The St. Louis Site (FfNk-7) and the Below Forks Site (FhNg-25): The Faunal Analysis of Two Mummy Cave Series and Oxbow Complex Sites in Central Saskatchewan

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By
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Abstract

The St. Louis site and the Below Forks site are both well stratified, multicomponent archaeological sites situated on terraces of the South Saskatchewan and Saskatchewan River valleys respectively. The St. Louis site, located 1.6 kilometres east of St. Louis, Saskatchewan, was originally excavated as part of a Cultural Resource Management study conducted by Stantec Consulting Ltd. in 2002. Subsequent excavations were carried out the following year under the supervision of Dr. David Meyer. Artifacts and radiocarbon dates revealed that the site had an antiquity that included the late Plano Tradition, the Mummy Cave Series, and the Oxbow Complex (8400-4590 rcybp). For this thesis only the faunal remains from the upper four occupations were analysed which contained the Mummy Cave Series and Oxbow Complex occupations. The Below Forks site is located two kilometres east of the confluence of the North and South Saskatchewan rivers. This site was originally discovered in 1980 by Saskatchewan Research Council archaeologists and was excavated more intensively in 2000, 2001, and 2002 under the supervision of Dr. David Meyer. Diagnostic artifacts and radiocarbon dates indicate that this site contains both Mummy Cave Series and Oxbow Complex occupations.

A detailed analysis of the faunal remains from both sites was carried out revealing that a broad spectrum of fauna was exploited, especially at the Below Forks site. It appears that bison were the main source of subsistence, though the number of bison in each occupation was low. There was a heavy reliance on secondary sources, especially snowshoe hare and canids. The highly fragmented and dispersed nature of the faunal remains indicated that most of the occupations were campsites or multiple activity sites. A comparison with other sites of similar geographical location and antiquity revealed similar subsistence practices were utilized at these sites as were utilized at the St. Louis and Below Forks sites. The site comparisons also revealed that the Below Forks site

contained the highest diversity of fauna. Paleoenvironmental evidence reveals that the Altithermal climatic period was at its height during the Mummy Cave Series and was in the process of ameliorating during the Oxbow Complex. The placement of the Below Forks site would have made both Boreal Forest and Grassland adapted species available for exploitation and may be a possible explanation for the diversity of species seen at the site. Further paleoenvironmental research will be necessary in continuing studies into subsistence practices used during these time periods.

Acknowledgements

The completion of this project is a result of the work and guidance from numerous people to whom I owe a great deal of thanks. First and foremost I would like to thank my supervisor Dr. Ernie Walker for his support and advise regarding the project's direction as well as for passing on some of his expertise in faunal analyses. I would also like to thank my committee member Dr. David Meyer for encouraging me to examine the Below Forks site faunal remains as well as for the information and assistance he provided in researching the St. Louis and Below Forks sites. I would like to thank Dr. Margaret Kennedy for serving on my committee as well as for her assistance in editing the final document.

I would like to thank Stantec Consulting Ltd. for providing the results of their work at the St. Louis site for this project. In particular, I would like to thank Butch Amundson for his guidance and assistance during 2003 excavations at the St. Louis site as well as for the continued advise and information regarding the site long after the field season was over. Thank you to the large cast of volunteers who assisted in excavations at the St. Louis site. These volunteers include the Saskatchewan Archaeological Society Field Schools, local citizens of St. Louis, Maggie Hanna, Michael Markowski, Alex Too, Georges Doterai, Cherene Ilott, and Valerie Hamilton.

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Finally, I would like to thank my husband Neil Johnston for his immeasurable patience, understanding, and encouragement during the completion of this project. His support was a testament to our partnership.

This thesis is dedicated to my parents, Brent and Cherene Ilott, and to my late great-grandmother, Georgina Case, who taught to value and love education.

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CHAPTER ONE

Introduction, Statement of Objectives, and Thesis Outline

1.1 Introduction and Statement of Objectives

The St. Louis site (FfNk-7) and the Below Forks site (FhNg-25) are both multi-component archaeological sites that contain Mummy Cave Series and Oxbow Complex components. Radiocarbon dates from the Mummy Cave occupations at both sites cluster around 6000 radiocarbon years before present (rcybp). These dates place these occupations in the Altithermal climatic period (Antevs 1948). This warm and/or dry period on the Plains is central to forming interpretations regarding the settlement and subsistence strategies that were needed in order to cope with the changing environmental conditions. The emergence of the Oxbow Complex coincides with the amelioration of the Altithermal period (Lemmon and Vance 1999) and radiocarbon dates from the Oxbow occupations at these sites cluster around 4600 rcybp. The environment at this time appears to be somewhat cooler and wetter than present day conditions. Understanding these paleoclimatic conditions is extremely important in formulating subsistence models based on faunal remains and site locations.

