environmental variables influencing site selection, reflecting the importance of the environmental variables directly associated with the archaeological site.

Site Visitation: It was decided that viewing the environmental contexts of Blackduck archaeological sites firsthand would enhance the study by contextualizing the environmental variables noted in the GIS analysis. The site visit not only served to confirm the site's location, but also served to place the various local site environments in perspective. Each site was photographed to illustrate the significance of particular environmental variables at the site and resources, both apparent and possible, were noted. Several landowners and local collectors provided access to their private collections from the Blackduck sites studied, confirming the cultural affiliation of sites. Valuable anecdotal and environmental information was also gained through discussions with landowners and local collectors. Some of this information has been incorporated into the study, while other information communicated was noted but has not been included here.

Following the site visit, the GIS data was again reviewed to place the variables observed at the site into context. After the initial data had been gathered, combined with information gathered in the site visit and reviewed, an interpretation of each site was created. The interpretation reviews some of the major environmental variables identified

in the analysis, as well as provides an interpretation of some of the activities that may have occurred at the site.

Analysis: The environmental variables observed at the site are used to infer seasonality. The interpretations of seasonality have generally been placed into one of two categories: warm season and cold season. The seasons refer less to actual calendar dates than to general climatic trends. The term warm season might refer to a time of occupation lasting anywhere from April through September, but in some years might begin as early as March and end as late as early November. An exceptionally warm or cold year, or an exceptionally warm or cold period during the warm or cold season, may have influenced the movement of people between sites. It is difficult, even with exceptional data, to narrow down the specific time that a site was occupied, and this is usually accomplished through the expert examination of faunal remains from a properly excavated site (Monks 1981). It must be remembered that most of the sites included in the study are uninterpreted and represent little more than a surface collection of artifacts. Without careful excavation of these sites, the exact season of occupation cannot be confidently determined.

Several variables are regarded as more important to inferring seasonality than others. The two most important variables used to infer seasonality are proximity to fresh water and locations sheltered from the elements. Generally, sites located close to fresh water have been interpreted as warm season sites because fresh water has been identified as a critical resource during the warm season. Several sites are located close to pothole sloughs. These have been interpreted as sites without sufficient fresh water resources to be

occupied during the warm season. While the pothole sloughs do provide a source of water and it is acknowledged that Blackduck people in south-western Manitoba may have been able to tolerate less potable water, it is believed that these sites would not have been deliberately chosen for occupation during the warm season. Instead, Blackduck archaeological sites without fresh water but close to pothole sloughs are generally interpreted as cold season sites. During the cold season, fresh water would not have been as critical a resource, as snow would have been available for consumption.

Sheltered areas are also identified as a critical to site selection on the northern plains. Contrary to fresh water, shelter at a site is more important during the cold season than the warm season. Generally speaking, Blackduck sites with adequate shelter to protect a group from the winter elements have been interpreted as cold season sites. Blackduck sites lacking shelter from the elements are generally identified as warm season sites. One trend observed in the data is that well-sheltered sites are not located in close proximity to water, while sites with less shelter are located along waterways.

The twenty-seven Blackduck archaeological sites included in the qualitative analysis are described in Appendix A. A description of the environmental variables associated with each site is provided, as is an interpretation of seasonality.

The Quantitative Evaluation of Blackduck Settlement

The quantitative method employed in the evaluation of environmental variables at Blackduck sites was an automated GIS method. The reasons for using the automated method were that it provided accurate calculations related to the environmental variables

studied, rather than the approximations provided through the qualitative analysis. Additionally, this method permitted a feasible means of analyzing all the Blackduck sites in the study area, as opposed to the sample of sites that were studied for the qualitative analysis. Although several archaeological sites in the Historic Resources Branch database that were listed as having a Blackduck cultural affiliation were found to be incorrectly identified during the qualitative analysis, the number of sites with incorrect cultural affiliations were few.

To conduct the quantitative analysis, a program called Grid Sampler was downloaded from the ESRI (Environmental Systems Research Institute) website (arcscripts.esri.com). Grid Sampler is designed to be used independent from a GIS and as such is compatible with almost any GIS program. There were several different steps involved in preparing the data for use with Grid Sampler.

Data Preparation: Prior to using Grid Sampler, some of the data layers first had to be created. Using the DEM downloaded from the MLI website, slope and aspect coverages were generated. Furthermore, a coverage had to be created of all of the fresh, perennial water sources to be used in the analysis. From the 1:20,000 hydrography obtained from the MLI website, a new dataset containing all the fresh, perennial water within the study area was created. This was accomplished by querying the attribute table of the individual hydrographic features to identify any that were labelled as perennial water sources, including perennial lakes and perennial rivers. Man-made features such as dugouts were excluded from the analysis, as were pothole sloughs and intermittent water features. Following their extraction from the original datasets, the perennial water sources were

combined into one large dataset including all of the perennial water sources within the study area. Using a GIS, the straight line distance calculation was performed between all of the Blackduck sites within the study area and the nearest source of fresh, perennial water. Using a 100 m cell resolution, a new coverage was created that displayed the distance from each site to fresh water for each site within the study area.

Rather than a platform specific format, Grid Sampler uses a generic ASCII file format for analysis. The ASCII file format is a text file containing the values of cells in a raster grid, as well as a header describing the dimensions of the grid. A 100 m grid cell size was selected for all grids in order to replicate the grid cell size of the DEM obtained from the MLI website. The size of Blackduck archaeological sites within the study area is highly variable. Some sites in the HRB database occupy less geographic space than a 100 m by 100 m grid cell, while other sites occupy a much larger area. Regardless of the actual site size, a 100 m grid cell is considered to be of a sufficient resolution to accurately model environmental variables at the site while at the same time permitting analysis of the landscape immediately surrounding the site. It may have been possible to use a smaller grid cell size to analyze some of the vector environmental data, but a uniform scale between all datasets was considered appropriate. Furthermore, the use of a smaller grid cell size would run the risk of inferring that the data is more accurate than it actually is. The environmental data were converted to ASCII grid file format and included drainage, soils, surficial geology, aspect, distance to fresh perennial water, and slope.

The next step involved creating a text file of the Blackduck sites to be included in the analysis. All of the sites within the study area were analysed except for those previously

rejected from the qualitative evaluation based on ambiguous or incorrect cultural affiliation designations, resulting in the analysis of forty-two sites. The text file contained a descriptor of the site such as the Borden number or site name, and the UTM (Universal Transverse Mercator) easting and northing co-ordinates of the site. All sites in the HRB database have been converted to the North American Datum of 1983.

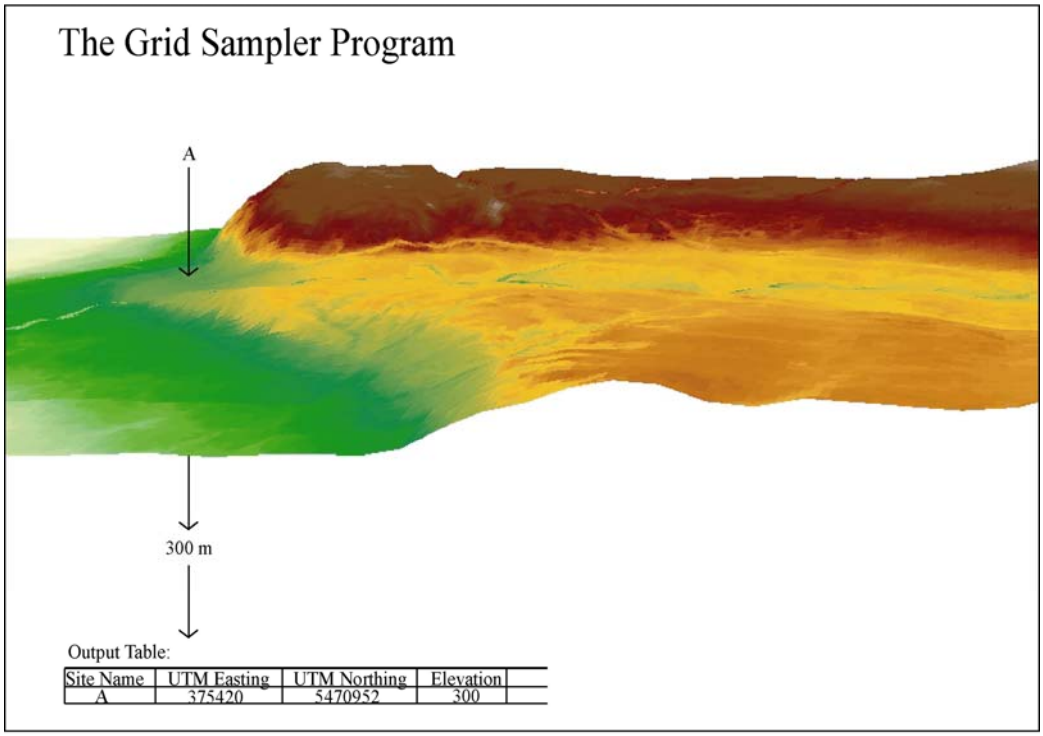

Figure 4-2. Grid Sampler extracts values from grid cells (e.g. elevation) associated with input points (Site "A") and exports the values to a text file.

Analysis: With the text file of Blackduck archaeological sites created and the environmental data layers converted to ASCII file format, it was now possible to run the Grid Sampler program. Grid Sampler functions as an automated process, collecting values from the cells in the ASCII grids associated with a set of input points (Figure 4-2).

For this study, the input points are represented by the text file of Blackduck archaeological sites within the study area and the ASCII grids are the environmental data.

In addition to automating a process enabling the analysis of all the Blackduck sites within the study area, Grid Sampler also creates an output text file of the results that can be then imported to a spreadsheet program and the results of the analysis displayed. The output file consists of rows of input descriptor points and corresponding columns of cell values collected from each of the ASCII grids (Figure 4-2 and Appendix B). In other words, each Blackduck site within the study area was associated with drainage, soils, surficial geology, aspect, proximity to fresh perennial water, and slope data. The data were randomly checked for accuracy. With the data in tabular format it was possible to generate some statistics about the environmental variables associated with Blackduck archaeological sites in south-western Manitoba. Combined with the qualitative evaluation of sites it was possible to identify a pattern of land use and settlement for Blackduck people in south-western Manitoba.

Land Use Patterns

With a broad understanding of some of the environmental variables associated with Blackduck archaeological sites in south-western Manitoba, it was possible to generate some general observations and hypotheses about land use and settlement patterns. These observations were drawn from an analysis of the distribution of Blackduck sites across south-western Manitoba and from the combined qualitative and quantitative evaluations. Together, the observations led to the development of a new model of Blackduck settlement in south-western Manitoba.

With a newly proposed model of land use and settlement it was possible to evaluate some of the previously identified land use patterns for Blackduck people. Unfortunately, very little has been previously published on Blackduck settlement in south-western Manitoba. Due the lack of published literature it was necessary to turn to the boreal forest for a relevant comparison. A thorough review of the literature related to settlement and land use patterns in the boreal forest revealed that although no pattern specifically has been published related to Blackduck, a generally accepted model of settlement for boreal forest hunter-gatherers has been published. These patterns were applied to Blackduck.

The model of land use and settlement for Blackduck in south-western Manitoba was also compared to the adaptive models proposed by Ray (1974), Syms (1977), Pettipas (1980) and Nicholson (1987). Each of these models was evaluated for their applicability to Blackduck settlement in south-western Manitoba. While only Pettipas' model was developed to specifically apply to Blackduck settlement in southern Manitoba, each of these models has been generally accepted as suitable for modeling the land use and settlement patterns of hunter-gatherers such as Blackduck in south-western Manitoba.

Summary

A thorough review of the relevant literature provided a framework with which to study Blackduck settlement in south-western Manitoba. Using a qualitative approach, twenty-seven Blackduck archaeological sites within the study area were selected for individual analysis. The qualitative analysis was conducted during the summer of 2004 and involved the analysis of environmental variables at twenty-seven Blackduck sites using a GIS as well as a visit to each site. Quantitative methods were also used in the analysis to study

forty-two Blackduck sites within the study area. The observations from both the qualitative and quantitative research led to the development of a new model of Blackduck settlement in south-western Manitoba. This new model was contrasted with accepted models of settlement in the published literature and the accepted models were evaluated for their applicability to Blackduck settlement in south-western Manitoba.

Chapter Five:

Blackduck Settlement in south-western Manitoba

As outlined in chapter four, the analysis of Blackduck sites in south-western Manitoba was conducted in two separate stages, consisting of a qualitative analysis of twenty-seven sites and a quantitative analysis of forty-two sites. From these separate analyses, some general deductions have been derived related to the general characteristics of Blackduck settlement in south-western Manitoba. The deduction of these general characteristics has enabled a re-examination of the cultural dynamics surrounding Blackduck people. A new model of Blackduck settlement in south-western Manitoba is proposed. The analysis of individual variables is discussed in support of this new model prior to the discussion of more general characteristics of settlement.

The Evaluation of Environmental Variables

Seasonality as an Environmental Variable: Each of the twenty-seven sites in the qualitative analysis was evaluated for their proximity to resources, and environmental variables associated with each site were measured. These data were used to interpret the seasonality of occupation for each Blackduck site. The interpretations of seasonality have generally been placed into one of two categories: warm season and cold season. The seasons refer less to actual calendar dates than to general climatic trends. As Monks (1981) has noted, without the careful excavation of sites and considerable expertise in faunal analysis, it is difficult to narrow down the exact time of year that a site was occupied. The majority of the sites in this study are uninterpreted and usually represent

little more than an assortment of artifacts collected from the surface of the site by the landowner.

Two resources are identified as critical to site location: fresh water and shelter. The quality of the water supply is as important as its proximity. Fresh, potable, water is more critical during the warm season than during the cold season due to the availability of snow, and while it may have been possible to consume the more alkaline, silty, water available in pothole sloughs or intermittent streams, locations near these water sources would not have been preferred for warm season occupation. For this reason and others, sites located close to fresh water were generally interpreted as warm season sites. Sites where the only available source of water is a pothole slough were identified as cold season sites.

A sheltered site location is identified as a critical resource during the cold season. Contrary to fresh water, shelter at a site is more important during the cold season than the warm season. Blackduck sites lacking shelter from the elements are generally identified as warm season sites. One trend observed in the distribution of Blackduck sites in south-western Manitoba is that well-sheltered sites are not located in close proximity to water, while sites without shelter are located along waterways. There are several sites within the study area that contradict this pattern in the Plains Region where sites are well-sheltered and located adjacent to waterways, however at these sites it has been observed that the only available shelter is located along waterways. This pattern can be extrapolated to the pre-contact past when a recurring prairie fire regime maintained the grasslands above the

river valleys. Therefore, the sheltered nature of some sites on the plains is interpreted as being coincidental to the site's location adjacent to fresh perennial water.

Table 5-1 shows the results of the interpreted seasonality of each site. Of the twenty-seven Blackduck archaeological sites qualitatively assessed, twelve are interpreted as being occupied during the warm season and fifteen during the cold season.

Table 5-1
The Distribution of Warm and Cold Season Sites

Physiographic Region	Warm	Cold
Boissevain Till Plain	0	2
Red River Plain	5	0
Reston Till Plain	1	0
Souris Plain	6	1
Tiger Hills	0	2
Upper Assiniboine Delta	0	1
Lower Assiniboine Delta	0	6
Pembina Mountain	0	3
Plains Aggregated	12	3
Uplands Aggregated	0	12
Total	**12**	**15**

In the Plains Region, twelve of fifteen sites are deduced to have been occupied during the warm season. This reflects the sparseness of available shelter in the grasslands of the Plains Regions and the proximity of sites in the Plains Regions to fresh water sources. Each of the fifteen sites in the Uplands Region category are deduced to have been occupied during the cold season, reflecting the abundance of shelter in the area and the location of sites removed from perennial fresh water.

It is apparent from the interpretation of seasonality that a relationship exists between site seasonality and the physiographic regions of south-western Manitoba (Table 5-1). The Plains physiographic regions are interpreted to have been occupied during the warm season, and the Uplands physiographic regions are deduced to have been occupied during the cold season. Three of the sites in the Plains Regions are deduced to have been occupied during the cold season. These sites are located at a greater distance from water than other sites on the plains and additionally are also located in well-sheltered areas. These three sites do not conform to the overall pattern observed but are suitable examples of the flexibility that must be incorporated into any model.

To further analyze the relationship between physiographic regions and seasonality a chi-square analysis was conducted. The following formula was used to calculate the chi-square statistic:

$$Chi\text{-}Square = \sum(O-E)^2/E$$

Where O is equal to the observed frequency of sites and E is equal to the calculated expected frequency of sites. The results of the chi-square analysis indicate that the likelihood of the observed frequencies occurring randomly are less than 1 in 1000 (chi-square = 18.15, critical value = 10.83, p=0.0001 at 1 degree of freedom).

From the interpretation of seasonality several observations can be drawn. First, it can be deduced from the chi-square analysis that the relationship between the selection of warm and cold season sites and physiographic regions is not random. Second, it can be deduced that the Plains and Uplands Regions were more attractive for Blackduck settlement

during the warm and cold seasons respectively, or that Blackduck people deliberately avoided these physiographic regions seasonally. The nature of this relationship will be explored further following the qualitative evaluation of other environmental variables.

Water as an Environmental Variable: Water is regarded as a critical environmental variable related to site selection, particularly during the warm season. At the twenty-seven sites analyzed in the qualitative analysis, the location and nature of the water supply was noted. At some sites located directly adjacent to fresh water sources, the presence of water was clearly a factor in site selection. Several other sites were located within 500 m of fresh water and at these sites proximity to water was regarded as significant to site location selection, but less so than sites located immediately adjacent to water. In other instances, only intermittent streams or pothole sloughs were noted. For the purposes of the qualitative analysis the distance between site location and fresh water was estimated in the field rather than exactly measured.

Table 5-2 shows the relationship between site location and water type within 500 m of the site. The availability of water within 500 m of a site more directly influences site selection than water located farther than 500 m from a site. The results are displayed in raw frequencies rather than in a calculated chi-square value because the small sample size results in several calculated expected frequencies of less than five, which is a critical requirement of validity for chi-square analysis. While the categories displayed are not exhaustive, they are mutually exclusive from one another.

Using Grid Sampler**,** the quantitative relationship between Blackduck archaeological sites within the study area and their proximity to fresh, perennial water sources was analyzed.

The analysis does not include proximity to intermittent streams or pothole sloughs. Blackduck people may have been able to consume less potable water from pothole sloughs but it is believed that these locations would not have been preferred for site location, particularly during the warm season when water is a critical resource.

Table 5-2
Proximity to Water Type

	Adjacent to Water	**< 500 metres from fresh water**	**< 500 metres from intermittent water/pothole slough**
Cold Season Sites	0	1	5
Warm Season Sites	7	4	3
Uplands Aggregated	0	0	5
Plains Aggregated	7	5	3

On average, Blackduck sites within the study area are located at a distance of approximately 1400 m (Range 0 - 7433.03) from fresh, perennial water. In itself, the average distance from fresh perennial water provides little information until the average distances are broken down into different seasonality types and different physiographic regions.

The distances to fresh perennial water for sites in each of these categories are markedly different. The fifteen sites occupied during the cold season are an average distance of 2600 m (Range 200 – 7433.03) from fresh perennial water, while sites occupied during the warm season average only 240 m (Range 0 – 608.28) from fresh perennial water.

It is apparent from observing the data that Blackduck archaeological sites in the Plains Regions are located much closer to fresh water than are sites in the Uplands Regions (Table 5-3). The results of the quantitative analysis confirm the observations revealed in

the qualitative analysis: that proximity to water was a significant environmental variable related to site selection when sites were occupied during the warm season and located in the Plains Regions. Furthermore, it can be deduced from the absence of sites located adjacent to fresh water in the Uplands Regions that when these sites were occupied, proximity to fresh water was not an important variable in site selection or that locations adjacent to water were deliberately avoided.

Table 5-3
Distance to Fresh Water

	Adjacent to Water	**< 500 metres from fresh water**	**< 500 metres from intermittent water/pothole slough**
Cold Season Sites	0	1	5
Warm Season Sites	7	4	3
Uplands Regions	0	0	5
Plains Regions	7	5	3

Shelter as an Environmental Variable: Adequate shelter is regarded as a critical environmental variable related to site selection during the cold season. The harsh winter climate of south-western Manitoba necessitates the availability of sheltered areas for hunter-gatherers in which to take refuge from storms and the ever present wind-chill. Conversely, during the warm season, shelter is regarded as a less important variable contributing to site location selection. Throughout the warm season sheltered areas are characterized by hordes of mosquitoes, a variable likely to detract from the attractiveness of an area for site location. As such, the more desirable locations for site selection during the warm season would be those areas that are open and well-ventilated but with nearby access to other necessary resources.

The aspen parkland of south-western Manitoba is characterized by discontinuous patches of deciduous forest, open prairie, and wetland. Consequently, almost every Blackduck site qualitatively analyzed was located in an area with access to some form of shelter nearby. In order to address this issue, a working definition of what constitutes “shelter” was created. For the purposes of this study, shelter is thought to include those areas where significant forest cover was present. This excludes the areas where small copses of forest cover are present, such as those formed around marshes or pothole sloughs. These smaller patches of forest vegetation may have been sufficient to provide immediate and very temporary relief from a storm but would not have been purposely selected for occupation during the cold season. Most of the river valleys within the study area would have provided some form of shelter but the nature of that shelter is largely determined by local topography. South facing slopes are subject to the desiccating effects of the wind and sun during the warm season and as such were not significantly forested. The opposite is true of north facing slopes. Furthermore, the degree of slope plays a factor in the presence of forest vegetation. The designation of sites within river valleys as sheltered or not-sheltered was based on these local topographic factors rather than arbitrarily labelling all sites within river valleys as sheltered.

The difficulty in assessing the vegetation cover of the study area was further compounded by the significant change in the landscape since European settlement of the prairies. Particularly critical has been the change in fire regime that maintained the grasslands in the pre-contact era. The expansion of the aspen forest since settlement necessitated a re-construction of pre-contact vegetation composition through the consultation of early historical maps of and the analysis of local topography. A comparison of the Dominion

Land Survey maps from the late 1800's and recent digital aerial photography provided a means of extrapolating vegetation patterns into the pre-contact era. For each site a qualitative analysis of the corresponding Dominion Land Survey map was used to extrapolate pre-contact vegetation patterns. This was important in the interpretation of seasonality at each Blackduck site.

The analysis of the relationship between Blackduck site location and shelter is provided in Table 5-4. An initial observation of the distribution of sheltered sites reveals that cold season sites are more frequently associated with shelter than warm season sites. This again is to be expected, as shelter was identified as a significant environmental variable in determining the seasonality of sites. Furthermore, there appears to be an almost equal and unexpected distribution of sheltered sites between the Uplands Regions and Plains Regions. Closer examination of the sheltered sites in the Plains Regions reveals that four of the sites identified as sheltered are located adjacent to fresh water and as such have been identified as warm season sites. These sites are located in river valleys that were protected from chronic prairie fires in the pre-contact era and therefore the presence of shelter has been interpreted as coincidental to site selection rather than significantly related to site selection. When these four sites are removed from the analysis a relationship between sheltered sites, physiographic regions, and seasonality is more apparent.

With the raw frequencies of sheltered sites adjusted, a clear relationship is illustrated between sheltered sites and the Uplands Regions. Eight of the ten sheltered sites are located in the Uplands Regions and only two sheltered sites are located in the Plains

Regions. This leads to the conclusion that when sites in the Uplands Regions were occupied shelter was considered a significant environmental variable related to site selection and that when sites were located in the Plains Regions sheltered locations were avoided.

Table 5-4
Shelter and Site Location

	Shelter	**Shelter** (adjusted)
Cold Season Sites	10	10
Warm Season Sites	4	0
Uplands Regions	8	8
Plains Regions	6	2

Slope as an Environmental Variable: Slope was measured as an environmental variable contributing to site selection. The measurement of slope at archaeological sites is a common practise in predictive modelling (Marozas and Zack 1990; Duncan and Beckman 2000; Hageman and Bennet 2000), although its usefulness may be overestimated. The measurement of variables such as slope in the prairies where the majority of the landscape is relatively flat to rolling may result in the creation of a pattern of site location that may not exist. In several predictive models created by measuring the degree or percent of slope at documented hunter gatherer archaeological sites, the logical conclusion has generally been reached that sites are located on relatively flat land, rather than on steep slopes (Northern Lights Heritage Services 2003; Manitoba Hydro 2003). Nevertheless, as an environmental variable commonly associated with the modeling of site locations and settlement patterns, it has been included in the analysis.

The calculation of slope was derived from a slope map created using a GIS and the DEM downloaded from the MLI website. The methods used to create a slope map from the Digital Elevation Model and extract values from the map have been explained in Chapter Four. The slope of all Blackduck archaeological sites within the study area averages just less than one degree. As mentioned above, the relative lack of variation in relief indicated by this calculation is not surprising given the nature of the landscape in most of the study area. Similar to other environmental variables in the analysis, the calculations of slope are further broken down by physiographic region, aggregated data sets, and warm and cold season occupations (Table 5-5).

For sites identified as warm season occupations, the slope calculations resulted in an average of 0.93 degrees, while sites identified as cold season occupations resulted in an average slope calculation of 1.01 degrees. Although the differences are slight, this pattern may reflect the necessity of selecting sites with a greater slope in winter, when considerations of drainage or the selection of an area with a particular aspect are more significantly related to site location selection. Observing the average slope calculations by physiographic region, it is apparent that some physiographic regions are associated with Blackduck archaeological sites located on more significant slopes than in other physiographic regions. This may reflect the general trend of the landscape in those particular physiographic regions but may also reflect the deliberate selection of those physiographic regions as wintering areas. Sites in the Uplands Regions category are associated with steeper slopes than those in Plains category (1.51 and 0.68 degrees respectively).

Table 5-5
Slope and Site Location

	Mean	Median	Range
All Sites	0.98	0.45	0-6.40
Warm Season Sites	0.93	0.78	0.32-2.00
Cold Season Sites	1.01	0.61	0-5.87
Plains Aggregated	0.68	0.43	0-2.00
Uplands Aggregated	1.51	0.64	0-6.40

Although the difference between average slope calculations in the warm and cold season categories are only slight, a more significant difference can be seen between the calculations of slope in the Plains Regions and Uplands Regions. Observing the data, it can be deduced that when sites were occupied on the plains and during the warm season, locations with a gentler slope were preferred. In contrast, when sites were occupied in the Uplands Regions and during the cold season, a steeper slope was more desirable.

Aspect as an Environmental Variable: The measurement of aspect at Blackduck archaeological sites within the study area is associated with several of the same problems as the measurement of slope. The relative flatness of much of the prairies results in calculations of slope and aspect reflecting a pattern that may or may not exist. However, the importance of calculating aspect at hunter/gatherer archaeological sites such as those occupied by Blackduck groups may be significantly related to the interpretation of seasonality. In south-western Manitoba, the prevailing winds are generally from the southwest during the warm season and from the northwest during the cold season. The aspect of the site may reflect deliberate selection of a location in order to provide shelter from the wind or to absorb as much solar radiation from the south as possible. The

selection of a site location for one of these reasons may reflect the season in which a site was occupied.

Initially, the results of the aspect calculation were divided into eight categories representing the cardinal and sub-cardinal directions. No pattern related to site distribution was apparent in the data and therefore the aspect analysis was re-categorized into four categories representing only the cardinal directions. Each of the categories represents 90 degrees and an additional category was created representing the sites located on flat ground (Table 5-6).

When the analysis is broken down into warm season and cold season occupations, it appears that sites selected for occupation during the cold season are least likely to face north than any of the three other cardinal directions. The eleven sites interpreted as occupied during the warm season show no particular pattern related to aspect. Similarly, there appears to be no pattern related to site location selection and aspect in the Uplands Regions. The only obvious pattern related to physiographic regions is the selection of east-facing sites in the Plains Regions (Table 5-6).

There are few apparent patterns to draw from the analysis of aspect as it relates to site location selection using the methods followed in this study. The deliberate non-selection of north-facing locations at sites that were occupied during the cold season may support the notion that during the cold season Blackduck occupants of south-western Manitoba sought protection from the north wind by deliberately selecting more sheltered locations. However, this hypothesis is tenuous at best, given that only one less observation is

recorded for north-facing sites than south-facing sites. It is more likely that within the observed sample aspect is not an environmental variable related to site location selection

Table 5-6
Aspect and Site Location

	Flat	North (315°-44.95°)	East (45°-134.95°)	South (135°-224.95°)	West (225°-314.95°)
Warm Season Sites	0	3	3	2	3
Cold Season Sites	2	1	6	2	4
Plains Regions	1	3	13	5	5
Uplands Regions	2	3	4	3	3

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Drainage as an Environmental Variable: In geographic locations with unpredictable daily fluctuations in mean air temperature and precipitation, the overall capacity of an area for internal drainage is an important consideration when selecting a location for occupation. This consideration is particularly important during those periods of the year in which precipitation is frequent or when the consequences of precipitation can have significant negative effects. In south-western Manitoba, the consideration of internal drainage is particularly important from late fall through early spring, when rain or snow may have adverse effects on habitation areas. A well-selected location with adequate internal drainage ensures that the accumulation of precipitation will not necessitate a sudden change in location.

The data used to analyze drainage patterns was selected from the soilAID files available from the MLI website. Unfortunately, soil data was not available for three of the Blackduck archaeological sites that fall within the boundaries of the City of Winnipeg.

Although these sites are situated on the floodplains of the Assiniboine and Red Rivers and are likely associated with inadequately drained soils, the general site environment has been drastically altered by development, preventing a reconstruction of overall drainage patterns. Furthermore, the generalization that these sites were likely inadequately drained does not indicate whether or not they would rate as “poor” or “imperfect” in the soilAID classification scheme. The lack of specific data for these sites leads to their exclusion from the analysis of drainage characteristics.

Warm season sites are evenly distributed between well and poorly drained areas. The distribution of sites occupied during the cold season stands as a point of contrast. Twelve of fifteen cold season sites are associated with well to rapidly drained areas (Table 5-7). The contrast between drainage and sites occupied in different seasons leads to the conclusion that when sites were occupied during the cold season, the selection of areas with adequate internal drainage was a significant environmental variable related to site location selection.

Table 5-7
Drainage and Site Location

	Imperfect	**Poor**	**Rapid**	**Well**	**Unknown**
Warm Season Sites	6	1	1	3	0
Cold Season Sites	3	0	4	8	0
Uplands Regions	4	0	5	6	0
Plains Regions	13	1	2	8	3

When the analysis of Blackduck sites and drainage is examined by physiographic region, no distinct pattern is apparent in the data. The only noticeable observation is the selection

of poor to imperfectly drained soils in the Red River Plain. In the Uplands Regions there is a deliberate selection of sites with rapid or well-drained soils, while in the Plains Regions the selection of sites with poor or imperfectly drained soils is apparent.