The goal of this thesis is to interpret subsistence strategies practiced during these time periods on the Northern Plains using evidence from the faunal remains recovered from the Below Forks and St. Louis sites. Sites attributed to the Mummy Cave Series are poorly known on the Northern Plains and those of the Oxbow Complex are only slightly more frequent. New information regarding subsistence practices from these time periods will be a valuable addition to models already formulated from previous faunal research conducted on Mummy Cave/Oxbow site assemblages. The faunal assemblages from the Below Forks and St. Louis sites will be compared to several other Mummy Cave/Oxbow sites on the Northern Plains in an effort to determine what, if any,

subsistence strategy similarities existed between people during this time period.
In order to carry out the task of interpreting the subsistence strategies from the St. Louis and Below Forks sites the faunal remains were analysed with a number of goals in mind. First, it was necessary to accurately identify the faunal resources exploited by the site inhabitants. The faunal specimens were checked for evidence of burning and butchering marks which would indicate human processing. An analysis of taphonomic processes affecting the faunal assemblage was undertaken in an effort to determine if the observed faunal frequencies were the result of human accumulation or if preservation had affected what remained in the assemblages. Verifying activity areas and site seasonality was also considered vital in the attempt to understand the subsistence strategies. It is hoped that the information presented in this thesis will increase the current knowledge on subsistence strategies during the Mummy Cave Series and Oxbow Complex periods and that these new data will be useable for future researchers in further investigations of this nature.

1.2 Initial Investigations and the SCAPE Project

The St. Louis site is located within the South Saskatchewan River valley, approximately 1.6 kilometres east of the town of St. Louis, Saskatchewan. Initial investigations were conducted by Stantec Consulting Ltd. in 2002 for Saskatchewan Highways and Transportation in relation to the planned construction of a new bridge and connecting highway in the area. The main focus of these investigations was concerned with the deep layers of the site that have been attributed to the late Plano tradition. The upper four layers of the site have been attributed to Mummy Cave and Oxbow occupations and the faunal remains from these layers were analysed for this thesis. Investigations were continued at the site during the summer of 2003 under the direction of Dr. David Meyer of the University of Saskatchewan. The majority of these excavations were concentrated on expanding the excavations from 2002 in Layer VII through IX. The author conducted excavations during this field season in Layer I, the Oxbow layer.

The Below Forks site is located 2.5 km east of the junction of the North and South Saskatchewan rivers. It lies on an abandoned river terrace on the north side of the Saskatchewan River valley. This site was discovered by Dr. David Meyer, during the Saskatchewan River Forks Archaeological Survey in 1980 and 1981 (Meyer 2003). Initial test excavations were conducted at this time and continued during the 1989, 2000, 2001 and 2002 field seasons. The faunal remains recovered from these excavations will be analysed for this thesis.

The excavations conducted at the St. Louis site in 2003 and at the Below Forks site in 2000, 2001, and 2002 are part of a larger project called the "Study of Cultural Adaptations in the Canadian Prairie Ecozone," which produces the acronym SCAPE. Funding for this project is supported by the *Social Sciences and Humanities Research Council of Canada* (SSHRC) through the *Major Collaborative Research Initiatives* (MCRI) program. This project involves the collaboration of a team of archaeologists, geoarchaeologists, paleoenvironmentalists, and geographers whose research locations are in southeastern Alberta, southwestern Manitoba, and central Saskatchewan (Meyer 2003, Kasstan 2004).

In central Saskatchewan the SCAPE research has focussed on the area around the confluence of the North and South Saskatchewan rivers, known as The Forks. This project initially was to involve investigations at four archaeological sites, but since the discovery of the St. Louis site it came to involve five. The other archaeological sites involved in the study are the Harper Valley, Fenton Ferry and Intake sites. Work with members of the aboriginal bands in the region is also an important aspect of the project (Meyer 2003). See Figure 1.1 for all site locations mentioned.