The relationship between physiographic regions and drainage aids in confirming interpretations of seasonality. Most of the sites associated with poor drainage are located in the plains areas, most notably the Red River Plain and Souris Plain, indicating that occupation of these areas took place during the warm season when the consideration of drainage in site location selection was not important. Furthermore, it is observed that sites associated with well-drained soils are more frequently located in the Uplands Regions. As it relates to seasonality, this may reflect occupation of these areas during the colder periods of the year when precipitation is more frequent and drainage is more important.

Discussion

The qualitative analysis of twenty-seven Blackduck archaeological sites was conducted during the summer of 2004. Each of these sites was examined through a combined analysis of topographic maps, aerial photography, historic maps, site documentation, and individual site visits. This qualitative analysis was combined with a quantitative analysis of the environmental variables associated with Blackduck archaeological sites, conducted in a GIS. The combined evaluations have resulted in some general observations related to Blackduck settlement in south-western Manitoba.

Each site was assigned an interpretation of seasonality based on local environmental variables. Twelve of the fifteen sites located in the Plains Regions were determined to be

warm season sites, while the remaining twelve sites were identified as cold season sites, located in the Uplands Regions. A chi-square analysis determined that the chance of this distribution occurring randomly was less than 1 in 1000. This observation has led to the following deduction:

1) *Within the observed sample of Blackduck archaeological sites, there is a relationship between the season of occupation and the physiographic region within which a site is located.*

The null hypothesis would suggest an even distribution between warm and cold season sites across the physiographic regions. However, warm season sites are located exclusively within the Plains Regions and cold season sites are located predominantly within the Uplands Regions. Seasonal fluctuations in resource abundance between the Uplands and the Plains, the differential proximity of desirable environmental variables, and climate influenced pre-contact settlement in south-western Manitoba.

At each site qualitatively analyzed, the relationship between site location and the nearest water type was noted. Without exception, all Blackduck sites located immediately adjacent to fresh water are located in the Plains Regions. Furthermore, all sites located within 500 m of fresh water are also located on the Plains, and no sites in the Uplands Regions are located within 500 m of fresh water. At ten sites only an intermittent water source was noted within 500 m, and eight of these ten are located in the uplands. The remaining two sites are located in the plains only slightly more than 500 m from fresh water.

The quantitative evaluation of proximity to water as an environmental variable related to site location selection yielded some relevant observations. The findings published by

Wiseman et al. (in press) support the results found here that approximately 40% of Blackduck sites in south-western Manitoba are located within 500 m of water and that approximately 24% of Blackduck sites are located within 200 m of water (Table 5-9). Further analysis shows that sites occupied during the warm season are located on average much closer to fresh water than sites occupied during the cold season. Additionally, sites located in the Plains Regions are on average situated much closer to water than sites located in the Uplands Regions. The combined qualitative and quantitative analyses lead to the following deduction:

2) *Within the observed sample of Blackduck archaeological sites, proximity to water was a more important variable related to site selection when sites were located on the Plains.*

This relationship is a function of seasonality. If sites on the plains were occupied during the warm season, fresh potable water would be an environmental variable significant in site location selection. Conversely, at sites in the uplands occupied during the winter, snow would have been available to melt for drinking water.

Table 5-8
A Comparison with Wiseman, et al (in press) (m)

	</= 500m (Wiseman)	**</= 500m (Current Study)**	**</=200m (Wiseman)**	**</=200m (Current Study)**
Percentage of Sites	42%	40%	24%	18%
Boissevain Till Plain		1		2
Red River Plain		8		11
Reston Till Plain		1		1
Souris Plain		2		3
Tiger Hills		0		0
Upper Assiniboine Delta		0		1
Lower Assiniboine Delta		0		0
Pembina Mountain		0		1
Uplands Aggregated		0		2
Plains Aggregated		12		17

The relationship between sites occupied during the cold season and sheltered sites was examined in the qualitative analysis. When the frequencies of sheltered sites are adjusted to account for sites where proximity to fresh water and shelter are coincidental, the relationship between seasonality, shelter, and physiographic regions becomes more apparent. Eight of the ten sheltered sites are located in the Uplands Regions. This observation leads to the following deduction:

3) *Within the observed sample of Blackduck archaeological sites, shelter was an important variable related to site location selection when sites were located in the Uplands Regions.*

The distribution of sites in well sheltered areas in the uplands physiographic regions is again a function of seasonality. Sites were occupied during the cold season in the Uplands Regions when shelter was an important consideration, while sites in the Plains Regions were occupied during the warm season when shelter was a less critical resource.

The quantitative evaluation of the relationship between site location and slope indicates that sites occupied during the warm season and in the Plains Regions are associated with gentler slopes than sites occupied during the cold season and in the Uplands Regions. This observation leads to the following deduction:

4) *Within the observed sample of Blackduck archaeological sites, slope was a significant environmental variable related to site location selection when sites were located in the Uplands Regions.*

The non-random selection of areas with steeper slopes is again a function of seasonality. The selection of steeper slopes during the cold season may reflect the consideration of other environmental variables such as aspect or drainage.

The evaluation of the relationship between aspect and site location selection yielded few relevant observations contributing to a model of Blackduck settlement in south-western Manitoba. A significant relationship was identified between the selection of east-facing slopes for occupation in the Plains Regions. A weak relationship was identified between the avoidance of north-facing slopes and settlement during the cold season. If this relationship could be strengthened through future research it could be explained by the deliberate selection of areas sheltered from the north wind during the cold season. Unfortunately, this relationship is weakly expressed within the sample of Blackduck sites studied, leading to the following deduction:

5) *Within the observed sample of Blackduck archaeological sites, there appears to be little or no relationship between aspect and site location selection.*

It was expected that a relationship could be established between aspect and the season during which sites were occupied. If sites located in the Uplands Regions were occupied during the cold season, then perhaps tree cover and the presence of large topographic features such as the Tiger Hills provided enough shelter, thereby making the selection of locations with particular aspects for occupation unnecessary. Additionally, a combination of well-sheltered and well-drained sites may have been more important to site location selection during the cold season than the single environmental variable of aspect.

A relationship was established between drainage and site location. Sites inferred to have been occupied during the warm season are more frequently associated with imperfect or poorly drained soils, while sites occupied during the cold season are associated with well-drained soils. Furthermore, sites occupied in the uplands are more likely to be associated

with well-drained soils than sites on the plains. These observations have led to the following deduction:

6) *Within the observed sample of Blackduck archaeological sites, drainage was an important environmental variable contributing to site location selection when sites were located in the Upland Regions.*

Summary:

Through the evaluation of multiple environmental variables thought to contribute significantly to site location selection, several deductions have been made contributing to the analysis of Blackduck settlement. Combined, these deductions lead to the conclusion that the occupation of the various physiographic regions within south-western Manitoba was based on a seasonal cycle. The various environmental variables analyzed in the qualitative and quantitative evaluations result in a regional model of seasonal physiographic settlement. In the Plains Regions, locations were selected for occupation during the warm season that were close to fresh water, open, on gentle slopes, and poorly drained (Table 5-9). These characteristics can be contrasted with the characteristics of sites occupied during the cold season in the Uplands Regions that were removed from water, sheltered, on steeper slopes, and well-drained (Table 5-9). The characteristics of the seasonal occupation of the various physiographic regions are the framework for establishing a model of Blackduck settlement and land use in south-western Manitoba.

Table 5-9
Characteristics of Blackduck Site Location in South-western Manitoba

Plains Regions	Uplands Regions
Close to water	Removed from water
Open	Sheltered
Gently Sloped	Steeper slopes
Poorly drained	Well-drained

Chapter Six:

An evaluation of existing settlement models

Prior to outlining a new model of Blackduck settlement in south-western Manitoba, a review is provided of previously published models. These models are evaluated for their general usefulness and also their specific applicability to Blackduck.

Arthur Ray's (1974) model of Parkland/Grassland exploitation cycles was not intended to model Blackduck land use in the pre-contact era, but has been repeatedly cited as a suitable model of Blackduck land use, particularly by Pettipas (1980) who used it to develop his "Parkland Convergence Model". Syms (1977) developed the "Co-Influence Sphere" model to illustrate how different archaeological groups exploited overlapping resource territories. This model also was not intended to apply specifically to Blackduck, but has been repeatedly cited as a model of how different groups adapted to south-western Manitoba. Nicholson's dissertation (1987) identifies several different adaptation strategies that were employed by various pre-contact groups in southern Manitoba. Nicholson uses the Blackduck culture to model an adaptive strategy, but the models were not developed specifically for Blackduck. Of these various models, only Pettipas makes a specific attempt to model Blackduck land use.

The work of each of these authors has been used to model Blackduck settlement in south-western Manitoba whether they were originally designed for that purpose or not, and accordingly, each model has strengths and weakness for modeling Blackduck land use. Key considerations here are that the majority of these models were not specifically

developed for Blackduck, and that they were developed at a time when less was known about Blackduck settlement in south-western Manitoba. Since the publication of these models numerous Blackduck sites have been added to the Historic Resources Branch database, greatly contributing to the knowledge surrounding the location and nature of Blackduck archaeological sites. Furthermore, very little research has been conducted on Blackduck archaeological sites since these models were first produced. The point of this discussion is not to criticize the efforts of the researchers that produced earlier models of Blackduck land use. Rather, it is to acknowledge that the newly proposed model is built on a foundation constructed from these earlier models.

Ray's Parkland/Grassland Cycle of Resource Exploitation

Ray's (1974) model of seasonal resource exploitation was developed on the basis of a very limited amount of archaeological research conducted at a very early stage of the study of Manitoba pre-history, and supported by references from early ethno-historic documents. Combining a minimal amount of archaeological research with historic accounts, Ray was able to develop a cycle of seasonal resource exploitation modeling the movements of historic groups between the boreal forest, parkland, and grassland biomes.

Ray developed a parkland cycle of seasonal resource exploitation (Figure 6-1) in which the Cree moved between the boreal forest during the warm season and aspen parkland during the cold season. In the aspen parkland the Cree encountered the Assiniboine who, based on Ray's grassland cycle of seasonal resource exploitation, moved between the grasslands during the warm season and the parklands during the cold season. The sharing of the aspen parkland during the cold season by both the Cree and Assiniboine is

proposed to have led to the development of trade relationships, in which not only items but ideas were exchanged. The Cree are proposed to have learned the technique of bison pounding from the Assiniboine, enabling a successful adaptation to the grasslands during the historic period. For a more thorough discussion of Ray's model see the original source (Ray 1974).

Ray's model was not developed with the intention of projecting backwards into the pre-contact era and applying to earlier Blackduck occupations in south-western Manitoba. It was built largely on ethnohistoric accounts and any extrapolation into the past was only meant to project as far back as the proto-contact era. At the time that Ray's model was developed it was believed that Blackduck people were related to the historic Cree, a relationship that has never been proven. Rays' model was intended to illustrate the seasonal movements of proto-contact groups, not the seasonal movements of archaeological cultures.

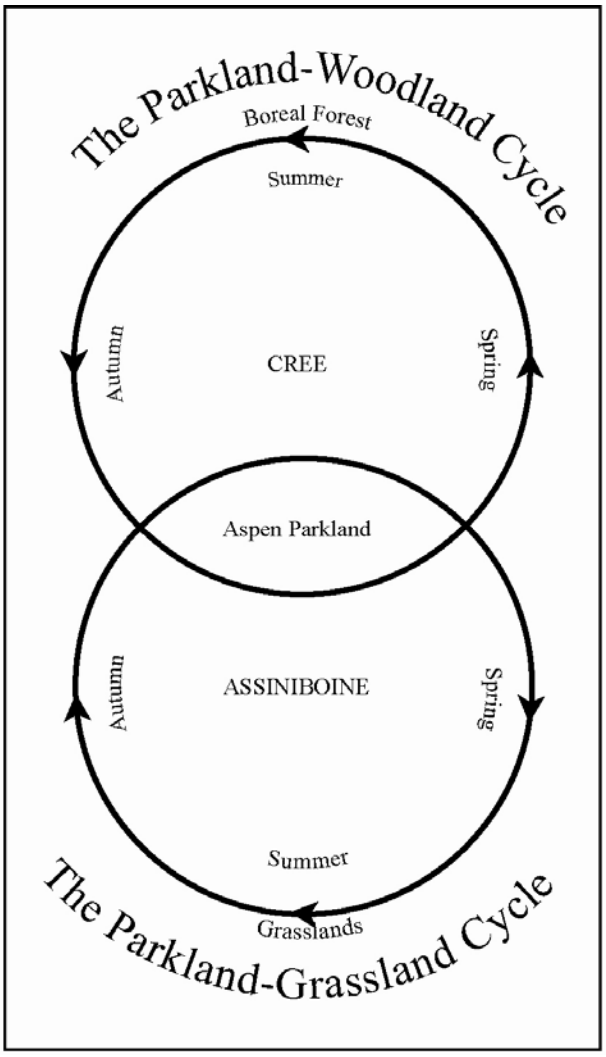

Figure 6-1. Seasonal resource exploitation cycles of the Cree and Assiniboine (after Ray 1974:47)

In addition to archaeology and ethnohistory, Ray's model was also established on the basis of the seasonal migration of bison herds. In an evaluation of the food resource potential of the three biomes of the boreal forest, aspen parkland, and grassland, Ray found that during the winter the aspen parkland had the highest resource potential of the adjacent biomes for pre-contact groups, based on the return of large herds of bison to the parkland from their annual summer migration into the grasslands. During the summer the Assiniboine followed the bison into the grasslands while the Cree returned to the boreal forest to fish and hunt migratory waterfowl.

The seasonal migration of bison has been supported and disputed by several researchers. Morgan (1980) supports the migration of bison between the parklands and grasslands from an ecological point of view, and finds the basis for these migrations in vegetation patterns. As winter foraging supplies are diminishing in the early spring, new grass becomes available in the northern open grasslands and bison emigrate from protected wintering areas to the open grasslands. As fresh forage develops, the bison follow the pattern of emerging vegetation south and west to a hypothetical focal point in the grasslands. The aggregation of large herds of bison on the open xeric grasslands in the south causes the forage in that area to become depleted, and, following the vegetation patterns, the bison turn northwards again, returning to the sheltered parkland until spring when the cycle starts over again. Morgan implies that the ecological basis for the migration patterns supports a complete exodus of bison from the parkland area in spring and a scheduled return to the parkland in the fall.

This point of view is contrasted by Hanson (1984), who contests not the migration of bison but rather the nature of the migration. Hanson agrees that the movements of bison were dictated by the availability of forage but argues that this availability was dictated by local conditions rather than a uniform ecological pattern to be applied to all of the parkland and grassland biomes. Hanson believes that while the aggregation of large bison herds in the summer on the grasslands did occur, the availability of forage in many areas of the parkland was sufficient to support smaller herds of bison. In other words, Hanson supports the viewpoint that bison were available throughout the year in the parkland in reduced numbers. Perhaps most importantly, Hanson's research was conducted in North Dakota, on the border of the current study area.

A further contribution to the debate of bison ecology is provided by Bamforth, who questions the validity of both Morgan's and Hanson's work. Bamforth argues that ethnohistoric accounts of bison movements cannot be used to model the movement of bison herds in the pre-contact era due to the effects that an increased human presence had on the movements of bison. The validity of the seasonal movement of bison, upon which much of Ray's evaluation of resource potential is based, can clearly be questioned. The availability of bison in the parkland area throughout the year would significantly affect the resource potential of the parkland, and may have enabled either Assiniboine or Cree groups to remain in the parkland throughout the year.

A second point of dispute arises from the concept of the Assiniboine and Cree sharing the parkland during the winter. A trading relationship likely existed between the Assiniboine and the Cree during the pre-contact era, but it is unlikely that they camped and lived

together throughout the whole period of Blackduck occupation of south-western Manitoba. Although the resource potential of the aspen parkland during the winter may have been high due to the presence of an increased number of bison, it is unlikely that there were sufficient resources to be shared equally without competition between different groups. Although there were more resources in the parkland during the winter than in the boreal forest, bison were still a relatively unpredictable resource. A mild winter or short-term fluctuations in temperature may have caused bison to remain out on the prairies rather than entering the sheltered areas of the parkland, creating a significant shortage in resources for groups occupying the parkland. It is unlikely that the relationship between competing groups would have remained amicable in times of shortage.

The mutually beneficial relationship between the Cree and Assiniboine likely only developed in the context of the fur trade. Numerous examples of the Cree acting as "middlemen" between plains groups and the Hudson Bay Company have been cited in the literature. In this context, an amicable relationship likely developed when the Assiniboine wished to trade furs with the Cree. Both groups camped together in the parkland where economic and social ties were reinforced through a mutually dependent trade relationship in which the Assiniboine were dependent on the Cree for fur trade items and the Cree were dependent on the Assiniboine for furs to trade to the HBC.

A further point of contrast can be seen in the potential of overlapping occupation territories between Blackduck and other cultural groups. As mentioned above, the resources of south-western Manitoba were likely not sufficient or predictable enough to

support competing groups during the cold season. During the warm season, whether a complete or partial exodus of bison from the parkland is supported, even fewer resources would be available based on the seasonal evaluation of resource potential, thereby increasing competition. As a consequence of this diminished resource potential, Ray finds that there was an evacuation of south-western Manitoba, leaving the study area bereft of human occupation during the warm season. The current study shows that there were indeed sites occupied in south-western Manitoba during the warm season. Furthermore, there is no archaeological evidence of multiple groups occupying south-western Manitoba during the cold season. From the onset of the initial settlement of south-western Manitoba by Blackduck people until the some point during the "late" phase of Blackduck settlement (after 1000 A.D.) in south-western Manitoba, there is no evidence of other groups occupying the study area. Duck Bay ceramics have been recovered from several sites within the study area but at these sites there are proportionally more Blackduck ceramics than Duck Bay ceramics. Hanna (1992) has explained this phenomenon as the result of an exogamous marriage pattern in which members of the Duck Bay group married into Blackduck groups to reinforce social networks. Additionally, Lenius and Olinyk (1990) believe that Duck Bay in fact developed out of the coalescence of the Blackduck and Laurel cultures. Although there is an indication that Blackduck groups interacted with plains groups, as evidenced by the presence of some plains pottery at locations such as the Stott Site (DlMa-1), there is no concrete archaeological evidence of Blackduck people sharing south-western Manitoba with other archaeological cultures.

In light of these considerations, it seems appropriate to note that at the very least Ray's model should be evaluated more carefully with regards to its application to the Blackduck culture in south-western Manitoba. This is not a dismissal of Ray's model altogether and in fact it is highly likely that this model accurately represents the movements of groups in the proto-contact and early historic periods. The application of this model to the pre-contact era however, and to Blackduck in particular, is questionable.

Syms' Co-Influence Sphere

Syms introduced the Co-Influence Sphere Model in 1977, and used it to explain the cultural dynamics of the ceramic producing cultures of south-western Manitoba (Figure 6-2). Syms found it necessary to create a new model of land use because the four basic assumptions that were the basis of chronological linear models did not adequately explain what contemporary archaeologists were discovering in the archaeological record.

The four assumptions that Syms rejected in the development of the Co-Influence Sphere model were:

1) *Differences in artifact assemblage in a given region are due to temporal change.*
2) *Most archaeological units will not overlap temporarily and therefore dates that conflict with the chronological sequence must be in error.*
3) *There has been little or no movement of groups from region to region; change in the artifact assemblage is due to cultural diffusion or the invention of new ideas.*
4) *Major archaeological units will have transitional forms...* (Syms 1977:8)

Instead, Syms based the Co-influence Sphere Model on new assumptions that reject or augment the assumptions generally accepted by chronological linear models. These assumptions are:

1) *Change in the artifact assemblage may be induced over time, change in function, or to co-existence of two or more groups.*
2) *Major archaeological units within a region may co-exist and overlap temporally.*
3) *The movement of archaeological groups from region to region is necessary for survival…*
4) *The major archaeological units may have transitional forms if there have been long-term local developments...* (Syms 1977:8)

The basis for Syms' rejection of assumptions and adoption of new assumptions cannot be addressed within the scope of this paper. Needless to say, the Co-Influence Sphere Model has greatly influenced archaeological thinking since its publication.

The model was created because of evidence recovered by Syms and other researchers that indicated that several groups from several near-by areas had utilized south-western Manitoba contemporaneously. These groups had influenced one another through positive interaction or negative interaction (avoidance). The basic premises of Syms' model are that groups used large areas, shifted distribution ranges, had the potential to be mobile, and were capable of making adjustments to the environment. Groups made use of core, secondary, and tertiary areas. Core areas represent the areas in which a group spent most of the year, or habitually spent certain seasons of the year. Secondary areas are where groups went to for a specific resource regularly, and tertiary areas are those that were used briefly and intermittently. In order for an area to qualify as tertiary, the area must be visited with sufficient frequency to leave evidence of repeated occupation (Syms 1977).

An evaluation of the Co-Influence Sphere in comparison with the attributes of Blackduck settlement identified in Chapter Five results in a re-appraisal of what were originally thought of as core, secondary, and tertiary areas of Blackduck settlement. The acceptance of a more traditional model of settlement, with Blackduck people moving between the boreal forest and the aspen parkland, would identify the core area as a space overlapping

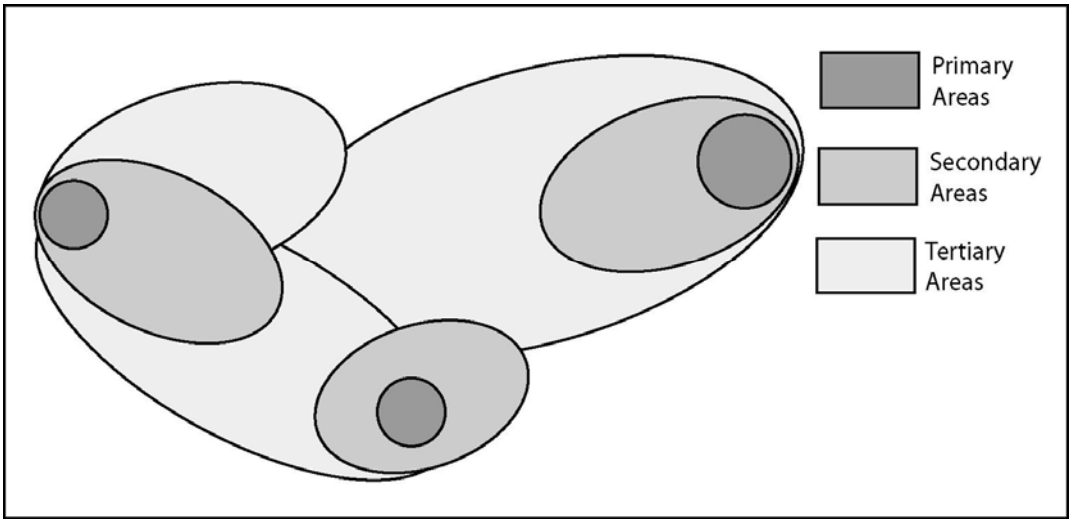

Figure 6-2. The Co-Influence Sphere Model (after Syms 1977:6).

parts of both the aspen parkland and the boreal forest, with secondary areas perhaps represented by the extreme edges of the core areas; that is, areas such as the extreme south-west corner of Manitoba or farther to the north in the boreal forest. Tertiary areas, in the context of this discussion, are of less concern. The attributes of Blackduck archaeological sites identified in Chapter Five demonstrate that the year-round occupation of south-western Manitoba was indeed possible. This results in the delineation of two core areas: one each in the boreal forest and south-western Manitoba. Secondary areas are identified as the peripheries of each of these areas, including the overlapping portions of the core areas in the more northern edges of the parkland or the southern edges of the boreal forest. Another secondary area for the Blackduck occupants of south-western Manitoba might be represented by the Knife River Flint quarries in southern North Dakota. Blackduck archaeological sites within the study area are dominated by the presence of brown chalcedony, which likely has its origins in the Knife River quarries. While there is little or no evidence of Blackduck intrusion into the Dakotas to procure

lithic raw materials, there is also no evidence of groups venturing north to trade with people of the Blackduck culture. The delineation of core, secondary, and tertiary areas of Blackduck settlement is difficult due to the fact that the archaeological record is incomplete and the identification of Blackduck archaeological sites is inconsistent.

The most useful application of Syms' model to Blackduck settlement in south-western Manitoba is as a heuristic device. Syms makes no attempt to specifically delineate core, secondary, and tertiary areas for any particular group. The four assumptions upon which the model is based (Syms 1977:8) may not be directly applicable to the Blackduck culture but serve as an appropriate means of explaining the archaeological record of a geographical area, rather than a particular archaeological culture.

Pettipas' Parkland Convergence Model

Pettipas developed the Parkland Convergence model in 1980, in an effort to better understand the Blackduck occupation of Manitoba. Building largely on the efforts of Ray (1974) and Syms (1977), Pettipas identifies two separate Blackduck groups, based on the distribution of ceramics across Manitoba.

Pettipas finds that the Blackduck culture was divided into two groups, a northern division and a southern division. In Pettipas' model, the northern group moved between the boreal forest in the summer and the aspen parkland in the winter, and the southern group moved between the aspen parkland in the winter and the grasslands in the summer. The proposal of the movement of Blackduck people into the grasslands in the summer is problematic

because Blackduck ceramics have not been recovered in the grasslands beyond the borders of Manitoba.

Pettipas acknowledges that women were the primary producers and users of ceramics, and accounts for a lack of Blackduck ceramics in the grasslands by finding that women remained in the aspen parkland fishing with members of the band unable to travel, while the men hunted bison in the grasslands. Pettipas' alternative hypothesis is that women travelled with the men to the grasslands but simply didn't produce ceramics while in the grassland. Instead, containers made of materials such as birch bark are hypothesized to have been used.

While it may have been the responsibility of the male members of society to hunt and procure bison, the processing of the meat was largely done by females. For this reason, it is difficult to accept that women would not have accompanied the hunters on trips to the grasslands. Furthermore, it is difficult to accept that women would not have produced pottery while in the grasslands. While it is acknowledged that pottery may have been difficult to transport, it is difficult to accept that given the opportunity pottery would not have been produced at one of the numerous temporary processing camps occupied after a kill event.

Pettipas' Parkland Convergence Model is the only model reviewed here developed specifically for Blackduck and based largely on the archaeological record. Unfortunately, the Parkland Convergence Model falls short of an accurate representation of Blackduck settlement on several fronts. First, the Parkland Convergence model cannot adequately account for the lack of Blackduck pottery in the grasslands. Secondly, Pettipas' model is

still based on the seasonal movement of Blackduck groups between biomes, while the characteristics of Blackduck archaeological sites identified in Chapter Five demonstrate that the year round occupation of south-western Manitoba by Blackduck groups was possible. Still, the Parkland Convergence model is useful because it outlines how the year round occupation of south-western Manitoba was possible, by at least some members of the Blackduck culture. While Pettipas' recognizes that certain aspects of the model are lacking, it certainly is thought provoking and is acknowledged as one of the few archaeological publications that attempts to deal with a problematic issue in archaeology.

Nicholson's Models

Like Syms, Nicholson (1987) developed several models of settlement based on the archaeological record of an area rather than a particular archaeological culture. Nicholson develops several models of subsistence strategies in studying the forest-grassland transition zone of western Manitoba. A great deal of the work is based on ethno-historic accounts of the Assiniboine, Cree, and Ojibway, while noting that subsistence strategies used by these particular groups changed significantly in the proto-historic period. These strategies changed as a result of groups moving through western Manitoba, influenced by the effects of the fur trade and adapting to new resource procurement opportunities as they were encountered. Nicholson's summary of the resources available in each biome (forest, aspen parkland, and grassland) is similar to the information provided by Syms (1977) in his summary of the potential resources of each biome. While Syms (1977) focused on the cultural dynamics of groups adapting to south-western Manitoba, Nicholson's work is more closely tied to evaluations of resource potential.

Nicholson finds that models of adaptive subsistence strategies are closely tied to resource and habitat, and that these strategies are cultural responses strongly conditioned by the environment. Citing Jochim (1976), Nicholson (1987) finds that adaptive strategies are based on the primary goals of:

1) *The achievement and maintenance of reliable food supplies and non-food staples.*
2) *The maintenance of energy expenditure within a predefined range.*

Nicholson also cites Jochim's (pg.22) secondary goals of the desires for good tasting foods, variety, and prestige, as well as a desire to maintain a differentiation of sex roles, as goals desirable to meet within the resources available within a given environment. Nicholson finds that there are several variables affecting the rankings of resources by groups, including seasonality, distribution, mobility, abundance, energy value, and non-food yield potential.

Nicholson, in an analysis of the ecological diversity of the area, finds that no single subsistence strategy model can properly account for the range of adaptive strategies possible within the study area. To this end, Nicholson (1987) provides four models of adaptive strategies, built on the bio-geographic concepts of ecotone and biome:

a) *Seasonal round utilizing the resources of a single biome*
b) *Seasonal round utilizing the resources of two or more biomes*
c) *Seasonal round utilizing the resources of a single biome with seasonal exploitation of one or more ecotones*
d) *Intensive exploitation of one or more ecotones.* (Nicholson 1987:230)

Nicholson applies these models to various pre-contact and historic groups and identifies a Type B subsistence strategy, the exploitation of two or more biomes, as most appropriate to explaining Blackduck settlement. This is an appropriate model for explaining the more traditional Blackduck settlement pattern of groups moving between the boreal forest and aspen parkland. While Nicholson recognizes that some movement occurred between the

boreal forest and aspen parkland, he acknowledges an uncertainty in just how much migration occurred.

The characteristics of Blackduck archaeological sites identified in Chapter Five propose the year round occupation of south-western Manitoba. Following Nicholson's identification of four possible adaptation strategies, the Blackduck occupation of south-western Manitoba follows a Type C strategy, the exploitation of a single biome and one or more ecotones. In this case, the single biome is represented by the aspen parkland and several physiographic features of south-western Manitoba. The Blackduck occupation of the boreal forest followed either Type A, the exploitation of a single biome; or Type B, the exploitation of two biomes. A Type B strategy would occur if Blackduck groups were in fact coming to the aspen parkland as part of the seasonal round and intermixing with the Blackduck groups residing there. Of course, these adaptation strategies may not have been followed by all Blackduck groups. It may be that only some Blackduck groups maintained social networks with groups in the adjacent biome.

Nicholson's models are still applicable for outlining the year round Blackduck occupation of south-western Manitoba. The four adaptation strategies identified by Nicholson were not developed with Blackduck specifically in mind and at the time that the models were developed the traditional concept of Blackduck people moving seasonally between the aspen parkland and boreal forest was still largely accepted. Although Nicholson identified Blackduck as having a Type B rather than a Type C adaptation strategy the models are useful for identifying the possible adaptation strategies available to pre-contact occupants of southern Manitoba.

Summary:

Previously accepted models of Blackduck settlement in south-western Manitoba and the boreal forest have been evaluated for their potential to model Blackduck settlement in south-western Manitoba. Each of these models fall short of accurately modelling Blackduck settlement in south-western Manitoba either because they are being applied beyond their intended use, because they were not developed directly on Blackduck archaeological research, or because they were developed upon previously published literature surrounding Blackduck land use and settlement patterns.

The current study addresses a gap in the literature by analyzing Blackduck settlement in south-western Manitoba in more detail than previously accepted models and furthermore is the only research to date based on a combination of fieldwork and analysis directed towards specifically identifying a Blackduck settlement pattern.

Chapter Seven:

Blackduck Settlement and Land Use

With the previously published models of Blackduck settlement evaluated, it has been shown that each model is inadequate for modelling Blackduck settlement in south-western Manitoba. The environmental variables associated with Blackduck archaeological sites in south-western Manitoba identified in Chapter Five, demonstrate that the study area was occupied during the warm season. The recognition of this fact necessitates the proposal of a new model of Blackduck settlement and land use. This new model identifies two separate and contemporaneous Blackduck groups: a Boreal Forest Blackduck group and a Plains Blackduck group. Following the outline of a new model of Blackduck settlement in south-western Manitoba, these models are compared to one another and a model of the how these groups interacted is proposed.

Syms (1977) and Buchner et al (1984) note that the Blackduck occupation of south-western Manitoba represents the immigration of a group of people from the south and east around the west end of Lake Superior. This immigration is based on similarities in ceramics recovered in northern Michigan, Wisconsin, and Minnesota, and likely occurred as a result of population pressure during the Late Woodland period. These people were well adapted to subsistence in the Great Lakes Forest and likely practiced a seasonal cycle of movements between water bodies during the warm season and inland areas during the cold season. Upon arriving in north-western Ontario and southern Manitoba, Blackduck people separated into two groups: one into north-western Ontario, adopting

the boreal forest pattern of Blackduck settlement; and one into southern Manitoba, occupying the study area of the current research.

The Regional-Environmental Model of Blackduck Settlement in South-western Manitoba

Following their migration from the south-east around the western end of Lake Superior and through the Great Lakes Forest into southern Manitoba, it was possible for Blackduck groups to adopt their traditional subsistence patterns in a new environment. The major adaptation to southern Manitoba occurred in the adoption of a plains oriented subsistence economy dominated by bison procurement. Syms (1977) notes that this adaptation to a new and seasonally plentiful resource occurred quickly, and that this quick adaptation may indicate that bison hunting was not newly learned on the prairies. Syms suggests that bison hunting may represent a subsistence strategy learned by ancestral Blackduck people living on the plains/woodlands fringes to the southeast. Sites such as Stott (DlMa-1) and Hokanson (DiLv-29) demonstrate that Blackduck people rapidly became proficient at bison hunting as a focal point in their subsistence economy in south-western Manitoba.

The analysis of environmental variables associated with Blackduck archaeological sites in south-western Manitoba demonstrates that during the warm season, Blackduck groups occupied the areas adjacent to waterways in the Plains physiographic regions, including the Red River Plain; the Souris Plain; the Reston-Till Plain; and the Boissevain Till Plain (Figure 7-1). In the river valleys and grasslands that characterized these physiographic regions, Blackduck groups hunted many of the same species of game as they did in the

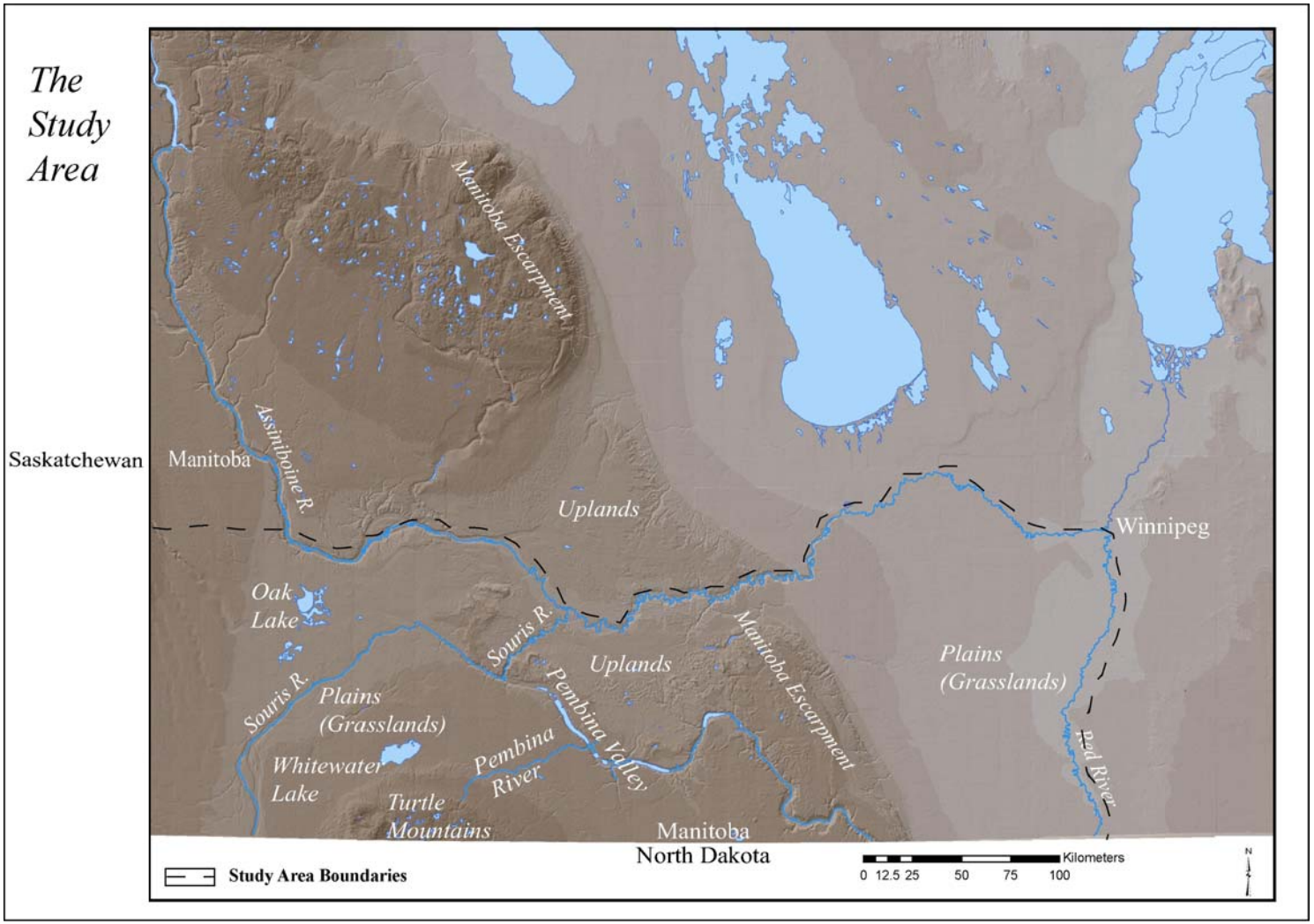

Figure 7-1. Blackduck groups moved between the plains physiographic regions (black text) during the warm season and the uplands physiographic regions (white text) during the cold season.

forests to the south and east, and fishing was continued as a major subsistence activity. During the cold season, Blackduck people moved away from the water bodies into the Uplands physiographic regions of south-western Manitoba, including the Upper and Lower Assiniboine Deltas; the Tiger Hills; and the Pembina Mountains (Figure 7-1). In these upland areas firewood would have been available and shelter would have been provided both by the local topography and forest vegetation.

The year-round occupation of south-western Manitoba by Blackduck groups challenges the original seasonal exploitation cycle of movement between biomes proposed by Ray (1974) and supported in the published literature by archaeologists (Syms 1977; Pettipas 1980; Nicholson 1987). However, the model proposed by Ray forms the basis of the Regional-Environmental Model of Blackduck Settlement in South-western Manitoba (hereafter referred to as "The Regional-Environmental Model"), a model based on a similar seasonal cycle of resource exploitation and intimate knowledge of the physical and cultural environment (Figure 7-2).

Warm Season Blackduck Settlement in South-western Manitoba: During the warm season, Blackduck occupants of south-western Manitoba lived in the plains physiographic regions of south-western Manitoba. The grasslands that characterized these regions provided many important resources, including bison. The seasonal movement patterns of bison are still a source of considerable debate in the literature, with some researchers documenting a complete withdrawal of bison from the prairie/parkland areas of south-western Manitoba (Morgan 1980) and others finding that bison seasonal

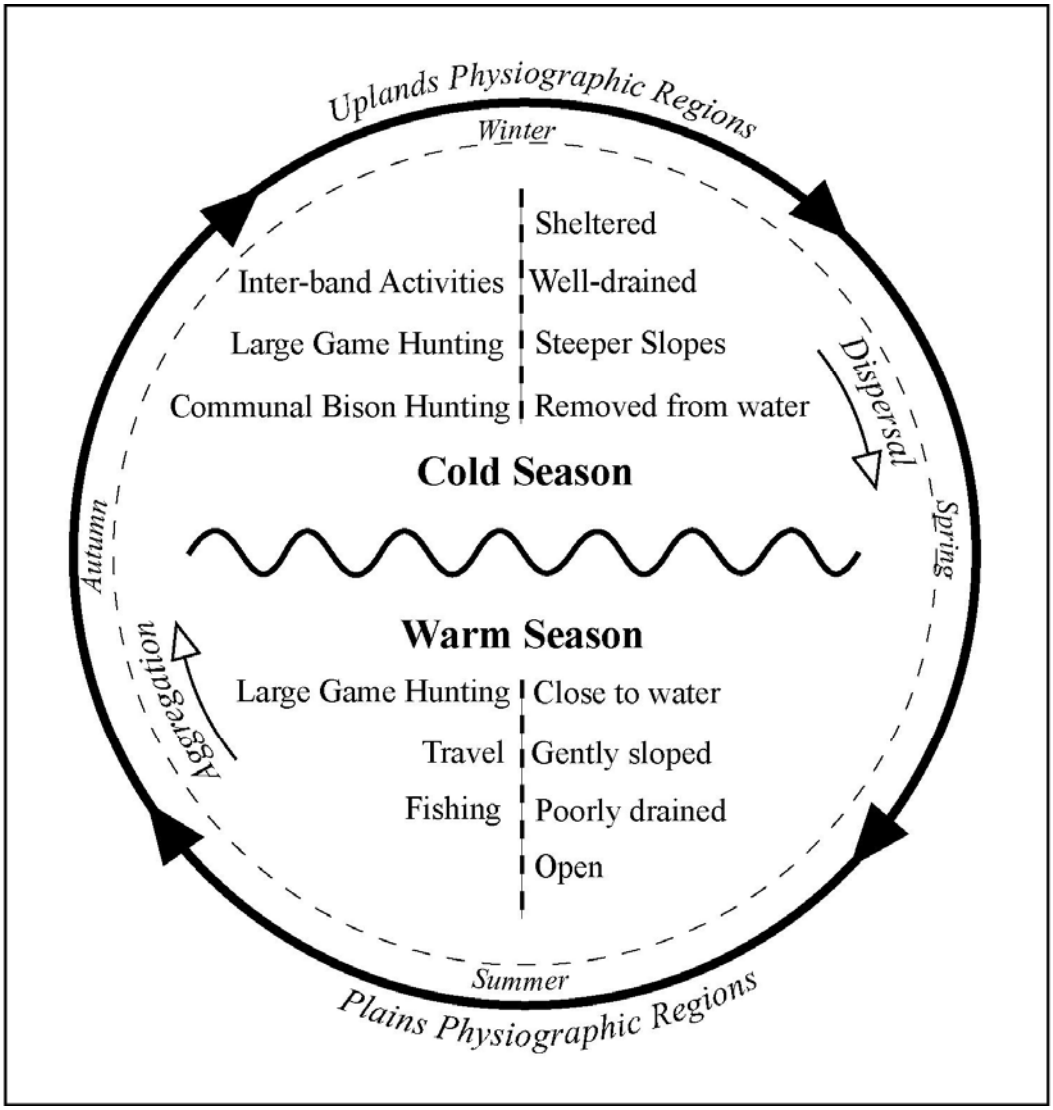

Figure 7-2. The Regional-Environmental Model of Blackduck Settlement in South-western Manitoba.

movements were highly irregular and subject to local environmental influences (Hanson 1984). Other researchers offer a cautionary note related to the reconstruction of bison seasonal movement patterns from ethno-historic documentation, noting that the seasonal movement of bison was drastically affected by the fur trade (Bamforth 1987). Noting the ongoing debate, it is accepted here that most of the bison population migrated out of south-western Manitoba in the early spring, but that small herds remained in Manitoba's prairie/parkland region throughout the year. Blackduck occupants of south-western Manitoba pursued these animals throughout the summer in the plains physiographic

regions and were presented with a surplus of game when bison returned to the prairie/parkland areas in the fall.

Other important resources were available on the grasslands throughout the warm season. Other large and medium-sized ungulates including elk, deer, and antelope were present, but these animals are less visible in the faunal materials recovered at archaeological sites because they are non-herd animals. As such, procurement of these animals often occurred in the capture of single animals rather than the multiple kills generally associated with bison hunting.

On the plains, Blackduck sites are located in close proximity to fresh water resources. Lakes and rivers are not only valuable as a source of drinking water, but the warm season resources of freshwater clams, aquatic vegetation, and aquatic mammals are extremely important. Perhaps the most important and reliable resource to be acquired from freshwater are the various species of fish, particularly during their respective spawning seasons. Fish provided a source of food when bison movements were at their most erratic, during the spring and fall seasons. Smith (1988:21) points out that by adopting fishing as a regular part of subsistence strategies during these periods, pre-contact groups would have had a means of sustaining themselves through seasonal transitions on the northern plains.

Waterways were also significant for their proposed function as travel corridors (Figure 7-3). Permanent watercourses such as the Assiniboine and Souris Rivers, in conjunction with major topographic features such as the Pembina Valley or Turtle Mountains, may have functioned as a means of directing travel across the landscape of south-western

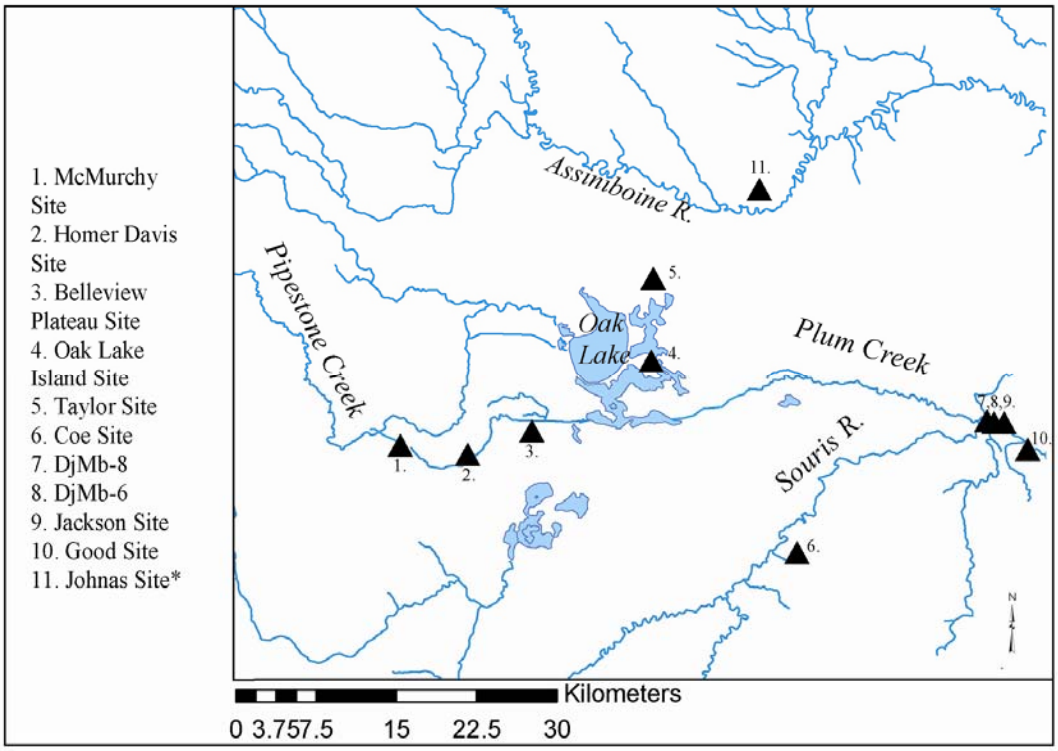

Figure 7-3. Blackduck Sites on the Souris Plain associated with watercourses (note: * the Johnas Site is actually a Vickers Focus site with an adjacent unexplored Blackduck occupation).

Manitoba. An example of this may be illustrated in the vicinity of Pipestone Creek, west of Oak Lake on the Souris Plain. Pipestone Creek enters the study area from the west in Saskatchewan in the vicinity of the Trans-Canada Highway. Three Blackduck sites (the McMurchy Site (DjMg-31), the Belleview Plateau Site (DjMf-15), and the Homer Davis Site (DjMf-6)) are located adjacent to Pipestone Creek before it empties into Oak Lake to the east. The Oak Lake Island Site (DkMe-13) is located on the eastern shore of Oak Lake (Figure 7-3). From Oak Lake, Blackduck occupants were able to travel north to the Assiniboine River or south through Plum Creek to the Souris River. Blackduck sites are located along the Assiniboine and Souris Rivers across the study area and travel along these waterways may have been possible by canoe or on foot.

Cold Season Blackduck Settlement in South-western Manitoba: During the cold season, Blackduck groups in south-western Manitoba occupied the upland physiographic regions. These areas are characterized by well-drained slopes and significant forest vegetation providing shelter from the harsh winter climate. The forested areas not only provided shelter but also provided other important economic resources, such as wood for cooking and warming fires and for constructing shelters and tools. Food resources were more abundant in the uplands areas than on the plains during the cold season as well. Bison returning to the prairie/parkland areas of south-western Manitoba sought shelter among the forested uplands, aggregating in large herds and making possible communal kill events such as those observed at the Hokanson (DiLv-29) and Stott (DlMa-1) sites. These sites are believed to represent events where large groups of Blackduck people aggregated to create a storable surplus (Hamilton, et al. in press) before dispersing in the late winter or early spring within the uplands to live out the remainder of the cold season at the smaller sites more frequently observed in the archaeological record. In addition to bison, other animals such as elk, antelope, and deer were present in the uplands during the cold season as well, where they sought shelter from the elements and browsed on forest vegetation. Forest dwelling mammals including moose, fox, rabbit, hare, coyote, bear, and other small mammals were confined to forested areas during the cold season. These diffuse resources are the same species of animals that Blackduck groups would have hunted while wintering in the boreal forest. The climate of south-western Manitoba likely caused a season of physical hardship during the cold season, but the variety of resources available in the uplands created ample hunting opportunities for people of the Blackduck culture.

Blackduck sites in the uplands physiographic regions are generally well-removed from fresh water sources. This is appropriate considering that rivers and lakes are less-sheltered from the elements and that the variables that attracted Blackduck people to waterways on the plains during the warm season are no longer a consideration. Frozen lakes and rivers no longer provide water or ambush opportunities for animals and aquatic resources in the form of aquatic mammals, fish, and vegetation are no longer available. Frozen waterways may have acted as pathways during the cold season but it is more likely that Blackduck people travelled in the interior of the uplands rather than on the frozen waterbodies. Hamilton, et al. (in press) believe that travel more likely occurred along "paths of least resistance" within the uplands such as the low valleys that nearly bisect the end moraine complex of the Tiger Hills.

In addition to the uplands of south-western Manitoba, Blackduck people may have wintered in outlying sheltered areas such as river valleys, the sand hills of the glacial Lake Hind basin, or in the Turtle Mountains. Shayne Lynxleg, of Valley River First Nation, commented that his relatives used to winter in the Turtle Mountains and spend the summers on the plains west of Virden, Manitoba (personal communication, 2005). These areas are relatively small and isolated when compared with the physiographic regions of the Upper and Lower Assiniboine Deltas, the Tiger Hills, and the Pembina Mountains, and would only have supported smaller Blackduck groups. These areas are well-sheltered from the elements and the same animal species that lived in uplands physiographic regions would have been present in these outlying areas in reduced quantities.

The analysis of environmental variables related to Blackduck settlement, including fresh water, slope, aspect, and drainage, reinforces the hypothesis of year round settlement for Blackduck groups within south-western Manitoba. The acceptance of the Regional-Environmental Model has dramatic implications for cultural dynamics. It changes the ways that both the Blackduck migration into the study area and the subsequent settlement of that area have been traditionally thought of by archaeologists.

A Comparison with Boreal Forest Settlement Patterns

The seasonal cycle of Blackduck land use adopted in the boreal forest has yet to be published in an explicit "model" of Blackduck settlement but rather has been discussed in descriptive terms in the published literature (Dawson 1977; Dawson 1983; Dawson 1987; Dalla Bona 1994; Larcombe 1994; Dalla Bona & Larcombe 1996; Dods 2003; Hamilton et al., in press). The resources of the forested areas are clearly different from the resources available on the prairies, providing the opportunity for a somewhat different physical and cultural adaptation to the landscape. In light of these different opportunities, the Blackduck settlement pattern of south-western Manitoba is compared with boreal forest settlement patterns. For a more detailed description of Blackduck settlement in the boreal forest see Chapter Three.

In the boreal forest, Dods (2003) finds that summer sites are located along the shorelines of lakes and on islands. Dawson (1983) notes that these locations were selected for canoe transport and for their proximity to fishing locations. Fish were the most predictable food resource in the boreal forest during the warm season and Dalla Bona (1994) believes that this concentrated food resource created the opportunity for group aggregation. Dalla

Bona (1994:3) notes that important activities in the summer months also included “berry picking, firewood collecting, and some opportunistic large game hunting”. Larcombe (1994) notes the importance of sites occupied during the summer months being well-ventilated, or at least located a sufficient distance from mosquito infested areas. Flat, dry land is also a key consideration for site selection during the warm season in the boreal forest.

In south-western Manitoba, sites are also situated in close proximity to water bodies during the warm season. On average, Blackduck sites occupied during the warm season are 240 metres from a permanent water source, although they may be located as far away as 600 metres. Fish remains have been recovered at several sites although none of these sites have been thoroughly excavated and reported. The use of waterways as transportation corridors in south-western Manitoba is also suspected (Figure 7-3), and although there is no archaeological evidence of canoe transport within the study area, there are numerous ethno-historic references. The distribution of flora has changed considerably in the historic period but several warm season Blackduck archaeological sites were associated with berries, and most sites are located within a reasonable proximity to firewood resources. Blackduck archaeological sites are generally associated with large ungulate (mostly bison) remains and it is proposed that “opportunistic large game hunting” also took place in south-western Manitoba during the warm season. Only two of the Blackduck sites qualitatively analyzed are associated with significant forest vegetation, reflecting a preference for camping in open, well-ventilated areas during the warm season.

During the cold season in the boreal forest, several researchers note the dispersion of groups inland to individual hunting territories. This reflects a lack of concentrated food resources in the boreal forest during the winter season and dispersal is thought to be one method of counteracting a diffuse resource base. Both Dalla Bona (1994) and Larcombe (1994) note that sites are located farther from water than during the warm season. Both authors further note that shelter is a key consideration during the cold season in the boreal forest, as is proximity to an adequate supply of firewood. It should be noted here that there is a bias in the archaeological record towards warm season sites rather than cold season sites due to the location of warm season sites along the well-travelled waterways of the boreal forest.

In south-western Manitoba, Blackduck settlement follows a similar pattern during the cold season. Sites are located much farther from water during the cold season than during the warm season, at an average of 2600 metres from permanent water. Furthermore, all of the cold season sites qualitatively assessed are associated with significant forest vegetation, resulting in suitable sheltered areas to escape the harsh south-western Manitoba winter climate. The uplands areas of south-western Manitoba are heavily forested and provide an ample supply of firewood. A point of contrast between Blackduck settlement in the boreal forest and in south-western Manitoba during the cold season may be seen in the distribution of food resources. In the boreal forest the cold season was a time of hardship due to a lack of concentrated food resources, whereas in south-western Manitoba bison were present and predictably available. Bison seeking shelter from the winter storms moved into the upland areas of south-western Manitoba: the Pembina Mountains, Tiger Hills, and Upper and Lower Assiniboine Deltas. During

the winter, Blackduck groups also moved into these areas. Although bison were not likely concentrated in the large herd sizes characteristic of summer aggregations in the grasslands, smaller herds were likely available and presented opportunities for communal kill events. Hamilton et al (in press) find that the opportunity to successfully carry out communal kill events resulted in an important difference in the social organization of the Blackduck groups in the boreal forest and south-western Manitoba. While Blackduck groups in the boreal forest followed a pattern of warm season aggregations and cold season dispersal based on the availability of concentrated food resources, Blackduck groups in south-western Manitoba aggregated during the cold season and dispersed during the warm season. Thus, it can be seen that Blackduck groups in the boreal forest and south-western Manitoba followed similar patterns of site selection, and that while the social organization and patterns are similar, the timing of social events is altered to coincide with the distribution of concentrated resources.

The Interaction between Boreal Forest and Plains Blackduck Groups

Within south-western Manitoba, Blackduck people lived in the plains areas during the warm season and moved into the uplands during the cold season. This is not to imply that Blackduck people migrated *en masse* between these locations. Blackduck groups were autonomous hunting bands loosely linked through kinship ties that were under no obligation to follow the direction of an overall leader. As such, some Blackduck groups living nearer the forest edge may have chosen to remain in the aspen parkland fringe, where they may have been joined by other Blackduck groups from the boreal forest at the onset of the cold season to hunt bison. These aggregation events provided the opportunity

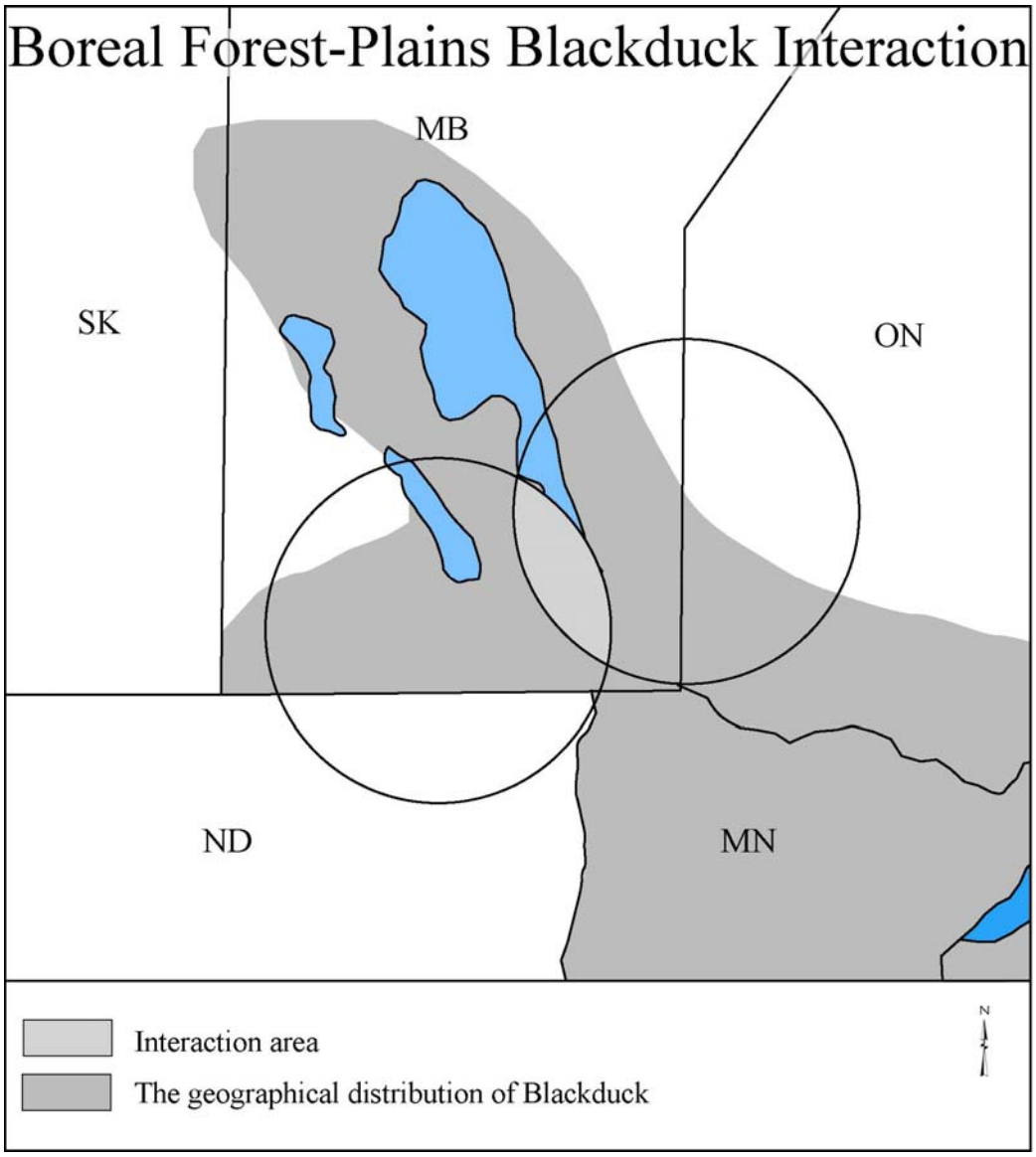

Figure 7-4. The cold season provided the opportunity for aggregation events between Blackduck groups in the boreal forest and southern Manitoba. At these events social networks were maintained through the exchange of people, ideas, and trade items.

for ceremonial events and promoted the exchange of people between groups living in the aspen parkland and the boreal forest. Through these aggregation events, Blackduck people living in south-western Manitoba maintained social ties and trade networks, and created alliances with Blackduck groups in the boreal forest (Figure 7-4). In fact, the

intermingling of plains Blackduck groups with boreal forest Blackduck groups may in part account for the presence of Duck Bay ceramics in south-western Manitoba.

Duck Bay ceramics have frequently been recovered in association with Blackduck ceramics across the aspen parkland, although the Duck Bay ceramics represent a considerably smaller proportion of the ceramics in the archaeological assemblage than Blackduck ceramics. Several researchers have described Duck Bay ceramics, including Hanna (1992) and Snortland-Coles (1979). These early researchers were the first to distinguish Duck Bay ceramics from Selkirk Composite and Blackduck ceramics (Hanna 1992).

The Duck Bay cultural group was first identified at its type site, Aschibokahn (FbMb-1) located at the mouths of the Duck and Drake Rivers. The site was a multi-season occupation, with evidence of occupation from spring through fall. Recoveries from Aschibokahn indicate ties to outside areas, and include lithic raw materials from North Dakota, northwestern Ontario, southeastern Manitoba, and perhaps northern Minnesota (Hanna 1992). Also recovered were ceramics indicative of plains influences and a scapula hoe similar to those used by the Missouri River villages. The concentration of Duck Bay sites in the immediate vicinity of Aschibokahn, combined with evidence of interaction with groups outside of the core area, has permitted some inferences to be made about Duck Bay society and cultural practices (Hanna 1992).