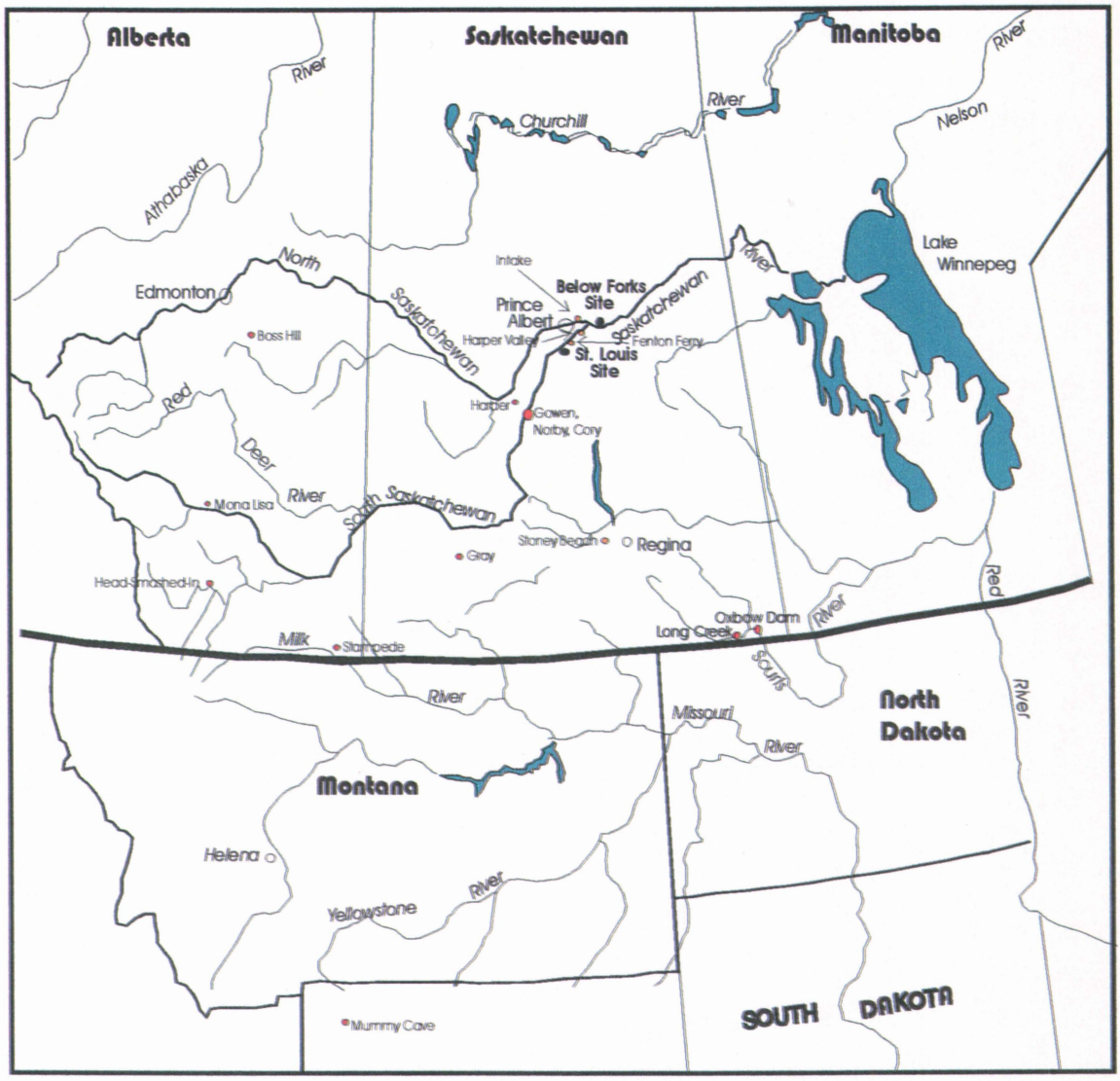

Figure 1.1 Map indicating sites mentioned in this thesis.

1.3 Chapter Summary

Chapter one is an introduction to the Below Forks site and the St. Louis site along with a statement of thesis objectives. The history of the research into the sites is presented along with a description of the SCAPE project.

Chapter two outlines the history of research into the Altithermal climatic period and outlines the current concepts regarding cultural response to this changing environment. Terminology is presented regarding the organization of material culture on the Plains and previous research into the Mummy Cave Series and the Oxbow Complex is summarized.