Snortland-Coles (1979) in an analysis of the Aschibokahn site and its surrounding physical environment, found that there were sufficient resources in the area to support a group of 175 individuals. This has been cited as the necessary group size for a population

to remain endogamous and successfully maintain its population. Hanna (1992) believes that an endogamous marriage pattern explains the distribution of Duck Bay ceramics across Manitoba. As noted earlier, archaeological sites with proportionately high numbers of Duck Bay ceramics are clustered around Aschibokahn, although it has been suggested that there are many Duck Bay sites in the Interlake area (Riddle 2004). Archaeological sites with proportionally low amounts of Duck Bay ceramics have been identified across southern and central Manitoba. The concentration of Duck Bay ceramics has been explained as the result of an endogamous marriage pattern within a highly localized group, with an *occasional* exogamous marriage taking place to allow access to outside resources or to reinforce social connections or alliances with outside groups. The occasional exogamous marriage is provided as the explanation for Duck Bay ceramic recoveries appearing across southern and central Manitoba (Hanna 1992).

In a study of the ceramics, Hanna found that the pots recovered at sites outside of the Duck Bay area were made from local clay sources rather than from clay sources in the Aschibokahn area. This information precludes the suggestion of trade networks being responsible for the distribution of Duck Bay ceramics across Manitoba. It reinforces the notion that people were moving across Manitoba, rather than pots. Hanna (1992) believes that this indicates that women were intermarrying with groups outside of the Duck Bay area. Hanna also believes that male members of the Duck Bay culture were marrying into outside groups, but notes that there is no material evidence of this (Hanna 1992).

Intermarriage and the exchange of band members between Blackduck and Duck Bay groups may be seen in the distribution of Duck Bay ceramics across south-western

Manitoba. Duck Bay groups may occasionally have moved towards the prairies and encountered Plains Blackduck people, but is more likely that Duck Bay and Blackduck groups encountered one another in the boreal forest, where there was an exchange of group members to promote social ties. This network was increased when boreal forest Blackduck groups rendezvoused with Plains Blackduck groups and again exchanged band members. The occasional marriage of women from the Duck Bay core area to outside groups such as Blackduck may explain the distribution of Duck Bay ceramics in relatively low proportion to Blackduck ceramics at archaeological sites across the aspen parkland.

Syms (1977) notes a reduction in the extent of the area occupied by Blackduck, and finds that people of the Blackduck culture had disappeared from south-western Manitoba by 1400 A.D. Nicholson (1996) believes that Blackduck people retreated east into the boreal forest by 1300 A.D. The exact date of the Blackduck abandonment of south-western Manitoba is difficult to ascertain. Radiocarbon dates, when budgets permit processing, are frequently obtained from poorly preserved samples and yield dates of questionable accuracy. There is a further possibility that undiscovered sites with later dates than are generally accepted have yet to be identified. In any case, there is a general consensus that Blackduck groups abandoned south-western Manitoba between 1200 and 1400 A.D.

The precise reason for Blackduck people abandoning south-western Manitoba is unknown. Nicholson (1996) believes that people immigrating into the aspen parkland forced the Blackduck people to retreat to the boreal forest and that this retreat coincides with immigration into the area by one or several horticultural groups from the south. This

hypothesis is founded upon the notion that Blackduck people only inhabited the aspen parkland as part of the seasonal round, and that the immigrants were more suitably adjusted to the area. In other words, Nicholson hypothesized that the Blackduck people were “out-competed” by the immigrants because the Blackduck people only occupied the aspen parkland seasonally. The possibility exists that the groups migrating into southern Manitoba were horticultural groups, displaced by other larger horticultural groups. These new horticultural groups, with larger populations and year-round occupation of the aspen parkland may have indeed displaced the Blackduck, forcing a retreat into the boreal forest.

It has been demonstrated through this study that the Blackduck occupation of south-western Manitoba was year round, not seasonal as reported by Nicholson (1996) and others. However, other parts of Nicholson’s hypothesis bear closer scrutiny. Even with a year round occupation of southern Manitoba, Blackduck people may in fact have been pushed out of southern Manitoba by immigrating horticultural groups. These groups were well adapted to life in southern Manitoba and may have been groups with large populations. If Blackduck people were in fact “out-competed” for resources, they may have returned to the boreal forest, where they maintained social ties through kinship.

The evidence of this return to the boreal forest may be demonstrated in the Rainy River Composite. Lenius and Olinyk (1990) hypothesize that the Rainy River Composite represents the coalescence of Blackduck and Laurel populations sometime after 1000 A.D. While not all researchers agree with this hypothesis in its entirety, most agree that there is considerable variability in Blackduck ceramics and that these changes occur not

only over space, but also over time (Carmichael 1977). The variability in Blackduck ceramics after 1000 A.D. may be due to a coalescence of Plains Blackduck and Boreal Forest Blackduck. To completely understand this cultural phenomenon, Blackduck ceramic decorative techniques from sites dating to later than 1000 A.D. would have to be compared and evaluated in both south-western Manitoba and the boreal forest.

There is of course, a lack of documented evidence to support this hypothesis. It represents a hypothesis generated from the current study, and a literature review of the cultural dynamics surrounding members of the Blackduck cultural group. Given the paucity of alternatives within the published literature, this hypothesis provides another means of explaining the cultural phenomenon identified as the Rainy River Composite.

Summary:

Frequently, the movements of hunters and gatherers are portrayed, particularly on the prairies, as driven by the pursuit of a single economic resource: bison. The current study shows that while the pursuit of bison as a food resource was obviously important and perhaps the most important consideration, other factors contributed to the choice of particular areas for site location. The choice of a location for occupation is the result of a conscious and complex decision making process based on prioritizing needs. Critical to understanding how different needs were identified and satisfied by groups is the recognition that a worldview is dominated by the "cognized" environment (Jochim 1976:9), composed of various elements of the physical and cultural world that an individual or group recognizes as significant to their daily lives. By recognizing what some of these elements are, researchers can investigate how some decisions were reached

and what elements were more important within the cognized environment the individual or group was living in.

The Regional-Environmental Model illustrates that Blackduck occupants of south-western Manitoba were intimately familiar with the landscape they inhabited and the resources that were exploited in pursuit of a sustainable subsistence strategy. The analysis of multiple environmental variables influencing site selection, including proximity to fresh water, proximity to shelter, considerations of slope and drainage, and the availability of resources at Blackduck archaeological sites, reveals elements of a conscious and complex decision making process. The Regional-Environmental Model is based not only on an evaluation of the physical environment but also on an evaluation of the cultural environment.

Chapter Eight:

Conclusions and Recommendations

This study has examined the geographical distribution and settlement patterns of Blackduck culture through an analysis of the environmental variables associated with Blackduck archaeological sites. The term Blackduck refers to a group of hunter-gatherers that inhabited parts of the boreal forest in Minnesota, north-western Ontario, central Manitoba, and north-eastern Saskatchewan. The current research focuses on the Blackduck cultural adaptation to the physical landscape of south-western Manitoba, where Blackduck groups also had a substantial presence in the aspen parkland and prairie regions.

The current study focuses on the environmental variables associated with Blackduck archaeological sites in south-western Manitoba in an effort to develop a new model of Blackduck settlement. The methods used to analyze Blackduck sites have been both qualitative and quantitative. In the qualitative analysis, a sample of Blackduck archaeological sites was selected from Manitoba's Heritage Resources Branch database. The sites selected for study represent a distribution of sites from across the study area occupied for different purposes and in different seasons. The archaeological record for each site included in the qualitative analysis was examined to confirm Blackduck cultural affiliations. The database of Blackduck archaeological sites was added to a GIS and environmental data from a variety of sources were qualitatively analyzed to identify relevant environmental variables associated with each site. Each site was further visited in order to identify local environmental variables not apparent in the topographic data.

The data collected in the qualitative analysis was used to infer a season of occupation for each Blackduck site through the analysis of environmental variables, including proximity to fresh water and proximity to shelter. The results of this qualitative analysis are provided in Appendix A.

The second stage of the analysis involved the quantitative evaluation of all Blackduck archaeological sites within the study area. The analysis was conducted in a GIS and involved the analysis of various sets of topographic data covering south-western Manitoba, using a program downloaded from the ESRI web site (arcscripts.esri.com). Grid Sampler employs an automated process in which data is collected from the cells of datasets associated with a set of input points created in a GIS. For a more complete discussion of the Grid Sampler procedure, see Chapter Four. The results of the Grid Sampler analysis are reported in a table that can be imported to a spreadsheet program. The table contains information from all of the map cells associated with the input points (archaeological sites), resulting in the correlation of each Blackduck archaeological site within the study area with site specific drainage, soils, surficial geology, aspect, proximity to fresh perennial water, and slope data (Appendix B). These data were randomly checked for accuracy and quantitative analyses of the environmental variables were performed.

Conclusions

The first objective of the research was to examine the geographical distribution and characteristics of Blackduck archaeological sites in south-western Manitoba through

individual site assessments. This objective has been addressed through the combined qualitative and quantitative evaluations.

The combined analyses resulted in six general deductions related to Blackduck settlement in south-western Manitoba. From the data, it has been deduced that:

1) *Within the observed sample of Blackduck archaeological sites, there is a relationship between the season of occupation and the physiographic region within which a site is located.*

2) *Within the observed sample of Blackduck archaeological sites, proximity to water was a more important variable related to site selection when sites were located on the Plains.*

3) *Within the observed sample of Blackduck archaeological sites, shelter was an important variable related to site location selection when sites were located in the Uplands Regions.*

4) *Within the observed sample of Blackduck archaeological sites, slope was a significant environmental variable related to site location selection when sites were located in the Uplands Regions.*

5) *Within the observed sample of Blackduck archaeological sites, there appears to be little or no relationship between aspect and site location selection.*

6) *Within the observed sample of Blackduck archaeological sites, drainage was an important environmental variable contributing to site location selection when sites were located in the Upland Regions.*

For a more complete discussion of these deductions, refer to Chapter Five.

From these deductions, a pattern of Blackduck land use in south-western Manitoba was identified, resulting in a clearer understanding of Blackduck culture and settlement patterns in south-western Manitoba. The analysis of the data led to the conclusion that Blackduck sites occupied in the uplands physiographic regions of south-western Manitoba are remarkably similar to one another and considerably different from sites

occupied in the plains physiographic regions. Blackduck sites located in the plains of south-western Manitoba are consistently located close to fresh water, in open well-ventilated areas, on gentle slopes, and on poor or imperfectly drained soils. This pattern contrasts with sites located in the uplands areas, which are generally well-removed from water, well-sheltered, and associated with steeper slopes and well-drained soils. The characteristics of the environmental variables associated with these two groups of sites lead to the inference that these areas were occupied in different seasons. The attributes of sites located in the plains physiographic regions are characteristic of warm season occupations, while the attributes of sites located in the uplands physiographic regions are more characteristic of cold-season occupations.

In order to address objective three, the land use pattern identified in the research was compared to the existing models of Blackduck settlement. Several researchers (Ray 1974; Syms 1977; Pettipas 1980; Nicholson 1987) have developed models of settlement either specifically for Blackduck or for the geographical area of south-western Manitoba. However, these models have been found to be insufficient in explaining the Blackduck cultural adaptation to south-western Manitoba through settlement patterns. The majority of these models were not developed to apply specifically to Blackduck but have been cited in the past as suitable models of Blackduck settlement patterns. Each of the models advocates a seasonal cycle of resource exploitation in which Blackduck groups moved between the grassland and boreal forest biomes adjacent to south-western Manitoba, but none of these models has studied the environmental variables associated with Blackduck sites in south-western Manitoba in a direct attempt to evaluate the season of occupation. Instead, sites have been assigned a seasonality based on existing models (Ray 1974;

Syms 1977; Pettipas 1980; Nicholson 1987) rather than attempting to test these models or develop new models. A comparison between the pattern of land use identified in the research and the existing models of Blackduck settlement in the published literature (Ray 1974; Syms 1977; Pettipas 1980; Nicholson 1987), finds that although a seasonal cycle of resource exploitation is proposed in each, the model most similar to that adopted by Blackduck people in south-western Manitoba is the seasonal round of Blackduck people in the boreal forest. In both the boreal forest and south-western Manitoba, Blackduck groups moved between the uplands during the cold season and the waterways during the warm season.

Several similarities are observed between Blackduck settlement in the boreal forest and in south-western Manitoba. In both the boreal forest and south-western Manitoba, sites are located close to waterways during the warm season. At archaeological sites in both areas there are opportunities to fish, travel by canoe, and collect firewood. While large game hunting was not the primary subsistence strategy in either area during the warm season, sites in both the boreal forest and south-western Manitoba are associated with opportunities for large game hunting. During the cold season in both areas there is a noticeable increase in the distance between site location and water. In the boreal forest, the dispersion of bands inland to individual hunting territories has been noted in the ethnographic literature. In south-western Manitoba, it appears that site locations were selected well-removed from water but there is no evidence of dispersal to individual hunting territories. In both areas key considerations affecting site location are shelter and an ample supply of firewood.

Objective four is addressed through the proposal of a new model of Blackduck settlement, the Regional-Environmental Model of Blackduck Settlement in South-western Manitoba (Figure 8-1). The Regional-Environmental Model is based on the evaluation of multiple environmental variables associated with reported Blackduck archaeological sites in south-western Manitoba and a review of the literature related to Blackduck cultural dynamics. Accepting that the Blackduck occupation of southern Manitoba represents the migration of people from the great lakes and boreal forests to the east, Blackduck groups appear to have adapted to the physical environment of southern Manitoba rather quickly. This adaptation was facilitated by the presence of many of the same species of flora and fauna in southern Manitoba as were present in the forested areas to the east (Syms 1977). Individual bands adopted the bison-oriented prairie subsistence economy and made the transition to a year-round occupation of southern Manitoba. Here, they followed a similar pattern of settlement as originally developed in the forest, with sites selected for occupation along the waterways during the warm season. Based on the analysis of environmental variables associated with Blackduck sites from across the study area, it is proposed that the plains physiographic regions, including the Red River Plain, the Souris Plain, the Boissevain Till Plain, and the Reston Till Plain, were occupied during the warm season. In the plains, Blackduck groups pursued the remnant populations of bison that remained in Manitoba throughout the year as well as other medium or large ungulates found in the grassland areas. The location of Blackduck sites along waterways during the warm season also infers that fishing and the pursuit of other aquatic resources was carried out on the plains. During the cold season, Blackduck groups migrated into the uplands physiographic regions of south-western Manitoba,

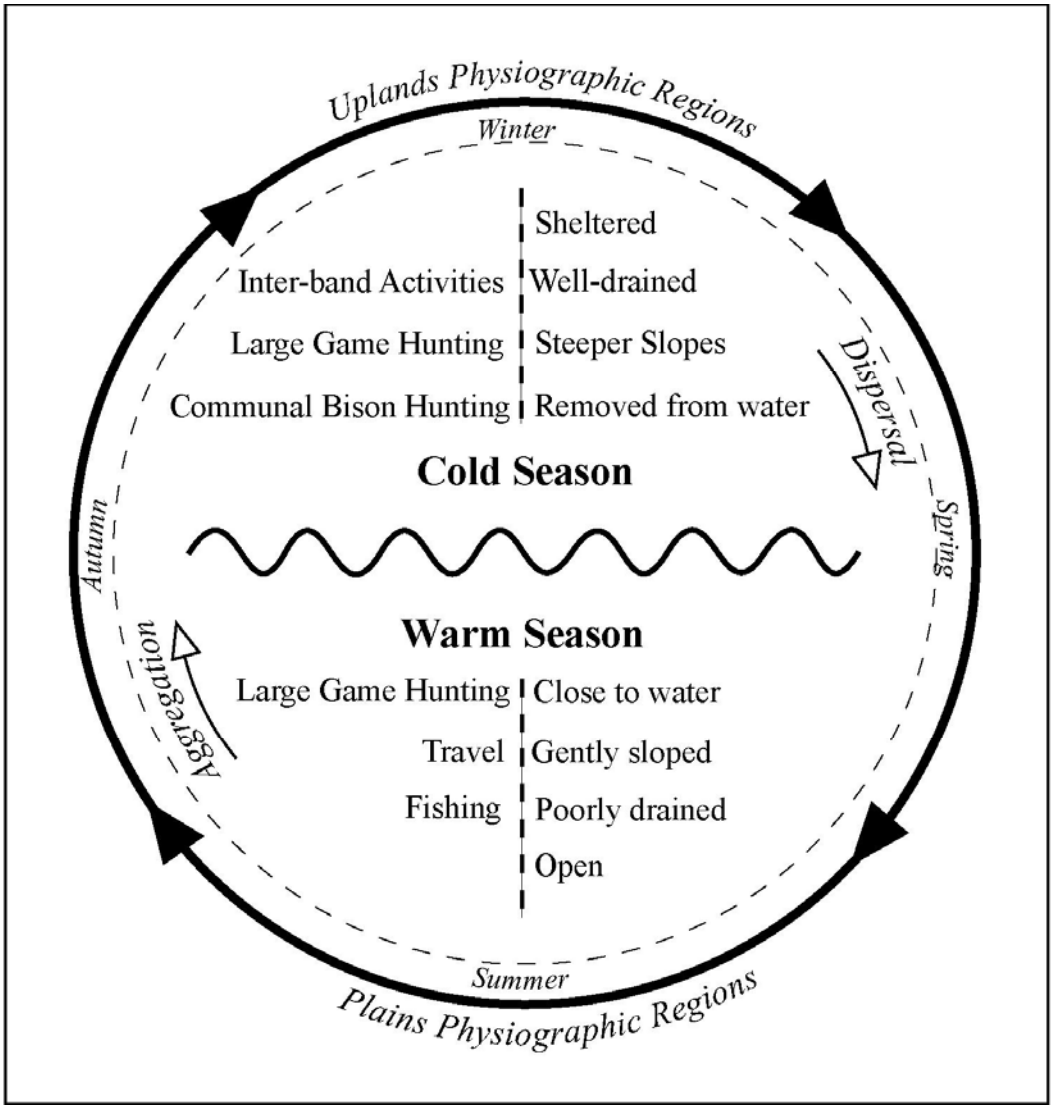

Figure 8-1. The Regional-Environmental Model of Blackduck Settlement in South-western Manitoba.

including the Pembina Mountains, the Tiger Hills, and the Upper and Lower Assiniboine Deltas. Other areas with characteristics similar to the Upland physiographic regions of south-western Manitoba, including river valleys or the Turtle Mountains may also have functioned as wintering areas. Communal kill events such as those demonstrated by the Stott (DlMa-1) and Hokanson (DiLv-29) sites were an important component of cold season subsistence activities, as was the pursuit of other fur-bearing mammals in the forested areas of the uplands. The uplands areas provided ample firewood as well as the

critical shelter needed to alleviate the harsh Manitoba winter climate. River valleys and outlying upland areas such as the Turtle Mountains would also have supported Blackduck groups during the cold season. Of course, not all Blackduck bands that moved into the plains areas of southern Manitoba necessarily moved directly into one of the four upland physiographic regions within the study area during the cold season. Some bands may have preferred to relocate closer to the parkland/forest fringe, where they may have been joined by other Blackduck bands moving from the boreal forest to the parkland/forest fringe for the cold season. The aggregation of Blackduck groups from the boreal forest and southern Manitoba created the opportunity for interaction with one another, promoting the exchange of trade items, ideas, and people. Furthermore, the interaction of groups from both biomes promoted social networks allowing Blackduck bands from southern Manitoba to maintain social ties to the boreal forest. This may have been particularly important when Blackduck bands abandoned southern Manitoba sometime after 1200 A.D.. The retreat of Blackduck bands from south-western Manitoba into the boreal forest may explain the development of the Rainy River Composite (Lenius and Olinyk 1990).

Cultural Adaptations: The driving force behind archaeology is the study of human culture. Of particular interest in this research is the study of cultural adaptations to the physical landscape. What we can learn from pre-contact cultures about both perceptions of the landscape and adaptation to the landscape, can be applied to modern cultures and may aid in the resolution of natural resource conflicts.

A cursory examination of the environmental variables associated with Blackduck sites in Manitoba reveals that sites are located in a variety of diversified environments, and yet the selection of a location for occupation is clearly not arbitrary. Site selection is a reflection of the conscious decision making process in which Blackduck groups choose locations in attempts to fulfill specific societal and physical needs. The physical environment clearly plays a major role in influencing cultural adaptations and as such cultural adaptations may be reflected in the non-random selection of areas for occupation. Through the careful analysis of the environmental variables associated with Blackduck archaeological sites, the cultural adaptation that influenced a successful Blackduck adaptation to south-western Manitoba's physical environment is revealed.

The seasonal round practised by Blackduck groups in the boreal forest indicates that the cyclical movement of people over large areas in the pursuit of economic resources is a successful cultural adaptation to the physical landscape. The persistence of a similar seasonal round in south-western Manitoba indicates that this adaptation is not unique to the boreal forest and furthermore, indicates that this cultural adaptation was embedded in the cultural traditions of the Blackduck people. Hamilton, et al. (in press) further note the persistence of another tradition related to social organization between Plains Blackduck and boreal forest Blackduck groups. Hamilton, et al. note that the population aggregation and dispersal practises of boreal forest Blackduck bands is continued with the migration of Blackduck people to the prairies. However, the authors also note an important difference in the timing of these activities. In the boreal forest, aggregation activities occur during the warm season along waterways, while dispersal occurs during the cold season. In southern Manitoba, aggregation events are proposed to have occurred during

the cold season when communal bison kill events were conducted following the return of bison to the parkland areas, while dispersal is proposed to have been the norm during the warm season (Hamilton, et al. in press).

As discussed in Chapter Three, several authors (Dawson 1983; Dalla Bona 1994; Larcombe 1994) note that the most appropriate form of social organization in the boreal forest to offset a diffuse and highly mobile resource base is to organize into small, autonomous family groups. Although these groups were autonomous, they maintained extensive social networks with adjacent groups. Furthermore, research indicates that Blackduck occupants of the boreal forest possessed a relatively common tool technology without any form of specialization. This general tool technology permitted a degree of flexibility in adapting to whatever subsistence opportunities presented themselves within the highly mobile and diffuse resource base.

In southern Manitoba, Blackduck groups maintained the small family group as the basis of social organization. Each group is believed to have maintained its autonomy in southern Manitoba and is proposed to have maintained social networks not only with immediately adjacent groups but also with Blackduck bands in the boreal forest. In southern Manitoba, Blackduck groups maintained the same generalized technology that was developed in the boreal forest. This is surprising given that on the prairies Blackduck groups were able to adopt a highly specialized subsistence economy focusing on the procurement of bison. The sole evidence of a highly specialized “tool” might be evident in the construction of pounds for communal bison kill events, although this seems to

represent more of an adaptation of social organization than the adoption of a new technology.

The cultural traditions of a society are embedded deeply within that society and only change under considerable duress. The persistence of characteristics of social organization and technology in southern Manitoba that were developed in the boreal forest is remarkable given that the physical environment is considerably different than that in which the cultural traditions originally developed. Kroeber notes the following in a discussion of cultural adaptations:

> *Cultures therefore incline to change slowly once they have fitted themselves to a setting, and to enter a new environment with more difficulty than to spread over the whole of the natural area in which their form was worked out. If they do enter a new type of territory, they are subject to change. Once fitted to an environment, they are likely to alter radically only through some factor profoundly affecting subsistence, such as the introduction of agriculture.* (Kroeber 1953:6)

The traditions and cultural adaptations of the Blackduck culture were developed and culturally embedded deep in the boreal forest to the east of the study area. Although Blackduck bands entered a "new type of territory" in southern Manitoba, cultural practises remained largely unchanged even in the presence of different subsistence opportunities. In southern Manitoba, Blackduck bands chose to adapt to a new physical environment using the previously developed and successful adaptation strategies of the boreal forest.

Recommendations

Although the intent of this research was not to develop a predictive model, the evaluation of environmental variables has resulted in the production of some general characteristics of Blackduck settlement that could be incorporated into the construction of a predictive model. Some researchers find that the construction of predictive models is a futile endeavour that will never be adequately able to deal with the intricacies of human culture. As such, the inability of predictive models to reliably predict the location of every archaeological site within a given area is proposed to render the efforts of predictive modelling futile. Other researchers rely completely on the statistical validity of predictive models to predict site locations and acknowledge that although the location of every archaeological site within a given area cannot be accurately predicted, the predictive model is useful enough to predict most of the archaeological sites.

While the location of every archaeological site within a given study area cannot be accurately predicted with predictive models, modelling itself is still a useful tool particularly in the context of decision making and policy building. If a predictive model is used as a tool to aid in decision making rather than as the firm basis of decision making itself, predictive modelling can be used to identify areas of significant archaeological potential which can then be preserved or salvaged in anticipation of development. Useful predictive models are dynamic, unique, and well planned:

1) *Predictive models should be dynamic and flexible enough to be able to incorporate recently discovered sites and take advantage of new data sources.*
2) *A predictive model should be unique in its attempt to model a singular culture, time period, or subsistence strategy.*

3) *A predictive model should incorporate data that is accurate and of an appropriate scale, as well as appropriate to the model being constructed. Paleo-environmental reconstruction is critical to modelling site locations in the pre-contact era. Furthermore, predictive models should incorporate the visitation of at least a sample of sites for the archaeological culture being modelled.*

The value of modeling the land use and settlement patterns of pre-contact groups in Manitoba has never been more essential. Predictive models developed as the result of such studies can be used to identify areas of high archaeological potential both for researchers and consultants. Archaeological sites within these areas can then either be protected from impact or salvaged in order to gain as much knowledge as possible about Manitoba's pre-contact past. Archaeological sites are a non-renewable source of information about our cultural heritage and the physical heritage of our past. As development in and for large urban centres continues, the value of predictive models will only increase. The results of modeling efforts have policy implications and factor significantly in decision making related to commercial development.

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Appendix A:
Sites studied in the Qualitative Analysis

Table of Contents:

Introduction

In addition to presenting the results of the qualitative analysis of twenty-seven Blackduck archaeological sites, the following appendix is intended to serve as a reference document for other researchers studying Blackduck settlement in south-western Manitoba. As such, a brief introduction to the methods followed in the research is presented here. The sites are listed here in alphabetical order by common site name except for sites where only a Borden number is available.

The whole of Canada is divided into 2 degree latitude by 4 degree longitude blocks. Each block is further subdivided into 10 minute blocks. The first two letters of the Borden designation refer to a 10 minute latitude block, and the remaining two letters refer to a 10 minute longitude block. Each site within a 10 minute x 10 minute block is numbered sequentially in the order in which they were recorded. The Hokanson Site (DiLv-29) is provided here as an example:

D – the primary latitude of the block within which the site is located

i – the 10 minute subsection of the primary latitude block

L – the primary longitude of the block within which the site is located

v – the 10 minute subsection of the primary longitude block

29 – The Hokanson Site is the 29th site recorded in the DiLv block.

The location of each site was plotted in a GIS, and several different layers were added to the analysis. In some instances, several different data sets were used to examine the same variables.

Digital 1:50,000 National Topographic Series maps were used to examine modern vegetation cover, hydrology, and elevation. Hydrology was also analysed using 1:20,000 hydrography maps for each site, downloaded from the MLI website. Contemporary Land Use and Land Cover maps were analysed and used to infer information about the Land Cover Type at each site in the pre-contact era. These maps were also downloaded from the MLI website, as was the aerial photography used in the analysis. The 2 m resolution digital ortho-photography permitted analysis in fine detail. A DEM of southern Manitoba was downloaded from the MLI website, and these data were used to generate slope and aspect coverages, as well as provide a broad overview of elevation information in the surrounding area of each site. Dominion Land Survey maps were photographed using a digital camera at the Provincial Archives of Manitoba. These photographs were then georeferenced in ArcMap and incorporated into the analysis, providing information about land cover prior to settlement. This land cover information was used to infer land cover patterns during the pre-contact era. Combined, these data sets provided an overview of the environmental setting surrounding each Blackduck archaeological site.

Several researchers have noted that the environmental variables important to site selection are not limited to the immediate site environment. For this reason, major environmental features within a 10 km radius were noted and incorporated into the analysis. This 10 km catchment area was chosen following the example set forth by researchers such as Jochim (1976). At several sites, particularly those in the Red River Plain, Reston Till Plain, or Souris Plain, it was noted that the landscape within a 10 km radius was relatively homogenous and few, if any variables were noted. This in itself is important in a study of the environmental variables influencing site selection.

It was decided that viewing the environmental contexts of Blackduck archaeological sites firsthand would enhance the study by contextualizing the environmental variables viewed in the digital data. The site visit not only served to confirm the site's location, but also served to place the various site environments in perspective. Each site was photographed to illustrate the significance of particular environmental variables at the site and resources, both apparent and possible, were noted. Several landowners and local collectors provided access to their private collections from the Blackduck sites studied, enabling the confirmation of cultural affiliation at sites. Valuable anecdotal and environmental information was also gained through discussions with landowners and local collectors. Some of this information has been incorporated into the study, while other information communicated was noted but has not been included here.

Following the site visit, the digital data was again reviewed to place the environmental variables observed at the site into context. After the initial data had been gathered, combined with information gathered in the site visit and reviewed, an interpretation of each site was created. The interpretation reviews some of the major environmental variables identified in the analysis, as well as interprets some of the activities that may have occurred at the site.

An interpretation of the seasonality of each site is provided through the evaluation of environmental variables observed at the site. The interpretations of seasonality have generally been placed into one of two categories: warm season and cold season. The seasons refer less to actual calendar dates than to general climatic trends. The warm season might refer to a time of occupation lasting anywhere from April through

September, but in some years might begin as early as March and end as late as early November. An exceptionally warm or cold year, or an exceptionally warm or cold period during the warm or cold season, may influence the movement of people between sites. The interpretation of season is meant to reflect a general trend rather than a specific date. It is difficult with exceptional data to narrow down the time that a site was occupied, and this is usually accomplished through expert examination of faunal remains from an excavated site (Monks 1981). It must be remembered that most of the sites included in this study are uninterpreted and represent little more than a surface collection of artifacts. Without careful excavation of the sites, the exact period of occupation cannot be determined. One of the objectives of this study is to use the analysis of environmental variables to infer seasonality.

Several variables are regarded as more important to inferring seasonality than others. The two most important variables used to infer seasonality are proximity to fresh water and shelter from the elements. Generally, sites located close to fresh water have been interpreted as warm season sites because fresh water has been identified as a critical resource during the warm season. Several sites are located close to pothole sloughs. These have been interpreted as sites without sufficient fresh water resources to be occupied during the warm season. While the pothole sloughs do provide a source of water and it is acknowledged that Blackduck groups in south-western Manitoba may have been able to tolerate less potable water, it is believed that these sites would not have been deliberately chosen for occupation during the warm season. Instead, Blackduck archaeological sites without fresh water but close to pothole sloughs are generally

interpreted as cold season sites. During the cold season, fresh water would not have been as critical a resource, as snow would have been available for consumption.

Shelter is also identified as a critical resource. Contrary to fresh water, shelter at a site is more important during the cold season than the warm season. Generally speaking, Blackduck sites with adequate shelter to protect a group from the winter elements have been interpreted as cold season sites. Blackduck sites lacking shelter from the elements are generally identified as warm season sites. One trend observed in the data is that well-sheltered sites are not located in close proximity to water, while sites without shelter are located along watercourses. There are several sites that contradict this pattern in the plains physiographic regions, but at these sites it has been observed that well-sheltered areas can only be found along watercourses.

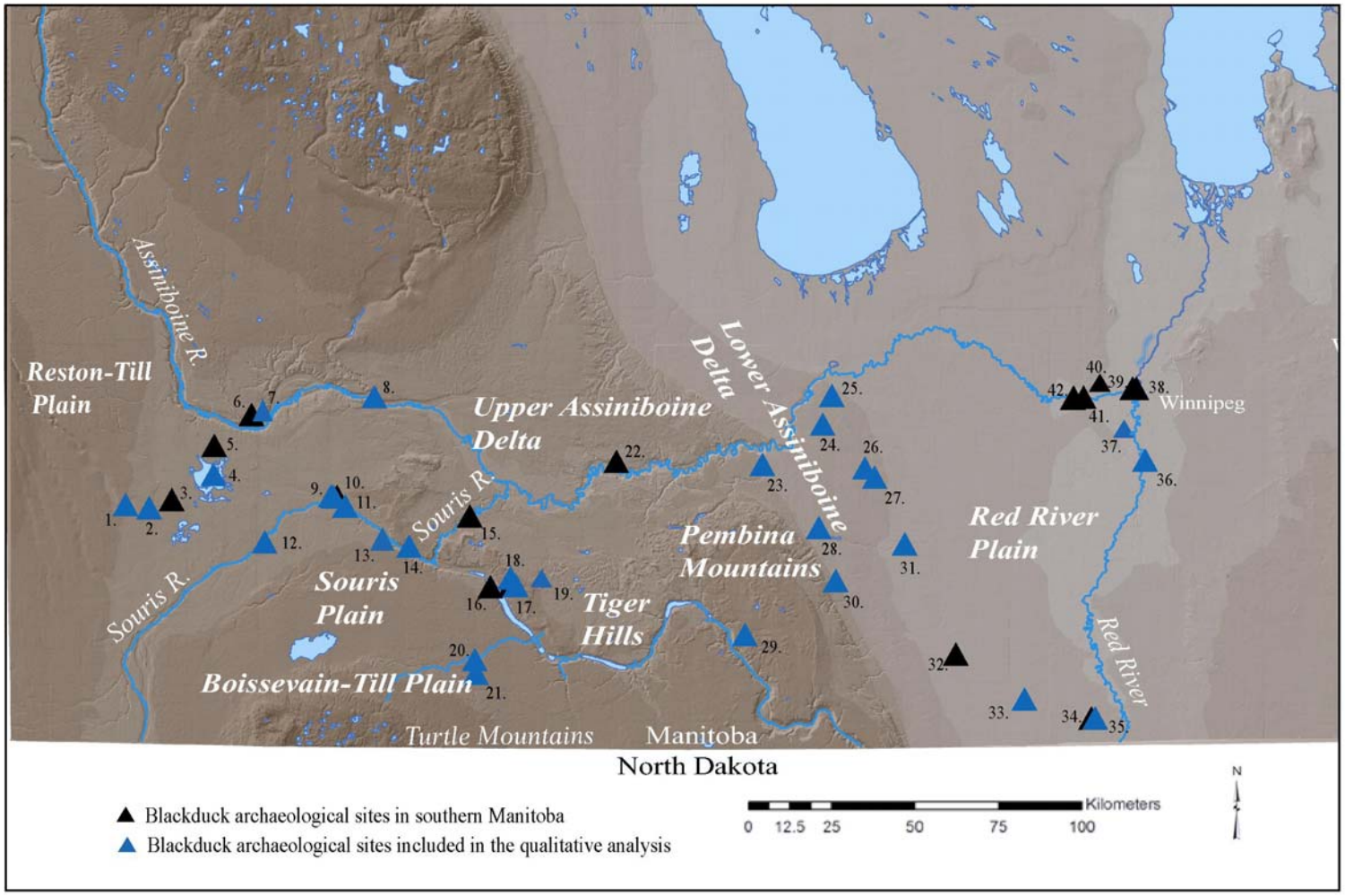

Figure A-1. Blackduck archaeological sites in south-western Manitoba.

Figure A-1 Legend: Blackduck Archaeological Sites in South-western Manitoba

1. The McMurchy Site (DjMg-31)
2. The Homer Davis Site (DjMf-6)
3. The Belleview Plateau Site (DjMf-15)
4. The Oak Lake Island Site (DkMe-13)
5. The Taylor Site (DkMe-2)
6. The Johnas Site (DkMd-11)
7. The Gompf Site (DkMd-3)
8. The Stott Site (DlMa-1)
9. DjMb-8
10. DjMb-6
11. The Jackson Site (DjMb-17)
12. The Coe Site (DjMd-3)
13. The Good Site (DjMb-16)
14. The Lovstrom Site (DiLx-1)
15. The Wawanesa Site (DjLw-2)
16. Sharpe's Garden Site (DiLv-28)
17. The Sandbox Site (DiLv-21)
18. The Gosselin Site (DiLv-30)
19. The Hokanson Site (DiLv-29)
20. The Gordon Randall Site (DhLw-6)
21. Pugh Site #2 (DhLw-18)
22. DkLs-6
23. The Rathwell Site (DkLp-11)
24. The PR240 Site (DkLo-2)
25. The Horse Skull Site (DlLn-3)
26. The Souque Site (DkLn-1)
27. The Divorne Site (DkLm-2)
28. The September 5 Site (DjLo-10)
29. The Earl Schewfelt Site (DjLp-2)
30. The Dead Dog Site (DiLn-6)
31. The Bryson Site (DjLm-1)
32. The Goertzen Site (DhLl-5)
33. The Buffalo Creek Site (DgLj-2)
34. The Janzen Site (DgLh-8)
35. The Marais River Site (DgLh-5)
36. The Lasko Site (DkLg-19)
37. The Lord Site (DkLg-1)
38. The Fort Gibralter 2/Fort Garry Site (DlLg-33)
39. The Forks Site (DlLg-33)
40. DlLi-3
41. DlLi-4
42. DlLi-2

Sites Studied

The Bryson Site DjLm-1

Topography: The Bryson Site is located on the north side of the Boyne River on the western outskirts of Carman, Manitoba. The Boyne River flows from the west through the Pembina Hills and Stephenfield Lake, and then northeast towards the Red River immediately east of Carman.

The topography of the area is relatively flat Red River Plain, and the vegetation pattern follows that of the aspen parkland. There are some larger forested patches of land in the area, but most forested areas in the vicinity of the site are restricted to the banks of the Boyne River and its tributaries. There are numerous seasonal pothole sloughs mapped in the area reflecting an overall poor drainage pattern.

Expanding the analysis of the site area to a 10 km radius, much the same pattern of environmental variables is observed. Forest vegetation remains largely restricted to the banks of the Boyne River and observing the current vegetation pattern and topography over a 10 km area indicates that although there were likely some larger forested areas in the past, the immediate vicinity of the site was not particularly well sheltered by forest vegetation. The only other water bodies aside from pothole sloughs are two perennial streams. The 10 km site area radius comes close to overlapping with both the 10 km site areas of the September 5 site and the Dead Dog site. Both of these Blackduck archaeological sites are located to the west along the eastern edge of the Pembina Hills.

The coarse sandy loam lacustrine sediments at the site are imperfectly drained, and this is observable in the high frequency of pothole sloughs in the area. The slope of the site is

relatively flat (between 0 and 2%) and local variations in relief are few, resulting in an aspect that is nearly flat. Although the HRB Database indicates that the site is on a ridge along the bank of an abandoned channel of the Boyne River, personal observation finds that the abandoned channel is in fact a historically constructed floodway or ditch. Furthermore, the site is well back from the floodway (approximately 250 m) on open and relatively flat ground.

Site Visit: At the site, artifacts are observable in a cultivated field and the landowner provided information that several hammers and projectile points have been recovered during cultivation. A small uncultivated area remains between the cultivated field and the banks of the floodway. Pedestrian survey of the uncultivated area led to the frequent observation of minimally processed large mammal and large ungulate faunal remains in the backfill of excavated pocket gopher burrows. The frequency with which faunal remains were discovered indicates the possible presence of a large undisturbed portion of the site in the uncultivated area.

Although the site is identified as a campsite in the HRB database, the amount of observed faunal material suggests to the author that a kill event at the site is possible. The Boyne River creates a suitable natural topographic feature against which to trap animals, as does the forested area along the river bank. The Boyne River during the warm season may have been one of the few predictable water resources in the immediate area and as such its presence may have served to attract both people and animals to its banks.

Interpretation: The location of the Bryson site on the landscape makes available the resources of both the Boyne River and the prairies to the west. The observed area of the

site is where a kill event may have taken place, with an associated processing and encampment area located nearby. Given the Bryson Site's location along the banks of the Boyne River, the site is considered to be a warm season site.

The Buffalo Creek Site DgLj-2

Topography: The Buffalo Creek Site is located along the east side of Buffalo Creek, approximately twenty-five km west of the Red River and immediately northwest of Altona, Manitoba. Buffalo Creek flows east across the Red River Plain, joining to the Plum River and eventually draining into the Red River approximately 31 km to the northeast of the site. There are several linear water features in the area that are identified as ditches in the MLI hydrography, as well as several intermittent streams. The extrapolation of the locations of these identified hydrologic features into the pre-contact past should be treated with a degree of scepticism as development of the area has significantly altered the overall hydrology of the area. Evidence of this can be seen in the 1:20,000 hydrography map of the area. Only the larger hydrologic features, such as Buffalo Creek itself, can be assumed to be relatively close to their original locations and approximate size as in the pre-contact past.

There is very little forest vegetation in the area, including along the watercourses. The only significant remaining forested area is a small forested upland approximately 500 m southwest of the site, on the north side of an east-west trend in Buffalo Creek. According to the landowners, this area has never been cultivated or developed and remains undisturbed. Another small forested area approximately 3 km west of the site is elevated and provides an excellent vantage point for the area. The Dominion Land Survey map

(1872) of the area shows the point at which Buffalo Creek enters the township but no other relevant detail.

Expanding the analysis to a 10 km radius of the site indicates that the area is relatively homogenous in terms of its topography and prairie vegetation. Several tributaries to Buffalo Creek are visible in addition to several other small intermittent streams and the modern vegetation again is limited to Buffalo Creek and its tributaries. The boundary of the 10 km area overlaps with the 10 km boundary of the Janzen Site and is close to overlapping the 10 km boundary of the Marais River Site, both of which are Blackduck Sites located along the Marais River to the southeast.

The soil at the site is a Black Chernozem. Surface textures are heavy with clay and this combined with a slope of less than 2% results in an imperfect to poorly drained surface. The site's proximity to Buffalo Creek and a gentle slope towards the creek facilitate drainage from a light rainfall, but the surface texture and general flatness of the landscape indicate that the area was as prone to floods in the pre-contact era as it is now.

Site Visit: The Buffalo Creek Site was visited with a local collector, Mr. Todd Braun of Altona, Manitoba, who offered to show the author several sites in the area. The site is located in a corn field that extends up to approximately 10 m from the water's edge. Pedestrian survey between the corn rows and discussions with a local collector and the landowners indicate that although the heaviest concentration of artifacts lies along the edge of the corn field closest to Buffalo Creek, artifacts are dispersed across the field and in the adjacent wheat field. Few if any artifacts have been recovered from the west side of the creek. Identifiable large ungulate bone and smaller bone fragments were observed at

the site, as well as Late Woodland period pottery, Late Plains or Prairie Side-Notched projectile points, and lithic debitage. A single rimsherd possibly associated with a Blackduck cultural affiliation was recovered but was too small to definitively confirm cultural affiliation. Blackduck rimsherds were however observed and photographed in Mr. Braun's personal collection from the site. In addition to Blackduck artifacts, Mr. Braun's collection from the site includes Archaic components as well as Laurel pottery and other Late Woodland ceramic wares.

The landowners are related to the original Euro-Canadian settlers on the property. Their recollection of discussions with their parents and grandparents are that the land never needed to be cleared, only broken, indicating that at the time of Euro-Canadian settlement the vegetation was prairie grassland with very few forested areas. Additionally, the landowners recall large amounts of Saskatoon berries *(Amelanchier alnifolia)* and chokecherries (*Prunus virginiana*) growing along the creek in the past, an attractive resource for pre-contact peoples.

Interpretation: The site is identified in the HRB database as a campsite, with reports of human burials in the area. At the site, no human burials were observed or mentioned in discussions with Mr. Braun or the landowners. The large amount of bone present in the field indicates that some sort of kill event took place at the site, the magnitude of which is unknown. It is most likely that the site represents the location of at least one kill event with an associated processing and encampment area located nearby. Unfortunately, it is impossible to assign the kill event to either the Blackduck occupation at the site or another of the documented cultural occupations without detailed methodical excavations.

Buffalo Creek represents a suitable natural topographic feature against which to trap animals. Additionally, the small forested area on the opposite side of the creek approximately 500 m southwest of the site would be an ideal location for a processing area or a lookout area to locate animals.

The lack of shelter in the immediate vicinity of the site, combined with the site's proximity to water indicates that the site may have been occupied during the warm season.

The Coe Site DjMd-3

Topography: The Coe Site is located on the southern terrace overlooking the Souris River on the northern outskirts of Hartney, Manitoba. The greatest density of artifacts is located in a cultivated field in the middle of a small hollow surrounded by a small ridge. The hollow and the cultivated field are immediately adjacent to the riparian forest along the north-facing wall of the river valley. The valley walls are too steep for habitation and the valley itself too narrow for habitation, and thus the choice for site location above the river valley on the Souris Plain seems appropriate. The hydrology of the area is dominated by the Souris River and there are no other fresh water sources readily apparent.

The Dominion Land Survey Map for the area (n.d.) surrounding the site shows only small patches of forest along the south side of the river, aside from the forested river valley itself. This stands in contrast to the north side of the river where there are extensive

aspen-oak forested areas in sand dune complexes. The surrounding landscape is dominated by prairie vegetation.

The site's location in close proximity to the Souris River offers several advantages. First and foremost, the river offers an excellent source of fresh water, as well as being one of the main watercourses in south-western Manitoba suitable for canoe travel. The aquatic resources of the river, such as freshwater clams, aquatic rodents, and fish, as well as the resources of the forested river valley, make the site rich in resources. Visibility along the river is somewhat restricted to the immediate visible stretches of water; however visibility increases greatly above the river valley across the rolling prairies. The site is exposed to the elements.

Expanding the analysis of the site to a 10 km radius includes the large forested sand dunes on the north side of the river. Additionally, several tributaries to the Souris River are visible. Vast numbers of pothole sloughs are visible in all directions. This is most likely a reflection of the high water table on the Oak Lake Aquifer.

Site Visit: A visit to the site with local collector Brad Coe, after whom the site is named, provided key insights related to site location. Mr. Coe identified the location of the density of artifacts recovered located in the hollow surrounded by the ridge. Artifacts were visible on the surface and included lithic debitage and faunal remains. Faunal remains were sparsely scattered across the site, in a manner that is more consistent with a campsite rather than a kill event.

The location of the site inside the hollow is fundamental to a discussion of site selection. In the summer, this area was well drained and sheltered by the river to the north, but was exposed to the open prairie to the south. The exposure of the site would have provided adequate ventilation, a key consideration considering the vast amounts of mosquitoes that would have been present in the river valley. In the winter, this area would accumulate snow to a greater depth than the surrounding area and during the rainy season would be the primary area through which water would drain towards the river.

Mr. Coe also pointed out the location of a set of rapids that are visible when the water is low. These rapids were not visible in the aerial photography, but this may be due to the time of year that the photographs were taken or it may be that the aerial photography was collected in a particularly wet year. It was pointed out that the rapids are a favourite fishing location for people from the Hartney area.

An examination of Mr. Coe's personal collection from the site revealed that the site has occupations ranging from the Paleo-Indian period through the Late Woodland Period. The collection consisted mainly of lithic artifacts including projectile points, scrapers, and flakes, and comparatively little pottery. This lack of ceramic artifacts in the collection is less an indication of the seasonality of the site than it is a reflection of Mr. Coe's admitted personal interests in collecting. Several Late Plains and Prairie Side-Notched projectile points were present in the collection, as well as Blackduck ceramic rimsherds. Based on Mr. Coe's personal collection, we can ascertain that Blackduck occupation of the site was sparse but is definitive. Interestingly, the collection contained

proportionately more lithic debitage than actual projectile points. This may provide inferences towards the function of the site.

Interpretation: The site's location in a small hollow surrounded by a ridge is an important indicator of seasonality for the site. As discussed above, during the winter the hollow would have accumulated more snow than the surrounding area and thus would have been unattractive for occupation. During the early spring, the hollow likely would accumulate a significant amount of runoff from the surrounding prairies and would have been wet. It is most likely that this site was occupied during the late spring or summer.

Further evidence of a warm season occupation is provided in the site's proximity to the river. The Souris River would have provided an adequate supply of aquatic resources. The location of the site along the river is similar to a boreal forest warm season occupation (Dods 2003). Dawson notes that this is because watercourses were a major food resource and that because watercourses were the only effective travel routes (Dawson 1983). During the warm season, campsites in the boreal forest were frequently located along rivers in order to take advantage of fishing opportunities, a food procurement activity traditionally conducted by female members of the group (Dods 2003). During this period, male members of the group were nearby pursuing game animals. The Souris River valley and the sand dunes on the north side of the river would provide excellent hunting opportunities. Conversely, the men could have taken advantage of the site's vantage point across the grasslands to watch for grazing bison herds. While waiting for bison herds to enter the vicinity, male members of the group could have invested a significant amount of time in flint-knapping, traditionally a male activity. This

would explain the greater proportion of lithic debitage over finished tools collected from the site.

Further evidence is provided in the relatively sparse faunal remains scattered across the site. The paucity of large identifiable bison remains indicates that a major kill event did not take place at the site. This is consistent with a warm season occupation of the site. While bison hunting is certainly still a possibility during the warm season, herd sizes in Manitoba were greatly reduced. The absence of fish bone at the site is not an indication that fishing was not practiced at the site. This is more likely a reflection of poor preservation. A small number of freshwater clam shells were observed at the site.

Based on the location of the Coe site on the landscape, and the artifact recoveries from the site, occupation of the site is estimated to have occurred during the warm season, in the late spring or summer. Had the site been occupied during the cold season, it most likely would have been located on the north side of the Souris River, in closer proximity to shelter, firewood, and a greater variety of resources.

The Dead Dog Site DiLn-6

Topography: The Dead Dog Site is located in proximity to several topographic features that likely influenced site selection by Blackduck people. The site is located along the base of a strand line of glacial Lake Agassiz that trends northwest to southeast parallel to the Pembina Hills, approximately 2500 m to the west. Several major coulees draining through the ridge are in the immediate vicinity of the site. The site is located at the base of the ridge in what is now a sandy cultivated field, but the Dominion Land Survey map

(1873) of the area shows the site in close proximity to a marsh or pothole slough. This marsh was likely the product of Tobacco Creek drainage combined with the other coulees that drained through the ridge. The nearest perennial water source is Tobacco Creek, approximately 1600 m to the northwest. South Tobacco Creek is located approximately 5700 m to the southeast.

There is considerable variation in the vegetation types in the immediate vicinity of the site. The Dominion Land Survey map for the area labels the ridge and adjacent Pembina Hills as “Thickly Timbered with oak elm poplar ash hazel birch and undergrowth”. Although there are no text labels on the Dominion Land Survey map for the immediate area of the site, shading on the map appears to represent forest, rather than grassland vegetation. The vegetation type listed in the HRB database is prairie, but given the proximity of the site to the ridge, a mixture of aspen parkland and prairie is more likely Stretching east away from the base of the ridge across the Red River Plain, most forest vegetation is restricted to the banks of Tobacco Creek and its minor tributaries. Small copses of forest vegetation are visible in patches around pothole sloughs.

Expanding the site analysis to a 10 km radius creates a catchment area that includes a large portion of the Pembina Hills and sections of Tobacco Creek, South Tobacco Creek, and Roseisle Creek, as well as including several more coulees draining through the ridge. Additionally, the 10 km radius overlaps that of the September 5 Site. Expanding the site radius to 10 km results in the inclusion of a vast array of resources that would have been available to Blackduck people occupying the Dead Dog Site. Forested areas of the

Pembina Hills and the open prairie to the east would have been available, as well as the above mentioned creeks.

Site Visit: A visit to the site enabled the identification of several environmental variables not apparent in the digital data. A large amount of chokecherries (*Prunus virginiana*) were identified at the base of the ridge that runs parallel to the Pembina Hills. Chokecherries are a documented resource for pre-contact groups (Shay 1980). Immediately south of the site is an intermittent stream which was dry in August when the site was visited. This stream may have provided a limited and intermittent water resource, but the prospects for fishing in the stream are low. The edges of the stream were lined with open aspen and oak deciduous forest.

The site is located close to several important topographic features, most notably the Pembina Hills and the ridge that runs parallel to the hills. This topographic feature significantly influences the hydrology and vegetation of the site, which are key environmental variables in site selection. Although the site is located in relatively close proximity to several water resources, these are not thought to have been a major factor in site selection. The vegetation and topography of the area were likely greater influences on site selection.

The site is located at the base of a ridge running parallel to the Pembina Hills. Given the site's proximity to this ridge, it is likely that the landscape immediately adjacent to the ridge would have a similar vegetation pattern to the ridge. That is, the area most likely would have been forested or at least partly covered with large deciduous forest patches. This means that the site would have been sheltered from the elements and firewood

would have been readily accessible. The ridge itself also likely influenced site selection as it would have made excellent hunting grounds for hunter/gatherers, as would the Pembina Hills. Additionally, a view from the top of the ridge towards the east would have allowed hunters to spot roaming herds of bison approaching the ridge. The coulees that drain through the ridge would have facilitated travel over the ridge for animals, particularly bison, seeking shelter and food.

Interpretation: The location of the Dead Dog Site offers a wide variety of resources to Blackduck hunter/gatherers. The proximity of the site to the ridge, in addition to several intermittent water resources including a now dry marsh, creates a linear-shaped ecotone along the ridge providing many resources. Animals of both the forested Pembina Hills and the prairies to the east of the site would have been frequent visitors to the site, and plant resources would have been diverse. Given the site's close proximity to both shelter and firewood, and the intermittent nature of the nearby water resources, it is proposed that this site represents a cold season occupation.

The Divorne Site DkLm-2

Topography: The Divorne Site is located immediately east of the town of Haywood on the Lower Assiniboine Delta. The topography of the area is relatively flat, with little variation in relief. Aside from pothole sloughs, hydrology is relatively sparse in the immediate vicinity of the site and appears only to consist of Elm Creek approximately 700 m to the north of the site, and drainage ditches along the sides of roads. Observing the hydrography of the area it becomes apparent that significant alterations have been made to the drainage patterns of Elm Creek. The Dominion Land Survey map of the

township (1874) shows where a branch or tributary to Elm Creek formerly existed very close to the Divorne Site. This small creek would have provided at least some source of water for occupants of the site. The HRB database reports that the site is located in sandy blowouts in the middle of a pasture. These blowouts are visible in the aerial photography and are likely the result of water being diverted from the vicinity of the Divorne Site.

Vegetation in the area is listed in the HRB database as aspen parkland and an analysis of the vegetation patterns visible in the NTS maps confirms this classification. There are several large patches of forest in the area, the edges of which coincide with property lines. This indicates that the forested areas in the past may have been more extensive and that significant portions have been cleared for agriculture. The presence of these extensive forested areas may be due to a high water table promoting the growth of forest patches. Evidence of this is seen in the numerous pothole sloughs which cover the area, which combined with a high water table may have diminished the chances of the area being cleared by recurring prairie fires. The Dominion Land Survey map of the area labels the vegetation in the immediate vicinity of the site as “Burnt Poplar Windfall Elm and Willow”. The presence of windfall suggests that any burning that did occur in the area was not as devastating as it would have been without the high water table. Further evidence of a high water table is seen in the presence of willow at the site. Willow (*salix spp.*) is a documented resource of pre-contact groups in Manitoba (Shay 1980) and generally grows in close proximity to water (Johnson, et al. 1995). This accumulated evidence supports the hypothesis that forest vegetation in the area may have been more significant in the pre-contact era.

Site Visit: This area of Manitoba appears to be relatively homogenous across its landscape. There are no significant topographic features that stand out. Expanding the analysis to a 10 km radius leaves the site far removed from the Boyne River to the south and the Assiniboine River to the north, and the Pembina Hills are far to the south and west. The landscape is relatively flat and variations in relief are most apparent around the few hydrologic features that are present. At the site, several pothole sloughs were identified that were unmapped and may have been a factor in site selection. Elm, poplar and willow trees were identified and the edges of large forested areas were observed.

Interpretation: Given the shelter that was likely present at the site and the site's removed location from permanent water sources, it is believed that the Divorne site was occupied during the cold season. During the cold season, bison and other animals would have sought the wooded areas for shelter and food. Blackduck people may have been seeking the same resources. Additionally, the site's proximity to firewood during the cold season would have been important. The lack of reliable water sources in the area would not have been as critical during the winter as during the summer.

DjMb-6, DjMb-8

DjMb-6 and DjMb-8 are located close enough together to be included in a single environmental variable analysis. Just east of the town of Souris, the sites are separated by only 725 m and are on opposite sides of a small unnamed tributary that empties into the Souris River. Where the tributary empties into the river, a modern dam has been constructed. This dam's effect on the volume of the tributary is unknown, but it is

suspected that the dam constructed northwest of the town of Souris at Oak Lake significantly affected the tributary's volume.

Given the similar environmental contexts of the two sites, they are thought to have been occupied during the same type of season and it is likely that the same types of activities were conducted there. DjMb-6 is located on the east side of the creek and DjMb-8 is located on the west side.

Topography: Significant features in the area that may have influenced site selection include the Souris River and its tributaries. The Souris River is one of the major watercourses in south-western Manitoba, and would have been important for aquatic resources including fish, aquatic mammals, and plants. Additionally, the Souris River is considered to be an important travel corridor for pre-contact groups. The density of archaeological sites from various time periods identified along the river stands in obvious contrast to the density of sites in locations removed from the river. The unnamed tributary to the Souris River is also regarded as an important variable in site selection. The tributary valley is wide and deeply incised in several areas, indicating that water flow along the tributary may at one time have been of a greater volume. The tributary would likely have provided the same kinds of resources available from the Souris River but in reduced amounts. Conversely, a slower moving stream may have provided additional marsh resources not available on the Souris River.

Perhaps less important than the resources available along the tributary is the location of the tributary itself. Tracing the path of the tributary north, it leads into the Souris Sand Hills, which in turn lead to the shores of Oak Lake and north to the Assiniboine River.

This may have been an effective means of traveling between the Souris River, Oak Lake, and the Assiniboine River. All three areas are noted for their importance to pre-contact settlement. Further examination of the Souris area hydrography finds that not only is the Souris River a main feature but that there are several major tributaries that empty into the river near the town of Souris. As such, the area near Souris may have served as a junction for pre-contact groups traveling to various locations across south-western Manitoba.

Vegetation in the immediate area of the sites is limited to the Souris River and its tributaries. DjMb-6, on the east side of the tributary, is located close to a planted windbreak in an area that was probably open prairie in the past. DjMb-8, on the west side of the tributary, is in an open grassy area. Unfortunately the Dominion Land Survey Map (1880) of the sites provides very little information related to vegetation. Presently, the south facing slopes along the Souris River are devoid of forest vegetation, as are the flat open areas above the river valley. The same pattern may be expected along the tributaries to the Souris River. This pattern can likely be extrapolated to the pre-contact past, although there may have been more individual stands of forested areas. Recurring prairie fires would likely have maintained the grasslands above the river valleys.

Expanding the site radius to 10 km identifies several important environmental variables including portions of the Souris Sand Hills, an environmental setting that has been noted for its density of archaeological sites. Although the Souris Sand Hills remain largely untested for archaeological sites, areas with similar environmental contexts such as the Lauder Sandhills and the Crepeele Dune Field to the southwest along the Souris River show an unusual density of archaeological sites. Stabilized sand dune environments are

thought to be attractive to pre-contact groups for settlement because of the diversity of resources available in these settings (Graham & Running IV 2003). The pattern of settlement at these other dune fields can be extrapolated to the Souris Sand Hills.

Another important topographic feature contained within a 10 km radius of the site is Plum Creek, emptying into the Souris River approximately 1500 m upstream of the tributary where DjMb-6 and DjMb-8 are located. Plum Creek drains the Plum Lakes along the southwest shore of Oak Lake and similar to the tributary near the sites, may have served as an important travel corridor between the Souris River and Oak Lake.

Other notable features within a 10 km radius of DjMb-6 and DjMb-8 are the numerous pothole sloughs north of the sites and the two other Blackduck sites, the Jackson Site (DjMb-17) and the Good Site (DjMb-16).

Site Visit: A visit to DjMb-6 and DjMb-8 served to re-affirm the location of the tributary around which the sites are situated. More importantly, important vegetation information was noted. Along the Souris River and the tributary, forest vegetation is visible in contrast to the surrounding areas above the river valleys. These areas are comparatively flat or rolling, with forested areas only in small natural stands or obviously planted as windbreaks. This information can be used to infer seasonality.

Interpretation: Both DjMb-6 and DjMb-8 are located on the grasslands above the Souris River and the small unnamed tributary. Although both of the sites had sheltered areas available in the immediate vicinities of the sites, it appears as though both sites were deliberately selected for location in the open grasslands. The open grasslands would have

provided little or no shelter from prairie winds in the winter, but conversely would have been well-ventilated during the warmer seasons when mosquitoes and other airborne insects are a nuisance. Both sites are located close to water bodies, inferring warm season occupation. Furthermore, the proximity of both sites to what may have been a slow-moving tributary that acted as a breeding ground for insects, may have necessitated the location of the sites in open, well-ventilated, areas. Based on the locations of these sites near water and the lack of shelter at the sites, it is proposed that DjMb-6 and DjMb-8 represent warm season occupations.