Chapter three describes the physical environment of the regions surrounding the sites including a discussion of the physiography, soils, climate, hydrology, flora, and fauna. Paleoenvironmental research is discussed in this chapter in an effort to outline differences from the present environment. Geological history and site formation processes are then discussed followed by a detailed description of the natural and cultural stratigraphy observed at each site. Radiocarbon dates are also presented in this chapter.

Chapter four provides a detailed description of the discovery of these sites along with a description of methods of excavation, cataloguing, and artifact analysis. A brief discussion of the terminology used in the faunal analysis is also provided.

Chapters five and six present the St. Louis and Below Forks faunal assemblages respectively. The sites are separated stratigraphically and each stratigraphic unit is presented as a separate assemblage. For each assemblage analysed, the total number of specimens and weight is presented as is the total number of identified and unidentified bone. Each assemblage is then analysed by species and NISP, MNI, MNE, MAU, and % MAU are determined. Each assemblage is discussed in an effort to determine seasonality, site activity areas, and the nature of the occupations.

Chapter seven is devoted to the interpretation of the subsistence practices observed in the Mummy Cave and Oxbow occupations at the St. Louis and Below Forks sites. Several sites of similar antiquity and geographical location are summarized and compared with the St. Louis and Below Forks sites in an effort to provide an overview of

Mummy Cave and Oxbow subsistence strategies on the Northern Plains. An effort is also made to determine how the St. Louis and Below Forks site are similar or different from the sites previously researched.

Chapter eight summarizes the results of the faunal analyses from the St. Louis and Below Forks sites. Several conclusions are made regarding the subsistence strategies employed by the Mummy Cave and Oxbow peoples in regards to the onset and amelioration of the Altithermal climatic period.

CHAPTER TWO
THE ALTITHERMAL AND CULTURAL BACKGROUND

2.1 The Altithermal

The acceptance of significant post-glacial climatic fluctuations, and more specifically the concept of a warm, arid mid-Holocene interval, became prevalent in North America during the mid-twentieth century. Many terms have been applied to this warmer climatic interval: the Hypsithermal (Deevey and Flint 1957), the Xerothermic Maximum (Sears 1942), or the Climatic Optimum (Sernander 1910). The term "Altithermal" was introduced to the literature in 1948 by Ernst Antevs and is the term that is most widely employed for this climatic interval. This term was created when Antevs defined a model to explain Holocene climatic change using geological methods such as rates of wind erosion, pollen evidence, ice recession, and rates of lake salinization (Buchner 1980:1-4; Walker 1992:1). This model was based around the idea of a gradual transition between three Holocene climatic periods: the Anathermal, the Altithermal, and the Medithermal. These periods are characterized by a gradual rise in temperature (Anathermal: 10 075-7500 BP) until a period of peak aridity was reached (Altithermal: 7500-4000 BP), followed by a gradual decline in temperature (Medithermal: 4000 BP-present). Antevs characterized the Altithermal as having "a temperature of a distinctly higher level than prevails at present" (Antevs 1955:326). He viewed this period as having fairly uniform effects over most of western North America causing all around lower lake levels, wind erosion, dune formations, and a significant loss of plant cover (Sheehan 2002:118).

As time progressed, the simplicity of Antev's model was questioned and in 1967 Bryson and Wendland proposed an alternate model for Holocene climatic change. Their model suggested that Holocene climatic variation could be represented by a series of

"quasi-stable" episodes separated by rapid and abrupt change, rather than the gradual change as Antev's model suggested (Bryson *et al.* 1970:72; Wendland and Bryson 1974:9; Bryson and Wendland 1967). Because the climatic shifts of the Holocene seemed to occur on a global scale, Bryson and Wendland (1967) suggested that a modified version of Europe's Blytt-Sernander terminology could be adopted to fit North America's climatic changes. These were established on the basis of peat bog analyses in Europe. Of the seven climatic episodes this scheme outlines, the Atlantic episode which dates between 8490 and 5060 BP is approximately equivalent to the Altithermal (Wendland and Bryson 1974; Walker 1992:2).