The Earl Schewfelt Site DhLp-2

Topography: The Earl Schewfelt Site is located at the top of a coulee leading down to a branch of the Pembina Valley, a spillway of several glacial lakes. The trench is deeply incised and the valley walls are steep, although across the bottom of the trench are small floodplains on either side of what is now the Pembina River.

The sides of the trench walls are thickly forested with deciduous vegetation, aside from the south-facing slopes which are mostly grass-covered with small stands of deciduous forest. The grassland above the trench is relatively flat or rolling, and is labelled on the Dominion Land Survey map of the township (1874) as “High Prairie”. The base of the trench contains the Pembina River but the floodplains on either side of the river create a large marsh habitat that supports several varieties of wetland plants. These are noted on the Dominion Land Survey map as “Willow”. It is likely that this vegetation pattern can be extrapolated to the past. The steep relief of the valley walls would have acted as a fire-break between the burning prairies above and the deciduous forest, while the floodplains

at the bottom of the trench would have been too wet to burn. A small amount of pasture land is present along the valley walls, but this is mostly limited to the flatter upper edges.

In the immediate vicinity of the site, water is relatively sparse. A small intermittent stream runs down through the coulee, the source of which can be found to the north in the grasslands above the trench, where it drains a pothole slough that was significantly larger in the pre-contact past. The stream drains south through a cultivated field, east into the coulee and past the site down to Mary Jane Creek, a perennial stream that runs along the base of the branch of the Pembina Valley. At the site, the tributary is thought to have been insignificant to site selection due to its intermittent nature. Mary Jane Creek is a tributary to the Pembina River, which is a large but slow-moving river running through the bottom of the Pembina Valley.

Expanding the environmental site analysis to a 10 km radius results in the inclusion of several significant topographic features. A large section of the Pembina Valley is included as is the entire northeast to southwest branch of the trench above which the site is located. Large sections of the Pembina River and Mary Jane Creek are included, as are many pothole sloughs in the grasslands above the trench. A fairly large section of the Pembina Hills is included in the 10 km site radius.

Site Visit: Approaching the site, it is obvious that the Pembina Valley is a unique and distinct feature on the landscape. Traveling from the grasslands into the trench, the transition from an open prairie to a river valley landscape is dramatic. The benefits of occupying this transition area are obvious. Locating a site near or in the Pembina Valley provides access to great variety of resources not present in the grasslands, including a

variety of both plant and animal habitats. Perhaps more importantly, locating a site on the edge of the trench provides access to resources in both the trench and the grasslands above. As such, the Earl Schewfelt Site is located in an ecotone, where “edge effect” allowed the occupants to procure resources from both areas.

Closer examination of the intermittent stream adjacent to the site confirmed that it was probably not a significant factor in site selection. On the west side of the road near the site, the only evidence of the intermittent stream in the cultivated field is a slight linear depression in the crops present. The stream is obviously not large enough to prevent cultivation of the area. The stream passes through a culvert to the east side of the road, where the watercourse is uncultivated but there is no surface water visible. Wet, grassy vegetation can be seen along the watercourse as it enters the coulee, past the area where the site is located.

The site’s location at the top of the coulee is important. Visibility across the grasslands at the top of trench would have been important for watching for herds of approaching animals. Additionally, the site would also provide a good vantage point for observing the bottom of the trench where animals might aggregate on the floodplains. The location of the site at the top of the coulee may also be important for traveling. The steep walls of the Pembina Valley are difficult to navigate, and as such the gentle slopes of coulees may have served as important transportation corridors for people and animals. The site may have served as an “ambush point” where Blackduck people waited for animals entering or leaving the Pembina Valley to pass.

Interpretation: The Earl Schewfelt Site is located a considerable distance from a reliable water source, in a well-sheltered coulee at the top of the Pembina Valley. The location of the site in relation to these features infers cold season occupation. Had the site been located closer to Mary Jane Creek at the bottom of the coulee, the presence of a reliable water source would likely have been interpreted as more important to site selection and may have inferred a warm season occupation. The site is well-sheltered from the elements, again inferring cold season occupation.

The Goertzen Site DhLl-5

The Goertzen Site was not originally selected for inclusion in the qualitative analysis, but when analyzing the results of the quantitative analysis of sites it became apparent that the Goertzen Site did not fit the overall pattern of settlement on the Red River Plain observed in the data. For this reason, Mr. Goertzen was contacted in an attempt to confirm cultural affiliation. Mr. Goertzen permitted a cursory examination of the artifacts collected from DhLl-5 as well as the artifacts from several sites that are part of his ongoing collection activities. An examination of the artifacts from the site revealed the presence of Late Plains/Prairie Side-Notched projectile points, as well as a ceramic rimsherd with CWO impressions. While this single rimsherd does not confirm a Blackduck cultural affiliation, neither does it rule out the possibility. In Mr. Goertzen's possession was a topographic map with the locations and Borden numbers of all the sites that he collected from. Upon observation of the map, it was noticed that the site was in close proximity to a creek that Mr. Goertzen indicated was a perennial source of fresh water. This contrasted with the

data provided by the quantitative analysis. Due to the discrepancies in information, a qualitative analysis was undertaken without a site visitation.

Topography: The Goertzen Site is located on the Red River Plain approximately 8.5 km north-east of the town of Winkler, MB. Major water resources are scarce in the area but the NTDB data indicates the presence of a watercourse 690 m straight south of the site. The 1:20,000 hydrography indicates that this watercourse is a ditch. An additional intermittent watercourse is located approximately 2300 m to the southeast. A very small pothole slough is located north-east of the site, but was probably not important to site selection. The closest forest patch to the site is approximately 2.5 km to the east, indicating that the site was not chosen for its sheltered location. An examination of the Land use/Land cover map for the area indicates that the site is located in an agricultural field, with some grassland areas bordering the watercourse to the south. An examination of the hypsography indicates that the land is almost flat.

The examination of the Dominion Land Survey Map for the area indicates that the surrounding landscape is flat and relatively open. “Good Grassland” is labelled north and east of the site and “Undulating” is labelled to the south. In the far southwest corner of the township is “Good Hay Land”. More important than these descriptions of the topography is the identification of several hydrologic features. Several features are labelled as “Dry Water Run” within the township, although a “Water Run” is identified approximately 565 m south of the Goertzen Site. This is the only feature indicated as having water in it within the township. Additionally, the Goertzen appears to be located on the edge of what is labelled as “Muskeg”.

Expanding the analysis to a 10 km radius around the Goertzen site causes several intermittent streams and Shannon Creek, a perennial water source, to be included. Forest cover within the area is limited to wind breaks and along the edges of creeks and streams. The area surrounding the Goertzen site is relatively homogenous in its composition and is characterized by relatively flat, open, prairie.

Interpretation: The reason for analysing the Goertzen site was because it did not fit the overall pattern of Blackduck settlement on the Red River Plain observed in the quantitative analysis. The analysis indicated that sites on the Red River Plain were located in close proximity to fresh, perennial, water, while the quantitative analysis indicated that the closest source of fresh water to the Goertzen Site was more than 5km away. Mr. Goertzen's indication that the site was located close to a perennial creek prompted a qualitative analysis of the environmental variables at the Goertzen Site.

Several different data sources were used to examine the water resources within the immediate site environment. The NTDB data indicated that there was a water source approximately 690 m south of the site, and the 1:20,000 hydrography indicated that this water resource was a ditch. This identification was confirmed by observing that the watercourse was straight and narrow, particularly at the point where it passed closest to the site. However the Dominion Land Survey map of the area indicated that this feature contained water when it was surveyed. While several other features on the map were identified as dry water runs, the feature in question was not indicated to be dry. This is particularly important when it is noted that the survey was conducted in August of 1872, a generally dry period of the year as indicated by the presence of other dry watercourses.

Surely if this feature was intermittent, it would have been dry at this time of year. Therefore, it can be concluded that this water feature was perennial at the time of survey. The likely scenario is that “Deadhorse Creek”, as it is identified in the NTDB data, was diverted to a ditch sometime during the historic period. As a result, the quantitative analysis identified this feature as a ditch, rather than a perennial stream. With the feature identified as perennial, the site more closely conforms to the overall pattern of Blackduck settlement on the Red River Plain, located only 565 m from water.

The Gompf Site DkMd-3

Topography: The Gompf site is located on the north side of the Assiniboine River, just above the edge of the valley wall approximately 8 km northeast of the town of Oak Lake, Manitoba. The topography of the area is highly irregular due to its proximity to the Assiniboine River Valley, but in general slopes south towards the valley and the numerous coulees that drain into the valley. The Gompf Site is located immediately adjacent to one of these coulees. Vegetation in the immediate vicinity of the site is restricted to the Assiniboine River Valley and the coulees and considerably more forest vegetation is present on the north valley wall than is expected. Aside from the riparian zone along the edge of the Assiniboine River itself, the valley bottom is open and currently used for pasture land. Above the river valley, the flat, open grasslands are currently cultivated for a variety of crops.

The hydrology of the area is dominated by the Assiniboine River. A small tributary drains through the coulee immediately adjacent to the site is identified in the 1:20,000 hydrography as intermittent along its length until it empties into the Assiniboine River.

The nearest standing water feature is a marsh more than 600 m north of the site and as such is not likely an important environmental variable in site selection. Several pothole sloughs are identified in the valley bottom.

Aside from the Assiniboine River, no permanent watercourses are visible within 10 km of the Gompf Site. Pothole sloughs are quite numerous north and south of the site, as are intermittent streams draining into the Assiniboine River. The northern edges of the Oak Lake Sand Hills are present on the edge of the 10 km boundary, representing the only significant forest vegetation outside of the river valley and along its tributaries.

The Dominion Land Survey map (1885) provides little environmental information other than indicating that the area north of the site above the river valley is “Rolling Prairie”. The adjacent survey map to the west (1880) however, indicates that the valley bottom is covered in prairie, with oak, hazel, ash, willow, and elm lining the Assiniboine River.

Only one other Blackduck site, the Johnas Site (DkMd-11) is within 10 km of the Gompf Site, although the 10 km boundary of the Taylor Site (DkMe-2) overlaps with the 10 km boundary of the Gompf Site.

Site Visit: The site proper is located above the river valley, although the current property renter recalls an area along the south-facing valley wall containing cultural material likely associated with the site. The site is in an agricultural field where continual cultivation has disturbed the site across a considerable area, and large ungulate bone is visible across the surface of the field. Associated with the site is a small slough at the head of a coulee where a portion of the site remains undisturbed (Hamilton et al, in press).

The site is located in a small localized depression at the head of the coulee. Approaching the site from the north, the coulee is invisible until the false horizon created by a break in topography is reached. The head of the coulee would make a suitable location to drive bison into a pound, and numerous hammerstones have been found in the adjacent field that may have been used for pounding in corral posts. Alternatively, the low area at the head of the coulee presents an excellent opportunity to surround bison travelling up the coulee from the valley bottom to the grasslands above. In either instance, the considerable faunal material associated with the Gompf Site is consistent with that of a communal kill event, in which large numbers of bison were captured in a single event (Hamilton et al, in press). The local topography of the site is remarkably similar to that of the Hokanson Site, a bison pound site located in the Tiger Hills.

Interpretation: The Gompf site is associated with a communal kill event most likely to have occurred during the cold season as bison returned to the aspen parkland. Although there is no shelter in the immediate area of the site, shelter may have been found in the nearby Assiniboine River valley. The wooded areas along the coulee provided ample amounts of firewood, as did the forested areas of the valley itself. Very little fresh water is located in the immediate vicinity of the site, and as such Blackduck people at the Gompf site would have to travel to the Assiniboine River for water if it was a warm season site. Based on the environmental variables associated with the site and the evidence of communal kill activities at the site, the Gompf Site is interpreted to represent a cold season occupation.

The Good Site DjMB-16

Topography: The Good Site is located on the north side of the Souris River, just east of Souris, Manitoba. The Souris River is an important resource to pre-contact groups, not only for its aquatic resources but also as a travel corridor. The Souris River at the Good Site is wide and moves at a consistent pace, although the site is located downstream of a modern dam. The river fluctuates in flow rate and volume seasonally due to both natural and man-made factors. Tributaries to the Souris River are located approximately 500 m west and 250 m east along the river. The location of the site along the Souris River between the two tributaries may infer the site's function as a junction between the two tributaries. The presence of the two tributaries, combined with islands visible in the aerial photography (1995) which are located mid-stream east and west of the site, may have provided good fish habitat for pre-contact groups in the area.

Forest vegetation in the area is mostly limited to the banks of the Souris River and its tributaries. The Land Use, Land Cover map of the site places the site in a grassland area, with agricultural cropland surrounding the site above the river valley. Most of the sides and bottom of the valley are identified as grassland, with patches of deciduous and open deciduous forest located on the south side of the river.

A 10 km site radius encompasses several features, including three other Blackduck archaeological sites located upstream (DjMb-6, DjMb-8, and the Jackson Site (DjMb-17). Topographic variables within a 10 km radius include the junction of Plum Creek and the Souris River, and the unnamed tributary to the Souris River between the DjMb-6 and

DjMb-8 Sites. The southeast edge of the Souris Sand Hills is also included within the 10 km radius.

Site Visit: At the time of the site visit, the flow of the Souris River was relatively slow and low water levels left much of the banks of the river exposed. The site is located in what is now pasture land on a south-facing slope immediately adjacent to the Souris River. The aspect of the site is important as it is believed to be a particularly important environmental variables contributing to site selection at the Good Site. The south facing pasture slope is grassy with small stands of poplar and willow, and this vegetation pattern can likely be extrapolated to back to the time when the site was occupied. Unfortunately, the Dominion Land Survey map of the area (1880) provides little information about the vegetation in the area. The grassy pasture on the south-facing slope can be contrasted with the north-facing slope on the south side of the river, which is thickly forested with deciduous vegetation, particularly 250 m to the west where a tributary empties into the Souris River. Above the river valley, Blackduck occupants of the Good Site would have had access to prairie resources on the gently rolling landscape.

Interpretation: The Good Site's location in close proximity to the Souris River indicates a warm season occupation. The Souris River would have been important to the occupants of the site not only for its resources but also for its function as a travel corridor.

As discussed above, the selection of the south-facing slope rather than the north-facing slope is believed to have been an important factor contributing to site selection by the Blackduck occupants of the Good Site. The grassy pasture interspersed with small copses of poplar and willow in which the site is now located, is likely very similar to the

environment at the time of site occupation. The south-facing slopes likely would have been devoid of any substantial forest vegetation due to the desiccating effects of the combined sun and wind from the south-west in the summer. This vegetation pattern can be contrasted with the heavily forested deciduous vegetation across the river on the north-facing bank. The north facing bank would have been spared the effects of the wind and the sun in the summer, creating a micro-climatic effect facilitating the growth of forest vegetation. This difference in vegetation patterns, created by a difference in aspect, likely influenced site selection. The Good Site's location on the south-facing slope likely reflects a warm season occupation. Had the site been occupied during the colder winter months, the south side of the river likely would have been selected for occupation because of the shelter and fuel provided by the thick deciduous forest growing there.

The conclusion of a warm season occupation of the Good Site by Blackduck occupants is shared by Playford (2004) who found that the recoveries excavated at the Good Site were consistent with a warm season occupation. In addition to recovering freshwater clam shells in situ, two hearths were identified in association with both burnt and unburnt bone. The reddening of the soil beneath the hearths is believed by Playford to infer warm season occupation. Playford cites Ponomarenko's work, who finds that during the winter fires rarely achieve the necessary heat level to redden the soil below (Playford, et al. 2004).

The Gordon Randall Site DhLw-6

Topography: The Gordon Randall Site is located in a cultivated field on a small hill north of the town of Killarney. Important topographic features in the area are Killarney

Lake to the south and the Pembina river valley immediately north of the site. These are the only hydrologic features of any significance in the area.

Killarney Lake is located approximately 3900 m south of the Gordon Randall Site. The lake is linear shaped from northwest to southeast, at a length of approximately 4.5 km. The Pembina River is approximately 850 m north of the site, and flows from approximately 25 km to the west at the foothills of the Turtle Mountains, east through the Pembina Valley to the point where it enters North Dakota south of Portage, Manitoba. Where the Pembina River passes the site, it is relatively small, and its distance from the site suggests it may not have been important in site selection. However its possible function as a travel route should be noted, particularly as it passes several important topographic features including the Turtle Mountains, the Tiger Hills, and the Pembina Valley. Other hydrologic features in the area are numerous potholes, including those mapped in the cultivated field at the Gordon Randall Site.

Most of the vegetation in the area is limited to the area surrounding Killarney Lake and the Pembina River Valley to the north. Given the site's relative proximity to the Pembina River and its location on an isolated upland, the immediate area of the site may have been forested in the past. Observing the current vegetation patterns, it appears that the edges of the cultivated field in which the site is located are marked by sharp lines cut into deciduous forest. This indicates that the site may have been cleared to the property edges and may in fact at one time have been as heavily forested as the surrounding area. Alternatively, this property may have been selected for clearing due to the presence of isolated stands of deciduous vegetation, rather than a thick forest cover. The surrounding

forest cover may be a result of historic fire suppression. In either case, it appears that the area was either aspen oak forest or aspen parkland in the pre-contact past, as opposed to open prairie.

Expanding the site analysis to a 10 km radius, most of the substantial vegetation in the area is still limited to Killarney Lake, the area of the Gordon Randall Site, and immediately to the north in the Pembina River Valley. Although the 10 km radius includes a large portion of the Pembina River, it does not include any portion of the Pembina Valley. A large wetland area on the south side of Killarney Lake is included, as are the numerous potholes north and northeast of the Gordon Randall Site. The Pugh Site #2 (DhLw-18), a Blackduck site located along the north shore of Killarney Lake, is included in the 10 km radius.

Site Visit: The field in which the site is located is gently rolling, and the area where the site is located has a slight south aspect. The field is slightly elevated from the surrounding area and although this elevation may provide a slight increase in visibility from the site, visibility is generally poor in all directions. Along the road at the edge of the field, a small marsh was observed, indicating that the water table may be fairly high in the area of the site. The deciduous vegetation surrounding the cultivated field is composed mainly of aspen and oak trees.

Interpretation: The Gordon Randall Site is located in relative proximity to the Pembina River and at a distance from which it would be feasible to access Killarney Lake resources. However due to other environmental factors, it is believed that these major topographic features were not significantly related to site selection. Had the site been

located in the Pembina River Valley itself, it may have indicated warm season occupation. Given the slight distance from the river valley, the Gordon Randall Site is hypothesized to have been a winter occupation. Further evidence of this may be seen in the vegetation pattern at the site. Sharply cut lines into the deciduous forest surrounding the cultivated field in which the site is located indicate that the area was at least partially forested in the past. The forest vegetation provided shelter and firewood, and access to deciduous forest plants and animals. Given the site's distance from an immediate water source and the shelter offered by the forest vegetation, the Blackduck occupants of the Gordon Randall Site are hypothesized to have occupied the site during the cold season.

The Gosselin Site DiLv-30

Topography: The Gosselin Site is located in the Tiger Hills west of Belmont, Manitoba. Important topographic features in the area are the Tiger Hills proper, and the Pembina Valley, located west of the site. The site is located on a terrace overlooking a small shallow kettle lake, one of the relatively few level areas within the Tiger Hills. The Tiger Hills represent a unique topographic feature in this part of the prairie landscape; a glacial end-moraine marked by dramatic relief in variation and interspersed with small lakes such as that at the site (Hamilton 2003).

Hydrology in the immediate vicinity of the site is rather limited. The small lake that the site overlooks is located immediately west of two larger kettle lakes. Examination of the current vegetation and hydrography visible in the aerial photography indicates that all three lakes may have at one time been part of a single larger lake. A single isolated upland in the middle of the three lakes is all that currently separates the water bodies. In a

wet year, the three small lakes may combine to form a small, continuous, shallow lake. Aside from the small kettle lakes, the only other water bodies in the area are numerous pothole sloughs.

The presence of forest vegetation in the area is significant. The Tiger Hills are heavily forested with aspen and oak trees, as are the sides of the Pembina Valley along its length. Additionally, numerous patches of forest are present outside of the Tiger Hills, particularly around the numerous pothole sloughs in the area. Outside of the Tiger Hills, the vegetation can best be described as aspen parkland, as identified in the HRB database. The Land Use and Land Cover Map for the area identifies areas along the flanks of the Tiger Hills as grasslands.

If the site analysis is expanded to a 10 km radius, several important topographic features are identified within the catchment area. A larger area of the Tiger Hills is added to the analysis, as is a portion of Pelican Lake within the Pembina Valley to the west. Within the Pembina Valley, Overend Lake and Grass Lake are included, as is a portion of Bone Lake. These lakes were all part of the Pembina River during the pre-contact era. Also included in the analysis are several major coulees that act as access points to the Pembina Valley, and several other Blackduck archaeological sites have been identified within 10 km of the Gosselin Site. These are the Sandbox Site (DiLv-21), the Hokanson Site (DiLv-29), and Sharpe's Garden Site (DiLv-28). The Belmont Mound (DiLu-Y1) is a Blackduck archaeological site containing human burials. As such the UTM co-ordinate provided in the HRB database is acknowledged to be purely fictional. However it is assumed to be in

the immediate vicinity of the town of Belmont and as such may be included within the 10 km radius of the Gosselin Site.

Site Visit: Rather than re-visit the Gosselin Site, most of the data presented here represents the author's knowledge of the site from previous experience. From May to August of 2001 and 2002, the author worked for the S.C.A.P.E. project (the Study of Cultural Adaptations to the Prairie Ecozone) in the Tiger Hills research locality. The author was involved in searching for the site, delimiting the extent of the Gosselin site, and preliminary excavations. For a summary of the 2002 field season activities of the S.C.A.P.E. project in the Tiger Hills locality, including the Gosselin Site, see Hamilton 2003.

The site is located on a small flat terrace looking south to southeast over a small kettle lake, as described above. Adjacent to the site is an area that may have acted as a travel corridor for both animals and people, delimited by the presence of a gradual linear slope that extends from the west down towards the kettle lake near the Gosselin Site. This gradual slope is undetectable in the NTS map for the area due to the coarse resolution of elevation data. Hamilton (personal communication, 2005) has suggested that the location of the site adjacent to the corridor may have served as a suitable locale for ambushing animals on their way to and from the kettle lake. Bison remains were discovered in the hypothetical travel corridor but there was no definitive indication of butchering on the bone discovered.

As described above, the Tiger Hills are thick with deciduous forest, and the location of the Gosselin Site is no exception. Most of the trees are aspen and oak, and the underbrush

at the site is quite thick. The density of the underbrush is likely due to the fact that the site was once used as a pasture, an activity now abandoned. The browsed underbrush is currently recovering and will likely thin out again when the forest reaches maturity. The edges of the lake are surrounded by marsh vegetation and provide excellent moose habitat. Moose were observed frequently in the area during the author's time there and the same was likely true in the past.

Interpretation: The Gosselin Site's location within the Tiger Hills provides access to a variety of resources. A variety of plants and animals were available in the deciduous Tiger Hills, the grasslands beyond the Tiger Hills, and the marsh areas around the small lake that the Gosselin site overlooks. The author can attest to the fact that the site is well-sheltered and in fact hardly bearable during the summer due to the incredible numbers of mosquitoes that live out of the wind below the forest canopy. Firewood was available and a small amount of water was available from the kettle lake, however this water source is less potable, particularly during the warm season. Other than possibly serving as an attractive feature to animals, the lake is not likely to have been a significant factor in site selection. Based on the shelter available at the site, as well as the site's location away from a reliable source of fresh water, the Gosselin Site is hypothesized to have been occupied by Blackduck people during the cold season.

The Hokanson Site DiLv-29

The Hokanson Site is located on the southern edge of the Tiger Hills, west of Belmont, Manitoba. The site has been identified as a bison kill site, complete with a pound and an associated processing and encampment area (Graham & Hamilton 2002). Excavations at

the site were conducted in the summers of 2001 and 2002 as part of the S.C.A.P.E. (Study of Cultural Adaptations to the Prairie Ecozone) project. The Hokanson Site is a unique Blackduck archaeological site as it represents one of relatively few Blackduck archaeological sites in south-western Manitoba where there is conclusive evidence that Blackduck people fully adopted a prairie-oriented subsistence economy. This adaptation is seen in the construction of a bison pound, a corral-like structure used to trap and kill large numbers of bison in a single event. Pounds represent an exclusive Plains or Prairie adaptation to a valuable resource. The Stott Site (DlMa-1) in Brandon, Manitoba is another site where there is evidence of a Blackduck constructed pound. Evidence of pound structures is provided by the presence of vertical bone features. Although there are several different types of vertical bone features, an examination of the characteristics of the vertical bone features at several identified kill sites across the Canadian Prairies and in the United States show striking similarities (Graham 2003).

Topography: The Hokanson Site is situated around a pothole slough, with the slough likely forming part of the kill area and the processing and encampment area located south of the slough at the base of a north facing hill. The slough is located in a cultivated field at the base of a southwest-facing hill over which it is proposed that the bison were driven.

Hydrology in the area, aside from the slough, is relatively sparse. The closest perennial river is more than 5 km west of the site, in the Pembina Valley. There are numerous pothole sloughs in the area, and some small kettle lakes have been mapped in the nearby Tiger Hills. These water sources would have provided an inadequate water supply to Blackduck occupants at the Hokanson Site during the warm season.

Forest vegetation in the vicinity of the Hokanson Site is significant. In addition to the Tiger Hills proper, the vegetation of the areas outside of the Tiger Hills can best be described as aspen parkland. Large patches of forest are present in the area, particularly in association with pothole sloughs. Some large forest patches are visible on the Dominion Land Survey map (1880) of the area, as are open prairie areas. Supporting evidence for the site area being aspen parkland in the past is seen in an interpretation of the activities conducted at the site. In order to drive a large number of bison over a hill and down into a pound, there must have been a large, open gathering area to the northeast of the site where the bison could aggregate, reaffirming the identification of the area as aspen parkland in the past.

Similar to the Gosselin (DiLv-30) and Sandbox (DiLv-21) Blackduck sites, expanding the site analysis to a 10 km radius results in several important topographic features being included. A large section of the Tiger Hills is included, as well as a portion of Pelican Lake within the Pembina Valley to the west of the site. Grass Lake and Overend Lake are included, as is a portion of Bone Lake. Also within the 10 km site radius are several Blackduck archaeological sites, including the Gosselin Site, the Sandbox Site, and the Sharpe's Garden Site (DiLv-28). Due to the fact that the Belmont Mound (DiLu-Y1) is a Blackduck archaeological site associated with human burials, the exact location of the site is unknown. It is however, assumed to be near the town of Belmont and therefore may be included within the 10 km site radius. Coulees providing access to the Pembina Valley are also included in the 10 km site radius.

Site Visit: The data presented here represents the author's previous work experience at the site rather than a separate visit to the Hokanson Site. The author worked at the Hokanson Site during the summers of 2001 and 2002 for the S.C.A.P.E. project and was involved not only in identifying the site but also in excavations in both the kill site and the processing and encampment area.

The bison pound is located along the edge of a pothole slough at the base of a ridge in a cultivated field. The location of the kill area can be easily identified by the vast amounts of minimally processed identifiable bison bone visible in the cultivated field. The edge of the slough is surrounded by marsh vegetation and a brush pile on the edge of the slough indicates that until recently, trees surrounded its edges.

The campsite and processing area associated with the kill event is located several hundred meters south of the kill site around the southern edge of the slough at the base of a north-facing hill. The campsite and processing area is fairly large and in some areas is densely packed with bone and fire-cracked-rock. A large portion of the site is assumed to lie south of the fence line on the adjacent property and as yet, the property owner has denied permission to excavate on the property. The campsite and processing area is covered with a thick deciduous forest and this vegetation provided adequate shelter for the Blackduck occupants of the Hokanson Site. This is an important factor as the processing of the bison from the kill event could take several days and the occupants of the site would want to be able to escape from the elements to ensure maximum productivity from the kill event.

Interpretation: The archaeological literature finds that bison pounding events most likely took place during the cold season, in fall or winter (Ray 1974). Most of this literature is based on analogies with modern bison movement in and out of parkland areas, as observed with captive bison herds (Hanson 1984) (Morgan 1980). The information that is based on the observation of bison movements occurred during the fur-trade era, when the bison had already been greatly influenced by the presence of Euro-Canadians and the associated effects of the fur-trade. Bamforth (1987) however, notes the dangers of extrapolating the observations of the fur-trade era into the pre-contact past. Furthermore, Arthur provides ample evidence of Cree pounding bison during the warm season (Arthur 1975:106). Regardless of the literature, the environmental variables at the Hokanson Site are used to infer seasonality.

Aside from the slough around which the site is located, there are relatively few water resources in close proximity to the Hokanson Site. Although there are numerous pothole sloughs in the area, as indicated above, the closest perennial stream or river is more than 5 km west in the Pembina Valley. Although the pothole sloughs may have provided some water, it would have been less potable, particularly during the warm season.

The camping and processing area of the Hokanson Site is well-sheltered, while the kill area of the site is open to the elements. This reflects the necessity of constructing the pound close to the bottom of the ridge in the open field to hide it from the approaching bison. It is important to note however, that after the kill event took place, the campsite was located in a well-sheltered area. The bottom of the hill against which the site is located, in addition to the vegetation surrounding the camping and processing area,

provided adequate protection from the elements while at the same time is located relatively close to the kill event. There are closer locations to the kill event where the camping and processing area could have been located, but these locations are not as well-sheltered as the site chosen.

The seasonality proposed for bison pounding in the literature can be combined with the lack of adequate water resources and the well-sheltered nature of the camping and processing area to propose a cold season occupation of the Hokanson Site.

The Homer Davis Site DjMf-6

Topography: The Homer Davis Site is located in an open cultivated field north of Pipestone, Manitoba. The Souris River Plain in this area is relatively flat, and the only significant topographic features in the area are Pipestone Creek and several abandoned tributaries of Pipestone Creek which are preserved in the clay rich soils of the areas. Currently, the abandoned branches, such as that adjacent to the Homer Davis Site, are intermittent streams and are expected to only contain water collected from surface run-off.

Pipestone Creek is located directly north of the Homer Davis Site, at a distance of approximately 600 m. The Pipestone Creek is a relatively large water body on the Souris Plain, although its significance is often overshadowed by the Souris River, the Assiniboine River, and Oak Lake. Pipestone Creek stretches from the Saskatchewan border east through the towns of Reston and Pipestone, before turning north again and emptying into Oak Lake. The waterway may once have been an important travel corridor

for pre-contact people, and some evidence of this may be seen in the location of not only the Homer Davis Site, but also the McMurchy Site (DjMg-31) along the Pipestone Creek to the west and the Belleview Plateau Site (DjMf-15) to the east. In addition to travel, Pipestone Creek may have provided a variety of aquatic resources to the Blackduck occupants of the Homer Davis Site. Other water resources in the area, such as pothole sloughs are intermittent.

Vegetation in the area is sparse. The nearest forest patches are 1600 m east along the creek where it turns north towards Oak Lake. The Dominion Land Survey map for this area is difficult to interpret and is from a later date than other Dominion Land Survey maps used in the study. A date from a caption at the top of the map indicates that the map is a revised edition dated at 1923. Another date on the map clearly refers to the designation of the Sioux Valley Indian Reserve in 1913. We can be sure that the map is from at least after this date. Regardless of the date, several areas are labelled on the map as “Open Rolling Prairie”, and section 25 of the map, where the Homer Davis Site is located, is described as “Good hay land”. There are no other specific descriptions of vegetation on the Dominion Land Survey map, and it appears that vegetation was not illustrated on the map at all. The modern vegetation patterns consists of cultivated fields with trees only present in the form of wind breaks, and it is believed from the evidence provided in the Dominion Land Survey Map that this vegetation pattern can be extrapolated into the pre-contact past.

Expanding the analysis of the environmental variables surrounding the Homer Davis Site to a radius of 10 km, it is observed that landscape is fairly homogenous. The 10 km

radius includes both the McMurchy Site along Pipestone Creek to the west and the Belleview Plateau Site to the east. A large area of Pipestone Creek is included, up to the point where it is diverted into Oak Lake, however Oak Lake does not fall within the 10 km radius. Within a 10 km radius there is very little forest vegetation within the area.

Site Visit: Fortunately, the field where the Homer Davis Site is located was left fallow this year, and as such the author was able to walk the field. At the site, several pieces of large ungulate bone and teeth were observed, mostly likely bison. Additionally, several pieces of fire-cracked rock were observed, as well as lithic debitage. The raw materials of the lithics observed were brown chalcedony, most likely from the Knife River area of North Dakota, and Swan River Chert. Most importantly, part of a Blackduck rimsherd was recovered, confirming the cultural affiliation of the site.

Observing the aerial photography of the cultivated field, it appeared that there was some variation either in relief or moisture at the site that was not recorded in the topographic data. Walking across the field, a small watercourse was observed that would have been intermittent at best. Although the physical characteristics of the watercourse are still present, it is believed that the feature has not held any water for quite some time. This watercourse likely represents an abandoned intermittent branch of, or tributary to, Pipestone Creek and may have been important when the site was occupied.

Interpretation: The Homer Davis Site is located in the middle of the open prairie, only 600 m south of Pipestone Creek. A small intermittent stream, now dry, is adjacent to the site. Other than the intermittent stream and Pipestone Creek, there are few water resources nearby. The modern vegetation pattern of open fields and forest vegetation only

where windbreaks have been planted can be extrapolated into the pre-contact past. This is confirmed on the Dominion Land Survey map of the area. Given the site's location in the open prairie and its relative proximity to Pipestone Creek, the Homer Davis Site is hypothesized to have been occupied by Blackduck people during the warm season.

The Horse Skull Site DlLn-3

Topography: The Horse Skull Site is located in a sand dune field on the Lower Assiniboine Delta south of Portage la Prairie, Manitoba, about 5 km south of the Assiniboine River. The dune field is the result of deltaic sand being reworked by aeolian processes, resulting in the formation of parabolic dunes conforming to the modern wind regime. Major topographic features in the area include the dune field in which the site is located as well as nearby dune fields, and the Assiniboine River.

Hydrology in the area surrounding the Horse Skull Site is fairly limited. The Assiniboine River bends around the site at a distance of approximately 5 km to the north, but other hydrology is scant. The Assiniboine River may have provided significant aquatic resources to the occupants of the Horse Skull Site, but the distance between the site and the river is too great to have likely played a significant role in site selection. From the appearance of the 1:20,000 hydrography, it appears as though several small intermittent streams previously ran through the area but have since been diverted to ditches along the sides of roadways. This complements the Dominion Land Survey map of the area (1873), which indicates several large marshy areas that are not present in the 1:20,000 hydrography.

Vegetation in the area of the Horse Skull Site is significant. The slopes of the sand dunes are covered in deciduous vegetation on all sides but the south, where the combined sun and wind have a desiccating effect on soil moisture. The dune fields in the glacial Lake Hind basin are used as an analogy to explain the vegetation pattern observed in this dune field. In the glacial Lake Hind basin, concentric rings of varying types of vegetation surround interdunal wetlands, resulting from a high water table. The decreasing moisture gradient radiating out from the interdunal wetlands creates a variety of niches for plants and animals (Boyd 2000). This diverse array of available resources would have been attractive to the Blackduck group that occupied the Horse Skull Site. In addition to the plant and animal resources, the sand dunes offer protection from the elements and an ample supply of firewood. Surrounding the dune fields are aspen parkland or grassland environments. The occupants of the Horse Skull Site would additionally have had access to these resources (Graham & Running IV 2003).

Within a 10 km radius of the Horse Skull Site, several important variables are present. The 10 km radius takes in a large section of the Assiniboine River and the forested areas that line the river valley. Several dune fields and the grassland areas that surround them are included. The PR 240 (DkLo-2) Blackduck archaeological site is located south of the Horse Skull Site in another dune field.

Site Visit: The Horse Skull Site is located approximately 1200 m east of the PR 240 road, 24 km north of Hwy 2. Approaching the site from the west, an intermittent stream passes underneath the section road. On the south side of the road, the stream has been diverted to a ditch but on the north it appears that the cultivated fields have been arranged

around the natural stream feature. Adjacent to the site, a borrow pit has been excavated, resulting in considerable loose sand blowing across the dune fields. According to the aerial photography, the site is located on the south side of a large dune that is bisected by a property fence line. The north side of the dune is exposed to the road and is unstable. The stabilized portion of the sand dune is thick with aspen and oak forest. Deer tracks were observed in the sand and an abandoned structure was observed along the side of the road. Farther east along the south side of the section road, a large marsh area is encountered, where a dense thicket of willows was growing and it is likely that berries were present during the appropriate time of year. The marshy area is bisected by the grid road, and coincides with an extensive area labelled as "Willows" on the Dominion Land Survey map of the area (1875). On the north side of the road, the marsh area is less extensive and is surrounded by grassland vegetation.

Interpretation: The seasonality of the Horse Skull Site is difficult to estimate, however there are several environmental variables that can aid in inferring seasonality. Given the site's considerable distance from the Assiniboine River, cold season occupation is inferred, although the intermittent streams likely provided some water. The site is well-sheltered, again inferring cold season occupation. The sand dunes are an excellent location for people and animals seeking shelter from the elements. Additionally, the stabilized and vegetated sand dunes provide an ample supply of firewood. The site is located on the south side of the dune. This is important because the prevailing wind direction in south-western Manitoba during the summer is from the northwest. A site location on the lee side of the dune, that is, the south side, creates additional shelter from the wind. Additionally, the south side of the sand dune creates an elevated vantage point

to look out across the grasslands in search of bison. Combined, these environmental variables infer cold season occupation of the Horse Skull Site by Blackduck people.

The Lasko Site DkLg-19

Topography: The Lasko Site is located on the eastern bank of the Red River just north of St. Adolphe. At this point, the Red River makes a sharp east to west bend, and it is inside this bend that the Lasko site is located. The topography of the area is dominated by the Red River and its tributaries, including the Rat River and the La Salle River. There is little variation in relief across the Red River Plain.

The hydrology of the area surrounding the Lasko Site and the Red River in general has been so drastically altered by development that it is difficult to estimate what original water sources were present in the area. Intermittent streams have been diverted to ditches and only major water courses can be estimated to be in their original location. There are however, a number of coulees that indicate previous tributaries of the Red River. In addition to fresh water, the Red River would have provided many aquatic plant and animal resources to the occupants of the Lasko site, as well as served to attract animals to the banks of the Red River seeking fresh water. The Red River likely also served as a major travel corridor for pre-contact peoples as it did during the early historic period. The La Salle River empties into the Red River approximately 6km north of the Lasko Site.

The banks of both the Red River and the La Salle River are lined with deciduous forest vegetation. Aside from the banks of these rivers, forest vegetation on the Red River Plain is relatively sparse. Unfortunately, the Dominion Land Survey map of the area of the

Lasko Site provides little vegetation information. The map is a compilation of several surveys from 1871 through 1874, published in 1892. The area in which the Lasko Site is located is unfortunately represented by a large blank block, to the west of which is labelled “prairie land wet in some areas” and to the east: “prairie land”. Although the vegetation from the area in the immediate vicinity cannot be recreated from the Dominion Land Survey maps, it is safe to assume from descriptions of the surrounding areas that the Red River Plain in general is covered with prairie, rather than aspen parkland vegetation.

Expanding the site analysis to a 10 km radius, the landscape is perceived as relatively homogenous. The Red River Plain is characterized by very little variation in relief and forest vegetation is limited to the banks of the major watercourses. The confluence of the Red River and the La Salle River is included in the 10 km radius, and the La Salle River was important not only because of the resources that are provided in the water but also because its banks are lined with deciduous forest. Additionally, the La Salle River may also have been an important travel corridor. The 10 km radius overlaps with the 10 km radii of several Blackduck archaeological sites, including DkLf-7, the Mennonite Landing Site (DjLg-2), and DkLg-Y1. The 10 km boundary almost overlaps with the 10 km boundaries of the Swensen Site (DjLh-2), the Fort Gibraltar 2/Fort Garry Site (DlLg-33/84a3), the Forks Site (DlLg-33), and the Bike Trail Site (DlLh-30). Just beyond the 10 km site radius is the confluence of the Rat and Red Rivers.

Site Visit: The Lasko Site is located in the southwest corner of a cultivated field adjacent to the Red River. The cultivated field has remained fallow for the last two years, and as

such the author was able to walk the field, which was obviously cleared of the surrounding oak and elm forest for cultivation.

It was obvious during the site visit that many different resources were available at the Lasko Site. Freshwater clam shells and large ungulate bone were observed at the site, as well as chokecherries (*P. virginiana*), Saskatoon berries (*Amelanchier alnifolia*), and raspberries (*Rubus idaeus*) (Shay 1980). Additionally, a modern fishing location was observed approximately 2km south of the site.

Interpretation: The Blackduck occupants of the Lasko Site obviously had access to a wide variety of resources. The seasonality of the site is difficult to assess.

Most of the resources observed at the site, such as the berries and aquatic resources are warm season resources. Unfortunately, the mosquitoes present in the wooded areas of the site during the visit were sufficient enough to cause some discomfort, inferring a cold season occupation. Cold season resources would have been relatively few, aside from the abundance of firewood and shelter available along the forested banks of the Red River. As discussed above, shelter from the elements is relatively sparse in the Red River Plain.

Overall, the Lasko Site's proximity to water, combined with the warm season resources available at the site, indicate a warm season occupation. However, the possibility of cold season occupation of the site should not be ruled out.

The Lovstrom Site DjLx-1

Topography: The Lovstrom site is located south of Brandon, Manitoba, at the junction of Highway 10 and the Souris River. The site is situated on a northern river terrace, overlooking the Souris River on the western edge of the Tiger Hills.

The Souris River was important to pre-contact occupants of the area for providing a variety of aquatic resources including fresh water plants and animals, as well as being important for its use as a travel corridor. However, given a distance of more than 1200 m from the river, it is unlikely that the river was heavily relied upon for its resources at the time the Lovstrom Site was occupied. The Souris River channel is deeply incised at the Lovstrom Site and connects the south-western corner of the province with the Assiniboine River and several other travel corridors. Along the Souris River channel are many small tributaries to the Souris, including Jock's Creek, immediately west of the site. These tributaries are identified as intermittent in the 1:20,000 hydrography and as such were not likely a significant environmental variable contributing to site selection, although the coulees within which these tributaries are located may have functioned as access points to the Souris River channel.

While relatively flat at the site proper, the topography in the vicinity of the Lovstrom site ranges from comparatively flat prairie on the south side of the river channel, to small rolling moraine deposits forming localized uplands on the north side, representing the western edges of the Tiger Hills. Presently, most of the forest vegetation is concentrated on the isolated uplands of these deposits and the Souris River channel, and this pattern can likely be extrapolated to the past. The Dominion Land Survey map of the area (1880)

shows most of the vegetation concentrated on the north facing slopes of the river channel and the coulees that enter the river channel.

Two drastically different environments are located within a 10 km radius of the Lovstrom Site. On the north side of the Souris River, the site is located on the western edges of the Tiger Hills and the 10 km site radius captures a large portion of the more dramatic uplands to the east. To the north of the site is the rolling open prairie between the Tiger Hills and the Brandon Hills. Across the river to the south, the topography is open, rolling prairie that supported large bison herds in the pre-contact era. Also within 10 km of the Lovstrom Site is the elbow of capture of the Souris River, where it turns northeast to pass through the Tiger Hills and empty into the Assiniboine River. A significant portion of the northern end of the Pembina Valley is also located within the 10 km catchment area, which overlaps with the 10 km catchment area of the Wawanesa site to the northeast along the Souris River.

Site Visit: At the Lovstrom Site, the distance between the site and the Souris River is more emphasized. The bank of the river channel is steep and difficult to negotiate outside of the coulees. The area surrounding the site is heavily forested, though probably more so than in the pre-contact era. Numerous small wetlands and pothole sloughs support stands of aspen, as do the isolated knolls on the river terrace. The extent of these isolated forest stands may have been restricted in the past due to chronic prairie fires, but the combination of forest vegetation and topographic relief creates a well-sheltered environment. The site is located in a hay field and the agricultural land in the surrounding area is largely dominated by pasture.

Interpretation: The Lovstrom Site is well-removed from the Souris River or any other source of perennial fresh water that would have contributed significantly to site selection. Instead, the site is located in a well-sheltered environment of localized relief and forest vegetation interspersed with what were likely small meadows prior to historic settlement. The aspen parkland environment of forest and meadow created attractive bison wintering habitat, as did the flood plains of the Souris River in the channel below the site. Consideration of the environmental variables surrounding the site as well as consideration of the resources that were available in the immediate surrounding area of the site result in a proposed cold season Blackduck occupation at the Lovstrom Site.

The Marais River Site DgLh-5

Topography: The Marais River Site is located along the Marais River on the Red River Plain, just over 8km southwest of Letelier, Manitoba. The Red River Plain is characterized by little or no variation in relief, clay-rich soils, and open prairie vegetation.

The hydrology of the area has been drastically altered by development. This is visible in the 1:20,000 hydrography maps which show that the few small watercourses present in the area have been diverted to ditches. Because of this drastic alteration of the hydrology, only the major watercourses in the area can be assumed to be in their original locations. These watercourses would include the Red River, and, in the immediate vicinity of the site, the Marais River. The Marais River is much smaller than the Red River and as such its overall presence on the landscape of the Red River Plain is less dramatic. However, the Marais River does stand out as one of the few areas of the Red River Plain that is at least partly forested. The Marais River may at one time have been a larger watercourse,

and the river banks indicate that it is prone to flooding due to its connection to the Red River. The Marais River is a relatively short watercourse that begins approximately 10 km southwest of the site and empties into the Red River approximately 10 km northeast of the site.

As discussed above, the Marais River is one of the relatively few areas that stand out on the Red River Plain because of its forest vegetation. In general the Red River Plain can be characterized by a lack of forest vegetation. The majority of sites in the HRB database located on the Red River Plain are associated in the database with prairie vegetation. The few sites in the database on the Red River Plain associated with aspen parkland vegetation are located adjacent to watercourses. Examples of this can be seen at the Bryson Site (DjLm-1), located adjacent to the Boyne River, and the Marais River Site. In fact, the Marais River site is not associated with aspen parkland vegetation; it is associated with riparian vegetation, surrounded by prairie vegetation. This is supported by the Dominion Land Survey maps of the area (1874) that label the land on either side of the Marais River Site as “Fine Open Prairie First Class Land” and “Fine Open Prairie”.

Analyzing the environmental variables within 10 km of the Marais River Site, another Blackduck archaeological site, the Janzen Site (DgLh-8), is observed less than 1 km upstream along the Marais River. A portion of the Red River is included within the radius, as is the confluence of the Marais River and the Red River. Except for the river banks of these two watercourses, the area is devoid of any significant patches of forest vegetation. The surrounding area is open, flat to gently rolling prairie.

Site Visit: At the site, the neighbour owning an adjacent property to the Marais River Site permitted photography of part of his collection. In the collection, Blackduck and Laurel ceramics were observed as well as Late Plains Side-Notched and Un-notched Triangular Projectile Points (Figure 1-2). Also included in the collection were several Agate Basin, Pelican Lake, and Mummy Cave, projectile points, all collected from the Marais River Site.

At the time the site was visited the cultivated field had already been harvested, permitting some pedestrian survey of the field. The edges of the field were surveyed and lithic debitage, fire-cracked rock, and several pieces of bone were observed, as well as historic material. The site is located adjacent to a small backwater channel of the Marais River and this area was observed to contain marsh resources.

Across the road from the Marais River Site is an area that appears to be completely undisturbed. On the south side of the grid road, a large mature forest lines the banks of the Marais River and the interior of a sharp bend in the river. Mature elm and oak trees create a forest canopy that blocks the sunlight resulting in an open, grassy area beneath the forest canopy. Most of the poplar vegetation in the area is on the edge of the mature forest. This vegetation pattern can likely be extrapolated to the north side of the road. The north side of the road was obviously cleared for cultivation and the distribution of artifacts indicates that the grid road probably passes through the site. There may be an undisturbed portion of the site south of the grid road.

Interpretation: The seasonality of the Marais River Site is difficult to estimate. There are environmental variables associated with the site that would benefit occupants of the Marais River Site in both warm and cold seasons.

Warm season resources include the Marais River itself, as well as the aquatic plant and animal resources that the river provides. The Marais River may not be large enough to support sizable fish populations, but the river may have served as a travel corridor. Canoe travel certainly would have been possible in some parts of the river, but perhaps not across the entirety of the watercourse. Whether or not the river was navigable by canoe, it certainly would have been possible to follow the river on foot. The marsh resources of the small backwater channel may also have attracted occupants to the site.

The Marais River site may have been occupied during the cold season. The deciduous forest patches along the banks of the river would have provided shelter from the elements for both people and animals, as well as an ample supply of firewood.

Given the site's location along the Marais River, as well as the warm season resources available at the site, the Marais River Site is proposed to have been occupied during the warm season.

The McMurchy Site DjMg-31

Topography: The McMurchy Site is located on a set of point bar deposits along the south side of Pipestone Creek, northwest of the town of Reston, Manitoba. This part of the Reston Till Plain is characterized by sparse forest vegetation and the presence of only a few watercourses. Small pothole sloughs are numerous in the area.

Hydrology on the Reston Till Plain is limited to a single major watercourse. Pipestone creek enters Manitoba from Saskatchewan in the vicinity of the Trans-Canada highway, passing east through the towns of Reston and Pipestone before turning north and emptying into Oak Lake. The importance of Pipestone Creek as a travel corridor is exemplified by the locations of several other Blackduck archaeological sites along its length. The banks of Pipestone Creek are lined with small patches of deciduous forest, as are the several other small watercourses in on the Reston Till Plain. Stony Creek, Jackson Creek and Graham Creek are identified in the 1:20,000 hydrography as intermittent rivers or streams. All three of the creeks are oriented from north to south and their locations coincide with glacial margins. The banks of these watercourses are intermittently lined with small patches of deciduous forest vegetation.

The Reston Till Plain is characterized by prairie vegetation, rather than aspen parkland. This is confirmed by the Dominion Land Survey map of the area (1880). Across the township, the landscape is labelled “Rolling Prairie”. The lack of forest vegetation is due to the fact that there is little variation in relief across the Till Plain and only a few major watercourses. In the pre-contact period, these areas would have been ravaged by recurring prairie fires. The few patches of forest vegetation in the area are located along Pipestone Creek and to a lesser extent, the Jackson and Graham Creeks. A few isolated stands of forest vegetation are found north of the McMurchy Site.

The Reston Till Plain is relatively homogenous. Expanding the site analysis to a 10 km radius around the McMurchy Site reaffirms this. Another Blackduck archaeological site, the Homer Davis Site (DjMf-6), is within 10 km of the McMurchy Site and the 10 km

radius overlaps with the 10 km radius of the Belleview Plateau Site (DjMf-15). East of the McMurchy Site there are markedly less potholes as the 10 km buffer overlaps from the Reston Till Plain to the Souris Plain.

Site Visit: At the McMurchy Site, it becomes apparent that the site is located on the terrace above Pipestone Creek, rather than in the small creek valley itself. The site is located in a cultivated field which has been allowed to lay fallow this season. Walking the fields, several clusters of artifacts were observed. Among the artifacts were pieces of large ungulate bone, Swan River Chert and Brown Chalcedonny lithic debitage, and a Late Woodland Period smooth body sherd that was too small to assess cultural affiliation. The landowners have collected several items from the site, but none were diagnostic and no ceramics were present in the collection.

Several potential resources were observed at the site. Freshwater clam shells were observed in the cultivated field, as well as fish bone. Although the presence of these items in the cultivated field may not be the result of human activity, their presence indicates a possible resource. Chokecherries (*Prunus virginiana*) were observed at the site and the landowner recalls stories of aboriginal people coming to collect Saskatoon *(Amelanchier alnifolia)* berries from the property during the summers. Visibility along Pipestone Creek would have been poor but from the south side of the creek Blackduck occupants of the McMurchy Site would have had high visibility across the prairies to the south.

Interpretation: The McMurchy Site is located in close proximity to Pipestone Creek and the many aquatic resources it provides. Several of these resources were observed at the

site, and in addition to providing resources Pipestone Creek may have served as an important travel corridor to pre-contact peoples. The site is located in a well-ventilated position above the creek valley in close proximity to, but not within, the deciduous forest lining the banks of Pipestone Creek. Blackduck occupants of the McMurchy Site would have access to both aquatic and prairie resources.

The account from the landowner about Aboriginal people coming to the property to collect Saskatoon berries carries considerable weight. This warm season activity, combined with evidence of other warm season resources available at the site, results in a proposed warm season occupation of the McMurchy Site by Blackduck people.

The Oak Lake Island Site DkMe-13

Topography: The Oak Lake Island Site is located on the eastern shore of Oak Lake, on the southern edge of Oak Lake Island Resort. The area is dominated by the presence of Oak Lake and the Plum Lakes along the southeast shore. The Plum Lakes are fed by Oak Lake and in turn drain south towards the Souris River through several unnamed tributaries and Plum Creek. In addition to the major watercourses in the area a sand dune field is set back from the eastern shore of the lake.

Oak Lake is a relatively large water body that dominates the hydrology of the area. The lake is fed from the west by Pipestone Creek, a watercourse that enters Manitoba from Saskatchewan in the vicinity of the Trans-Canada Highway, turns southeast past the towns of Reston and Pipestone, and then northeast before emptying into Oak Lake. Pipestone Creek may have been an important travel corridor for Blackduck people, and

this is illustrated by the presence of three Blackduck archaeological sites (the McMurchy Site (DjMg-31) the Homer Davis Site (DjMf-6) and the Belleview Plateau Site (DjMf-15)) along the banks of Pipestone Creek between Oak Lake and the town of Reston. Prior to the construction of the dam at the outlet of Oak Lake, the lake was subject to dramatic fluctuations in water levels. Construction of the dam has since regulated the flow of water into the Plum Lakes.

The Plum Lakes are relatively shallow but broad marshes on the southeast side of Oak Lake. The area surrounding Oak Lake on the Souris Plain is characterized in general by little variation in relief, contributing to the poor drainage of the area. This can be seen not only in the Plum Lakes at the southeast edge of Oak Lake but also around Oak Lake in general. The Plum Lakes are significant enough for several of them to have been given individual names, including the lake on the eastern side of the Oak Lake Island Site, Bigelow's Slough. On the Dominion Land Survey map of the area (n.d.), Bigelow's Slough is labelled as "Deep Slough", as are the majority of the Plum Lakes.

Plum Creek is the only other major watercourse in the area and its importance is seen not in the size of the watercourse but for its connection to the Souris River. As mentioned above, Pipestone Creek enters Manitoba from the west and drains into Oak Lake. In turn Oak Lake drains through its south end into the Plum Lakes, which in turn drain through Plum Creek. Plum Creek travels southeast before draining into the Souris River just west of the town of Souris, Manitoba. From the Souris River, travelers along these watercourses, in canoe or on foot, can move either east or west across the province. These watercourses, taken together, likely represent major travel corridors for pre-contact

groups. How significant these proposed travel corridors were, will only be determined through additional research.

The Dominion Land Survey map of the area (n.d.) identifies the present area of Oak Lake Island Resort as “Marion’s Island”. The area gets its name from the “island” of aspen and oak forest on the eastern shore of the lake. This patch of forest is the only forested area along the shores of Oak Lake, although other “islands” of forest can be observed on the southern edge of the Plum Lakes and northwest of Oak Lake. These islands of forest vegetation are protected from prairie fires by the presence of the Plum Lakes and sand dunes, which both act as natural firebreaks. The areas beyond the Plum Lakes and adjacent patches of forest vegetation are labelled on the Land Use and Land Cover maps from the MLI website and the Dominion Land Survey map (n.d.) as “grassland” and “Open Rolling Prairie” respectively.

Within a 10 km radius of the Oak Lake Island Site are two other Blackduck archaeological sites, the Taylor Site (DkMe-2) and the Cherry Point Site (Syms 1977: 136). Additionally, the 10 km radius includes all of Oak Lake and the Plum Lakes, Oak Lake Marsh, and the confluence of Pipestone Creek and Oak Lake. The sand dune areas to the south and east are included, as are large expanses of open prairie. The inclusion of all of these possible resource areas infers that the location of the Oak Lake Island Site provided a wide variety of resources to Blackduck people.

Site Visit: Approaching the site from the southeast, the sand dunes bordering the edges of the Plum Lakes appeared as an elevated ridge visible from quite a distance. The dunes would have been a significant visible topographic marker for people traveling across the

Souris Plain. Entering the sand dune area from the east, the beginnings of the aspen and oak forest are visible. More mature oak are present closer to Oak Lake, and they outnumber the aspen.

The Oak Lake Island Site is located on the southern edge of the resort on a grassy area between Oak Lake and Bigelow's Slough. Viewed from the site, Bigelow's Slough is an extensive marsh that would have harboured many different types of marsh resources, including migratory waterfowl and perhaps moose. On the west side of the site is Oak Lake, the edge of which at the site is sandy and shallow with some small marshy areas. Lake resources would have included fish, freshwater clams, and aquatic mammals.

The Oak Lake Island Site is exposed to wind from the west. During the site visit, the site was well-ventilated by a strong breeze coming across the lake and this served to keep the numbers of mosquitoes to a minimum. In the winter however, the site would have been exposed to the same winds coming across the lake at much colder temperatures.

The site is located in a grassy area, but would have been in close proximity to the mature oak trees of the resort, and as such acorns would have been available. Acorns are a documented food resource of pre-contact groups in Manitoba (Shay 1980) and are a favourite food of whitetail deer (*Odocoileus virginianus*), which may have attracted Blackduck groups to the area to hunt. Furthermore, the forested area would have provided shelter if needed, and firewood.

While at the site, the author had the opportunity to view and photograph the collection of a local landowner. The landowner indicated that almost all of the collection came not

from the vicinity of the Oak Lake Island Site, but rather from the beach in front of the property. This location is not mapped as a Blackduck archaeological site in the HRB database. The collection included artifacts from various archaeological cultural periods as well as Blackduck ceramics and Late Plains and Prairie Side-Notched Projectile Points. This collection was catalogued by Dr. E. Leigh Syms, who was at the time a professor at Brandon University in the mid-1970's.

Interpretation: The Oak Lake Island Site is in close proximity to a variety of resources, including the aquatic resources of Oak Lake, the marsh resources of the Plum Lakes, the aspen and oak forest of the sand dunes and the open prairie outside of the Plum Lakes. Most of these resources are warm season resources. If the Blackduck occupants of the site were collecting acorns a late summer or early fall occupation might be proposed, but while this is possible there is no evidence of this activity.

There is however, evidence of warm season activities. In the HRB Database, both clams and fish remains are noted as collected at the site, in addition to Blackduck ceramics, lithic debitage, and bison remains. The presence of fish and freshwater clam shells provides a strong indication of warm season occupation. Perhaps as important, the site would have been exposed to the wind coming across the lake in the winter.

Given the Oak Lake Island Site's evidence of warm season activities and the environmental variables that surround the site, a warm season occupation of the Oak Lake Island Site is proposed.

The PR 240 Site DkLo-2

Topography: The PR 240 Site is located on the Lower Assiniboine Delta, south of Portage, Manitoba. The site is located within a parabolic dune field, the result of deltaic sand deposits being reworked by Aeolian forces. The parabolic dunes conform to the modern wind regime. Other notable topographic features include the Assiniboine River to the west and other nearby dune fields.

The hydrology in this area has largely been diverted to ditches, but there are several linear watercourses visible. Most of these are intermittent streams that are tributaries to the Assiniboine River. There are several pothole sloughs visible in the hydrography, although the sandy surface of the Lower Assiniboine Delta drains rapidly. This is likely evidence of a high water table.

Forest vegetation in the area is significant. The sand dunes in the area are covered with forest vegetation on all but the south-facing sides. The south-facing sides of the dunes are subject to the desiccating effects of the sun and wind during the warm season, combined with the rapid-draining sand underneath. Generally, these slopes are covered with grassy rather than forest vegetation. The Dominion Land Survey map of the area (1875) labels the area in general as “Low Marshy Soil Covered with Willows”. The sand dunes are not labelled at the site, but are labelled to the north and in other areas on the map.

One Blackduck archaeological site, the nearby Horse Skull Site (DlLn-3) is within 10 km of the PR 240 site, and the 10 km site radius overlaps the radius of the Souque Site (DkLm-1). Other environmental variables within 10 km of the PR 240 Site are a large

portion of the Assiniboine River, the forested sand dunes and pothole sloughs of the Lower Assiniboine Delta and the open prairies of the Red River Plain to the east.

Site Visit: The PR 240 Site is located on the west side of a sand dune along the west side of highway PR 240. Immediately adjacent to the highway on the exposed face of the sand dune, lithic debitage was observed. The Assiniboine River valley is visible from the top of the sand dune and thick aspen and oak forested areas are visible along the sand dunes in the vicinity of the site. In the pasture surrounding the sand dunes, a dugout was observed, providing an indication of the high water table.

Interpretation: The Lower Assiniboine Delta is covered with sand dunes, providing significant shelter and firewood. The site is almost 8 km from the Assiniboine River, although there are numerous pothole sloughs in the area. The site is located on the west side of a sand dune, rather than in the lee on the east side, but the site is still sheltered from the west by an adjacent sand dune.

Given the site's distance from a reliable water source and its sheltered nature, the PR 240 Site is believed to have been occupied by Blackduck people in the winter.

The Pugh Site #2 DhLw-18

Topography: The Pugh Site #2 is located west of the town of Killarney, approximately 200 m north of Killarney Lake. The topography of the area is dominated by Killarney Lake and the forest vegetation that is present in some areas around the lake. Generally, the topography in the immediate area of the site is flat or gently rolling, which is consistent with the Boissevain Till Plain.

Aside from Killarney Lake, hydrology in the area is fairly limited. South of Killarney Lake, intermittent streams drain into the lake but on the north side of the lake, drainage flows intermittently to the northeast through the Pembina River to the Pembina Valley. In the immediate area of the site there are several pothole sloughs, including a large slough approximately 250 m northeast of the site. Both the extensive pothole slough and Killarney Lake may have figured prominently in site selection.

Currently, the site is located in a grassy field that may or may not have once been forested. A large forested area is present along the lake immediately west of the Pugh Site #2 which may have once reached east to the location of the site. The site is located behind a cottage development, the construction of which probably resulted in the clearing of the land. There are large patches of deciduous forest in the area, and the site was most likely covered with aspen parkland vegetation in the past. Unfortunately, the Dominion Land Survey map of the area is unavailable from the Provincial Archives.

If the analysis of environmental variables is expanded to a 10 km radius, a larger section of the Boissevain Till Plain is included that is very similar to the environment at the Pugh Site #2. Another Blackduck archaeological site, the Gordon Randall Site (DhLw-6) is within 10 km of the site, as is the whole of Killarney Lake. The Pembina River north of the Pugh Site #2 is included, but the confluence of the Pembina River and the Pembina Valley is beyond the 10 km site radius. Throughout the 10 km radius, vegetation is mostly limited to the perennial watercourses in the area.

Site Visit: At the Pugh Site #2 the proximity of the site to both Killarney Lake and the forested area immediately west of the site become more apparent. Based on the sharp

boundary of the deciduous forest it is proposed that a significant amount of forest has been cleared from the area, suggesting that the Pugh Site #2 was in fact either forested or at least partly forested at the time that it was occupied. Along the roadway several coniferous trees were observed but it is believed that these trees were likely planted rather than natural to the area. Visibility is low towards the lake from the site, but high across the cultivated fields north of the site.

Interpretation: The location of the Pugh Site #2 in a grassy field creates problems for interpreting seasonality. If the area was open in the past, then it could be suggested that the site was occupied during the warm season. Given the site's proximity to Killarney Lake this argument is easily stated. If, however, the site was forested or at least partly forested during the time it was occupied, then the site may have been occupied during the cold season. Further evidence of a cold season occupation is seen in the location of the site removed from Killarney Lake rather than directly along the water's edge. Given the sharp boundary of the deciduous forest directly west of the site, it is hypothesized that significant clearing took place during the construction of the cottage development and that the area where the Pugh Site #2 is located was at least partly forested.

Unfortunately, the site is identified only based on a scatter of potsherds gathered by a local collector rather than a controlled surface collection or excavation. Therefore any artifacts that may have indicated seasonality or activities at the site are not included in the analysis, making seasonality more difficult to infer. Given the modern vegetation pattern and the site's location on the landscape, cold season occupation of the Pugh Site #2 is proposed.

The Rathwell #1 Site DkLp-11

Topography: The Rathwell #1 Site is located on the Lower Assiniboine Delta north of the town of Rathwell, Manitoba, in a cultivated field 450 m east of an intermittent stream that drains into the Boyne River. This part of the delta is characterized by little variation in relief and only small patches of forest vegetation, if any, along the watercourses.

As indicated, there are relatively few watercourses in the vicinity of the Rathwell #1 Site. In the immediate vicinity of the site is an intermittent stream, and farther to the north, the Assiniboine River is approximately 3500 m away. Almost an equal distance south of the site is the Boyne River near its headwaters. The Boyne River is relatively small here but increases in size as it flows south along the edge of the Pembina Hills and then farther to the east past the Bryson (DjLm-1) Blackduck archaeological site near Carman, Manitoba.

Forest vegetation in the area is limited to parts of the banks of the intermittent streams and the Boyne River. It is apparent from the Dominion Land Survey map of the area however (1875) that there was more natural vegetation in the past. The section that the Rathwell #1 Site is located on is labelled “Undergrowth of Hazel Cherry and Roses Some Windfall”. This is important because currently the area is characterized by little or no variation in relief, and very few watercourses, indicating a prairie vegetation type. However the Dominion Land Survey map indicates that the area may have been characterized by more of an aspen parkland vegetation type, as indicated in the HRB database. The aspen parkland vegetation type may have been promoted by the site’s proximity to both the Assiniboine River and the Boyne River.

Analyzing the environmental variables within 10 km of the Rathwell #1 Site finds that the area is relatively homogenous. Large portions of both the Assiniboine River and the Boyne River are included, as are considerable wetlands along the Boyne River. The 10 km radius of the site is characterized by little or no variation in relief and scattered patches of forest vegetation.

Site Visit: At the Rathwell #1 Site, the Assiniboine River Valley is visible to the west and north. Perhaps more importantly the Pembina Hills are visible to the south. The proximity of the Assiniboine River and the Pembina Hills provides indicates that the area may have been partly forested in the past. The area may also have a high water table. It was noticed that in the ditches along either side of the road water had collected although it had not rained recently. Furthermore, a well was spotted on the south side of the road several hundred meters east of the site. These variables combined may have promoted the growth of aspen parkland vegetation in the area.

Interpretation: The seasonality of the Rathwell #1 Site is difficult to assess. On first impressions, the site appears to be in the middle of the open prairie, without shelter, but with some intermittent water resources nearby. These environmental variables infer a warm season occupation. However the topographic information provided on the Dominion Land Survey map, combined with the site visit provide valuable information with regards to seasonality. The Dominion Land Survey map indicates the presence of aspen parkland vegetation in the immediate vicinity of the site and the site visit indicated that a high water table may have promoted the growth of at least small stands of aspen. These stands would have provided shelter and firewood, and there is a possibility that the

stands may actually have been large deciduous forest patches. The presence of deciduous forest resources implies that the site may have been occupied during the cold season, when the necessity of being located in close proximity to a regular water source was reduced. The shelter indicated by the Dominion Land Survey maps, combined with the site's distance from a dependable water source imply that the Rathwell #1 Site was occupied by Blackduck people during the cold season.

The September 5 Site DjLo-10

Topography: The September 5 Site is located on the Lower Assiniboine Delta, south of St. Claude, Manitoba. Major topographic features in the area include the Boyne River south of the site and the Pembina Hills to the east.

The Boyne River provides most of the drainage for the area. Its headwaters are located northwest of the site near the Assiniboine River, and the river flows east through Stephenfield Lake across the Red River Plain through Carman, Manitoba. The Boyne River is thought to have been significant in the selection of the Bryson (DjLm-1) Blackduck archaeological site. The September 5 Site is located on the edge of a drained marsh that is not mapped in the 1:20,000 hydrography, however there are several large pothole sloughs mapped on adjacent quarter sections.

The vegetation pattern at the September 5 Site follows that of the aspen parkland, with stands of forest vegetation interspersed with open areas. Observing the mapped vegetation in the area, it becomes apparent that the site may have been quite heavily forested in the past. In fact, the clearing of the deciduous forest may be the cause of the

blowouts at the site that are visible in the aerial photography and mentioned in the HRB database. Given the large amount of shelter near the September 5 Site, it can be safely speculated that the site was well-sheltered in the past.

If the analysis of the environmental variables at the September 5 Site is expanded to a 10 km radius, several important topographic variables are noted. The site catchment area includes a large portion of the Pembina Hills to the west as well as approaches the headwaters of the Boyne River to the northwest. Stephenfield Lake along the Boyne River is included, as is the 10 km radius of the Dead Dog (DiLn-6) Blackduck archaeological site to the southwest along the edge of the Pembina Hills.

Site Visit: At the September 5 Site, the marsh mentioned in the HRB database is identified based on different vegetation than the surrounding area and a slight change in elevation. The date that the marsh was drained is unknown but based on the different vegetation type it is expected that the marsh still collects some water during the spring melt.

The topography at the site is gently rolling because of the presence of sand bars in the cultivated field. Blowouts are visible in the field surrounding the former marsh area, and a sand dune is located immediately east of the site. The sand dune would have been an immediate source of shelter and firewood for Blackduck occupants of the September 5 Site. Several sand dunes were observed on the trip in and out of the site although the dunes are spread out across the landscape rather than in a concentrated field.

Interpretation: The September 5 Site, although situated on the edge of a now drained marsh, is located more than 1 km from a reliable water source. The water source in the marsh may have provided water in an emergency but during the warm season would have been less potable. Although it is possible to travel the 1250 m south to the Boyne River to collect water daily, it is proposed that the September 5 Site was occupied during the cold season when the necessity of available fresh water was diminished. Furthermore, the September 5 Site is well sheltered. The nearby deciduous forest scattered across the aspen parkland would have offered firewood and shelter to both people and animals.

The location of the site along the edge of the marsh indicates that the marsh itself may have figured significantly into site selection. The Blackduck occupants of the September 5 Site may have been hunting migratory waterfowl during the fall. Alternatively, the location of the site adjacent to a marsh in a well sheltered area of the aspen parkland may be a coincidence.

The Souque Site DkLm-1

Topography: The Souque Site is located on the Lower Assiniboine Delta north of Haywood, Manitoba. In general, this part of the delta is rather homogenous and there are no significant topographic features that stand out on the maps.

The hydrology of the area surrounding the Souque Site is rather limited. The nearest perennial water fresh water source is approximately 7 km to the east and the Assiniboine River and Boyne Rivers are at least 20 km from the site. There are several major pothole sloughs in the area, but these are located at least 1 km from the site.

There are several large vegetation patches in the area, confirming the identification of the area as aspen parkland in the HRB database. To the east of the site, forest patches are larger, more numerous, and more contiguous at the edge of where the Lower Assiniboine Delta gives way to the Red River Plain. The Dominion Land Survey map of the area (1874) provides a fairly detailed description of the vegetation in the area at that time. The section that the Souque site is located on is labelled “Poplar Oak and windfall”, and the adjacent section to the west is labelled “Burnt Poplar and Scattered Oak”. This indicates not only that the area was more heavily wooded in the past than in the present, but also that the area had recently been subject to a prairie fire. Separate descriptions of the sections immediately south of the Souque Site are “Willow swale and thick poplar” and “Burnt Poplar windfall and willow”. The presence of willow in the vicinity of the site indicates either more permanent surface water or the presence of a high water table.

An analysis of the environmental variables within 10 km of the Souque Site finds some variation in hydrology. North of the site, pothole sloughs are more numerous, and southeast of the site a large section of Elm Creek is found within 10 km of the Souque Site. Part of Elm Creek is perennial, and this may have been important to the Blackduck occupants of the site. As discussed above, deciduous forest patches are larger, more numerous, and more continuous east of the site. This is the area where the Lower Assiniboine Delta transitions to the Red River Plain. Also included within 10 km of the Souque Site is the Divorne Site (DkLm-2), and the 10 km radius overlaps with a 10 km radius surrounding the PR 240 (DkLo-2) Blackduck archaeological site.

Site Visit: The Souque Site was discovered during the excavation of a dugout. This location was chosen for the dugout because a test hole indicated that water drained from the dugout was replaced quickly by an underground source. The landowners informed the author that in general, wells in this area are much shallower than those in the neighbouring St. Claude area, indicating that the water table in this area is comparatively high. The landowners further confirmed that while the water table was high, actual surface water in the area surrounding the site was rather rare. This confirms observations from the 1:20,000 data. The site is located on an isolated, raised, sandy patch of ground that the landowners noticed was surrounded by heavier darker sand. An abandoned farm was also located adjacent to the site on this raised area, and this may reflect that during certain periods of the year, mostly likely during the spring, being located on a raised, well-drained surface was important. This also reflects that the area surrounding the site is imperfectly drained, as indicated in the soil data for the township.

Interpretation: The Souque Site is located in an area that was formerly heavily vegetated. This is indicated by the Dominion Land Survey map of the area and is supported by the presence of a high water table and imperfect drainage. The soil moisture of the area likely supported extensive forested areas. Furthermore, the area is characterized by a lack of surface water and the closest perennial fresh water source is located almost 7 km to the southeast. The sheltered nature of the site, combined with a lack of fresh water, indicate that the Souque Site was occupied by Blackduck people during the cold season.

The Stott Site DlMa-1

Topography: The Stott Site is located just east of Brandon on the Trans-Canada highway, at the junction of the Trans-Canada and Grand Valley Road. The site has been subject to numerous investigations and as such a considerable body of knowledge surrounding the activities conducted at the site has been proposed (Ray 1974; Hamilton et al 1981; Syms 1977; Badertscher 1986; Graham 2003; and others).

Located along the valley wall of the Assiniboine River, the Stott Site covers an extensive area above the valley and within the floodplain. It is identified as a campsite, kill site, and burial site in the HRB database, and excavations combined with radiocarbon dates provide evidence of repeated occupations spanning a considerable time period. Furthermore, exotic trade items have been recovered, as has been evidence of occupations of the site in different seasons. As such, it is difficult to provide a general interpretation of the site.

The Stott Site is located along the north valley wall of the Assiniboine River, with the river presently passing 800 m to the south along the southern side of the river valley. The river valley is broad along its length and at this point the valley walls are somewhat steep. The importance of the river for its aquatic resources and its function as a travel corridor have been stressed repeatedly throughout this volume. Several marshes are present on the floodplain and above the river valley, but none are in direct proximity to the Stott Site. The Little Saskatchewan River empties into the Assiniboine River approximately 2 km to the west of the site. The hydrology of the area is dominated by the Assiniboine River and the river valley.

Forest vegetation is present along the valley walls but is absent above the valley or along the valley floors. Repeated cultivation has significantly affected the forest vegetation in the immediate vicinity of the site although nearby numerous small stands of forest vegetation are observed east of the site. The Dominion Land Survey map of the area (1880) shows vegetation in the river valley and along several coulees, but lacks detail in the areas removed from the Assiniboine River. Verbal descriptions of "Level Prairie Clayey Soil" are provided just north of the site above the river valley, and indicate that the area was open and grassy prior to historic settlement. The valley walls are covered with thick brush where the valley faces directly south but are covered with more substantial forest vegetation where the aspect is in a more south-western direction. The vegetation in the immediate vicinity of the site is said to be a relatively recent phenomenon (Nicholson, personal communication, 2004).

Within 10 km of the Stott Site, the landscape is relatively homogenous. Very little vegetation is visible apart from the southwest edge of the catchment area where it overlaps the Kemnay Sand Hills. North of the site, along the Little Saskatchewan River, numerous pothole sloughs are observed.

Site Visit: A visit to the Stott Site provided little new information about the environmental variables at the site. Most of the site has been developed, reflecting a significant loss of cultural heritage to Manitobans. The expanse of the Assiniboine River Valley was observed as was the relative steepness of the valley walls. The Little Saskatchewan River, identified as perennial in the 1:20,000 hydrography, may have

provided some resources to occupants of the Stott Site, but the closer proximity of the Assiniboine River to the Stott Site was more likely a contributing factor in site selection.

Interpretation: As mentioned above, the repeated occupation of the Stott Site by Blackduck groups across a considerable time span makes the interpretation of a single activity type or season of occupation difficult. However, there are some clues that aid in the interpretation of the Stott Site.

The distance between the site and a source of fresh water is significant. At other sites that are interpreted as warm season occupations, the distance between site location and fresh water is generally less than 500 m. However, a distance of 800 m from fresh water is not a significant amount beyond the range of values for other warm season occupations. Additionally, the site lacks a significant amount of shelter to escape the harsh southern Manitoba winter conditions. It is expected however, that the river valley itself provided some form of shelter and that the limited forest vegetation in the surrounding area may have provided at least temporary shelter. The environmental variables at the Stott Site provide an ambiguous indication of seasonality of occupation.

Syms (1977), based on a small sample of faunal recoveries from the Stott Site, favours a warm season occupation of the Stott Site by Blackduck groups. However Hamilton et al. (in press) point out that the recovery of several warm season artifacts cannot be used to infer a warm season occupation of the Stott Site by all of the Blackduck groups that occupied the site over a significant period of time. It is clear that bison pounding was an activity performed at the site, based on faunal recoveries (Hamilton et al. 1981) and the identification of vertical bone features at the site (Graham 2003). While Arthur (1975)

notes that bison pounding could happen during either the warm or cold season, the larger herd sizes of the fall and winter Manitoba bison herds generally facilitated bison pounding activities during these seasons.

Based on a combination of the evaluation of multiple environmental variables contributing to site selection and an examination of the proposed activities thought to have been conducted at the site, a cold season occupation is proposed for the majority of the Blackduck occupations at the Stott Site.

Summary:

The major environmental variables at twenty-seven Blackduck archaeological sites have been identified and briefly reviewed. During the study, additional information was gathered about these Blackduck sites and other Blackduck sites in south-western Manitoba. The site visit and quantitative analysis combine to reveal a pattern of Blackduck settlement not previously described in the published literature.

In addition to revealing a new pattern of Blackduck settlement, the value of site visitation in the analysis of settlement patterns has been demonstrated. Many environmental variables not visible in the available topographic data were revealed through site visitation, and furthermore, the survey of archaeological sites confirmed the location of sites and pointed out inconsistencies with the HRB database. Site visitation also created the opportunity to discuss the sites with landowners. Not only were landowners able to reveal accurate knowledge about a landscape with which they were intimately familiar, they were also able to provide valuable anecdotal information related to the sites. Many

held collections of artifacts from the sites that served not only to confirm Blackduck occupations but also to identify the presence of other archaeological cultures from various time periods at the sites. In addition to being able to gain valuable information from landowners, site visitation enabled the author to promote the awareness of archaeology to the general public and to encourage the conservation of archaeological sites.

Appendix B:
Blackduck Site Information

The following information was compiled using Grid Sampler, a program downloaded from the ESRI Website (arcscripts.esri.com). The attached table contains the information used in the quantitative analysis of Blackduck archaeological sites, which resulted in the proposal of a new model of Blackduck settlement in south-western Manitoba.

The table contains environmental attribute information for each site included in the quantitative analysis. Some explanation for each column header is provided here.

Borden. Refers to the Borden site number of the archaeological site. Each archaeological site in Canada is referenced to by its own unique Borden number, which spatially references each archaeological site. For a more detailed explanation of the Borden system, see the introduction to Appendix A.

Site Name. Refers to the commonly known name of the site. Sites are generally referred to by this name rather than their Borden designation. Archaeological sites are frequently named after the person that discovered the site, the landowner's name, or a particular geographic feature in the immediate vicinity of the site.

Physiographic Region. South-western Manitoba is divided into eight physiographic regions based on geomorphology. These physiographic regions are used by Manitoba's Historic Resources Branch and follow the outline of Weir (1960). There are four plains physiographic regions in south-western Manitoba (the Red River Plain, the Souris Plain, the Boissevain-Till Plain and the Reston-Till Plain) and four uplands physiographic regions (the Upper and Lower Assiniboine Deltas, the Tiger Hills, and the Pembina Mountains).

Drainage. Refers to the overall capacity of the site to drain internally, this information was obtained from the SoilAID files on the MLI website. There were four categories of drainage for the sites studied: imperfect, poor, rapid, and well. For three sites included in the quantitative analysis, drainage information was unavailable.

Soils. Describes the general characteristics of the surface soils in the immediate vicinity of each Blackduck archaeological site included in the quantitative analysis.

Surface Texture. Describes the texture of the soil in the immediate vicinity of the each Blackduck archaeological site included in the quantitative analysis.

Aspect. Refers to the compass direction that the 100 m x 100 m cell of land on which the site is located faces. Values of 1 to 360 degrees are possible, while a value of -1 indicates that the land is flat. Aspect was derived from a 100 m x 100m cell DEM downloaded from the MLI website.

Elevation. Refers to the elevation of the 100 m x 100 m grid cell in metres above sea level. The elevation was obtained from a 100 m x 100 m cell DEM downloaded from the MLI website.

Slope. Refers to the slope of the 100 m x 100 m grid cell on which the site is located. Slope was calculated from a 100 m x 100 m cell DEM downloaded from the MLI website.

Fresh Water. Refers to the distance between site location and fresh perennial water. This distance was calculated using the 1:20,000 hydrography downloaded from the MLI website.

The table was randomly checked for accuracy and errors that were present in the original table have been corrected. Not all of the environmental data was available for each site.

Borden	Site Name	Physiographic Region	Drainage
DjMb-6	-0-	SOURIS PLAIN	Well
DjMb-8	-0-	SOURIS PLAIN	Imperfect
DlLi-2	-0-	RED RIVER PLAIN	Imperfect
DlLi-4	-0-	RED RIVER PLAIN	Imperfect
DjMf-15	BELLEVIEW PLATEAU	SOURIS PLAIN	Imperfect
DjLm-1	BRYSON SITE	RED RIVER PLAIN	Imperfect
DgLj-2	BUFFALO CREEK SITE	RED RIVER PLAIN	Imperfect
DjMd-3	COE SITE	SOURIS PLAIN	Well
DiLn-6	DEAD DOG SITE	PEMBINA MOUNTAIN	Imperfect
DkLm-2	DIVORNE SITE	LOWER ASSINIBOINE DELTA	Imperfect
DkLs-6	DkLs-6	UPPER ASSINIBOINE DELTA	Rapid
DhLp-2	EARL SHEWFELT SITE	PEMBINA MOUNTAIN	Well
DlLg-33	FORT GIBRALTER2/FORT GARRY	RED RIVER PLAIN	
DhLl-5	GOERTZEN SITE	RED RIVER PLAIN	Imperfect
DkMd-3	GOMPF	SOURIS PLAIN	Well
DjMb-16	GOOD SITE	SOURIS PLAIN	Rapid
DhLw-6	GORDON RANDALL SITE #2	BOISSEVAIN TILL PLAIN	Well
DiLv-30	GOSSELIN	TIGER HILLS	Well
DiLv-29	HOKANSON SITE	TIGER HILLS	Well
DjMf-6	HOMER DAVIS SITE	SOURIS PLAIN	Imperfect
DlLn-3	HORSE SKULL SITE	LOWER ASSINIBOINE DELTA	Rapid
DjMb-17	JACKSON SITE	SOURIS PLAIN	Well
DgLh-8	JANZEN SITE	RED RIVER PLAIN	Imperfect
DkMd-11	JOHNAS	SOURIS PLAIN	Well
DkLg-19	LASKO SITE	RED RIVER PLAIN	Well
DkLg-1	LORD SITE	RED RIVER PLAIN	
DjLx-1	LOVSTROM SITE	PEMBINA MOUNTAIN	Well

Bordem	Site Name	Physiographic Region	Drainage
DgLh-5	MARAIS RIVER SITE	RED RIVER PLAIN	Imperfect
DjMg-31	McMURCHY SITE	RESTON TILL PLAIN	Imperfect
DkMe-13	OAK LAKE ISLAND 1	SOURIS PLAIN	Poor
DkLo-2	PR 240	LOWER ASSINIBOINE DELTA	Rapid
DhLw-18	PUGH SITE #2	BOISSEVAIN TILL PLAIN	Well
DkLp-11	RATHWELL #1	LOWER ASSINIBOINE DELTA	Well
DiLv-21	SANDBOX	TIGER HILLS	Well
DjLo-10	SEPTEMBER 5 SITE	LOWER ASSINIBOINE DELTA	Rapid
DiLv-28	SHARPE'S GARDEN	BOISSEVAIN TILL PLAIN	Rapid
DkLn-1	SOUQUE SITE	LOWER ASSINIBOINE DELTA	Imperfect
DlMa-1	STOTT SITE & MOUND	UPPER ASSINIBOINE DELTA	Rapid
DkMe-2	TAYLOR SITE	SOURIS PLAIN	Imperfect
DlLg-33	THE FORKS	RED RIVER PLAIN	
DjLw-2	WAWANESA SITE	UPPER ASSINIBOINE DELTA	Imperfect
DlLi-3		RED RIVER PLAIN	Imperfect

Borden	Site Name	Soils	Surface Texture
DjMb-6	-0-	Sandy Loam Lacustrine	Coarse Loamy
DjMb-8	-0-	Sandy Lacustrine	Sand
DlLi-2	-0-	Variable Textured Alluvium (Regosols)	Clayey
DlLi-4	-0-	Clayey Lacustrine (Black Chernozems)	Clayey
DjMf-15	BELLEVIEW PLATEAU	Sandy Lacustrine	Sand
DjLm-1	BRYSON SITE	Sandy Loam Lacustrine	Coarse Loamy
DgLj-2	BUFFALO CREEK SITE	Clayey Lacustrine (Black Chernozems)	Clayey
DjMd-3	COE SITE	Sandy Lacustrine	Sand
DiLn-6	DEAD DOG SITE	Clayey Lacustrine (Black Chernozems)	Clayey
DkLm-2	DIVORNE SITE	Sandy Lacustrine	Sand
DkLs-6	DkLs-6	Sandy Eolian	Sand
DhLp-2	EARL SHEWFELT SITE	Loamy Lacustrine	Fine Loamy
DlLg-33	FORT GIBRALTAR2/FORT GARRY		
DhLl-5	GOERTZEN SITE	Clayey Lacustrine (Black Chernozems)	Fine Loamy
DkMd-3	GOMPF	Loamy Lacustrine	Fine Loamy
DjMb-16	GOOD SITE	Eroded Slopes	
DhLw-6	GORDON RANDALL SITE #2	Loamy Till (Black Chernozem)	Fine Loamy
DiLv-30	GOSSELIN	Extremely Calcareous Loamy Till (Black Chernozems)	Fine Loamy
DiLv-29	HOKANSON SITE	Extremely Calcareous Loamy Till (Black Chernozems)	Fine Loamy
DjMf-6	HOMER DAVIS SITE	Clayey Lacustrine (Black Chernozems)	Clayey
DlLn-3	HORSE SKULL SITE	Sandy Eolian	Sand
DjMb-17	JACKSON SITE	Sandy Loam Lacustrine	Coarse Loamy
DgLh-8	JANZEN SITE	Variable Textured Alluvium (Regosols)	Clayey
DkMd-11	JOHNAS	Loamy Lacustrine	Fine Loamy
DkLg-19	LASKO SITE	Variable Textured Alluvium (Regosols)	Clayey
DkLg-1	LORD SITE		
DjLx-1	LOVSTROM SITE	Extremely Calcareous Loamy Till (Black Chernozems)	Fine Loamy

Borden	Site Name	Soils	Sufrace Texture
DgLh-5	MARAIS RIVER SITE	Clayey Lacustrine (Black Chernozems)	Clayey
DjMg-31	McMURCHY SITE	Clayey Lacustrine (Black Chernozems)	Clayey
DkMe-13	OAK LAKE ISLAND 1	Sandy Lacustrine (Gleysols)	Sand
DkLo-2	PR 240	Sandy Eolian	Sand
DhLw-18	PUGH SITE #2	Loamy Till (Black Chernozem)	Fine Loamy
DkLp-11	RATHWELL #1	Loamy Lacustrine	Fine Loamy
DiLv-21	SANDBOX	Extremely Calcareous Loamy Till (Black Chernozems)	Fine Loamy
DjLo-10	SEPTEMBER 5 SITE	Sandy Eolian	Sand
DiLv-28	SHARPE'S GARDEN	Eroded Slopes	
DkLn-1	SOUQUE SITE	Sandy Lacustrine	Sand
DlMa-1	STOTT SITE & MOUND	Eroded Slopes	
DkMe-2	TAYLOR SITE	Sandy Lacustrine	Sand
DlLg-33	THE FORKS		
DjLw-2	WAWANESA SITE	Variable Textured Alluvium (Regosols)	Fine Loamy
DlLi-3			

Borden	Site Name	Aspect	Elevation	Slope	Fresh Water
DjMb-6	-0-	255.9638	428	1.181015	509.9019
DjMb-8	-0-	63.43495	424	1.921039	700
DlLi-2	-0-	135	235	0.7089629	200
DlLi-4	-0-	90	235	0.4297103	223.6068
DjMf-15	BELLEVIEW PLATEAU	71.56505	436	0.2264803	300
DjLm-1	BRYSON SITE	99.46232	265	0.8712244	282.8427
DgLj-2	BUFFALO CREEK SITE	296.5651	245	0.3202898	0
DjMd-3	COE SITE	291.8014	430	0.7713214	141.4214
DiLn-6	DEAD DOG SITE	62.10273	313	1.377367	1442.22
DkLm-2	DIVORNE SITE	-1	284	0	3807.886
DkLs-6	DkLs-6	71.16157	342	6.405413	1200
DhLp-2	EARL SHEWFELT SITE	184.3987	465	0.9337243	424.2641
DlLg-33	FORT GIBRALTAR2/FORT GARRY	90	231	1.145763	100
DhLl-5	GOERTZEN SITE	45	261	0.3038539	565
DkMd-3	GOMPF	95.19443	418	0.7910154	1565.248
DjMb-16	GOOD SITE	90	411	0.4297103	0
DhLw-6	GORDON RANDALL SITE #2	288.4349	491	0.2264803	707.1068
DiLv-30	GOSSELIN	126.8699	457	2.862405	4477.723
DiLv-29	HOKANSON SITE	233.1301	472	0.7161599	4561.798
DjMf-6	HOMER DAVIS SITE	26.56505	438	0.3202898	608.2762
DlLn-3	HORSE SKULL SITE	108.435	285	0.2264803	1360.147
DjMb-17	JACKSON SITE	258.6901	435	0.3651854	848.5281
DgLh-8	JANZEN SITE	180	239	0.1432392	0
DkMd-11	JOHNAS	-1	434	0	3601.389
DkLg-19	LASKO SITE	194.5345	229	1.996855	100
DkLg-1	LORD SITE	104.0362	230	1.77121	0
DjLx-1	LOVSTROM SITE	315	459	0.6076908	1204.159

Borden	Site Name	Aspect	Elevation	Slope	Fresh Water
DgLh-5	MARAIS RIVER SITE	341.5651	239	0.4529535	0
DjMg-31	McMURCHY SITE	26.56505	442	0.3202898	100
DkMe-13	OAK LAKE ISLAND 1	185.1944	428	0.7910154	200
DkLo-2	PR 240	243.435	298	0.6405596	7433.034
DhLw-18	PUGH SITE #2	153.435	494	0.3202898	200
DkLp-11	RATHWELL #1	-1	323	0	3026.549
DiLv-21	SANDBOX	18.43495	468	0.4529535	3361.547
DjLo-10	SEPTEMBER 5 SITE	296.5651	311	0.3202898	1334.166
DiLv-28	SHARPE'S GARDEN	45	419	0.4051356	300
DkLn-1	SOUQUE SITE	116.565	291	0.3202898	6718.631
DlMa-1	STOTT SITE & MOUND	205.9423	374	5.873085	860.2325
DkMe-2	TAYLOR SITE	71.56505	432	0.2264803	5249.762
DlLg-33	THE FORKS	90			500
DjLw-2	WAWANESA SITE	326.8887	371	1.965839	400
DlLi-3		165.9638	235	1.181015	100