These ideas originally put forth by Bryson and Wendland gathered acceptance and support in North America, and archaeologists began to build on this climatic model to help explain the adaptive responses of human populations during the mid-Holocene time period (Bryson 1987; Frison 1975; Meltzer 1999; Reeves 1973; Walker 1992). Even though Antev's model of a gradual change has now been disproved, his term "Altithermal" has remained entrenched in the archaeological literature and serves as a reference to the mid-Holocene climatic interval. The term Altithermal will be substituted for the Atlantic in this thesis. Despite the variances in climatic models for the mid-Holocene it can be concluded that the climate of the Great Plains during this time period varied substantially, but overall it can be characterized as having a north-south gradient of increasingly warmer and drier conditions (the Southern Plains being the warmest and driest), a decrease in rainfall, surface water, and resource abundance. There was an increase in resource irregularity, erosion, and aeolian activity (Meltzer 1999; Sheehan 2002; Walker 1992). The major feature of the Altithermal climate was a year round dominance of the Mild Pacific air mass. This climatic situation produced arid summers, with a temperature approximately 4°C warmer than present conditions. Rainfall in the spring would have been analogous to modern drought conditions. The annual precipitation would have been approximately 80% of the present annual average (Reeves 1973; Sheehan 2002; Vance 1987).

Archaeologists began to use the concept of the Altithermal to explain the changes

seen in the archaeological record beginning about 7500 BP. Understanding human responses on the Plains to the drier mid-Holocene climate is a matter complicated by the lack of archaeological data due to geomorphic processes that have either removed or deeply buried sites from this time period, and by the various adaptive strategies undertaken by the human populations during this time period.

2.2 Theories of Cultural Responses to the Altithermal

There have been a number of models proposed in order to explain human adaption to the Altithermal climate. The earliest of these models was presented by Mulloy (1958). While formulating a cultural chronology for the Northwestern Plains, he noted a lack of archaeological sites dating between 7500 and 5000 BP, the time period that corresponds with the Altithermal. He chose not to name this time period suggesting that the Plains had been abandoned during this time due to harsh and adverse climatic conditions. His theory suggests that the Altithermal caused near desert-like conditions on the Plains and therefore animal populations, and the humans that were exploiting them, migrated to regions outside of the Plains where heavier precipitation occurred. In this same work, Mulloy also noted that the suggested abandonment of the Plains was only a theory and that the lack of recorded archaeological sites during this time period may also be the result of insufficient archaeological exploration and excavation (Buchner 1980; Frison 1975; Reeves 1973; Sheehan 2002; Walker 1992). Nevertheless, this model of Plains abandonment, also known as a cultural hiatus, became mainstream within the archaeological literature of the late 1950s and early 1960s.

Once Mulloy's model of Plains abandonment had become entrenched into the literature other archaeologists began to build on this idea and create related models of their own. For example, Jennings (1957) saw no evidence from his work in the Great Basin that the environment was ever so desiccated as to not be able to support human habitation. He proposed that during the times of increased aridity on the Plains (7000-5000 BP) a preestablished "Desert Culture" moved out of the Great Basin and onto the Plains. Jennings based this concept on superficial comparisons of artifact types from the

two areas.

Wedel (1961:254-255) disagreed with Jennings'(1957) ideas acknowledging that a "Desert Culture" way of life had not been established for the entire Plains. He did, however, agree with Jennings that climate change alone is too simplistic an explanation to be the sole cause of culture change and stated that while abandonment may have occurred, he would maintain reservations regarding Plains abandonment theories until further proof was offered (Wedel 1961:214-215). Wedel (1978) later changed his opinion and subscribed to Hurt's 1966 refugium concept. Here Hurt notes that the northern and eastern peripheries of the Plains along with areas of higher elevation, and mountain fed springs and rivers in the west are areas characterized by readier access to water than the rest of the Plains and therefore may have served as oases during times of severe drought. He also proposed that major river valley systems, such as the Missouri and the Saskatchewan, may have served as potential places of refuge as well (Hurt 1966:110; Walker 1992:122-123).

Reeves (1973) argues adamantly against the concept of an occupational hiatus during the Altithermal. His study focusses on a reconstruction of the environmental conditions, using 38 paleoecological sites in combination with ecological information obtained during the 1930s "Dust Bowl," along with a reanalysis of the archaeological record during the Altithermal time period. From this Reeves concluded that since short grass communities are well adapted to drought-like conditions, an eastward and southeastward expansion of the short grass plains occurred during the Altithermal. Consequently the total area encompassed by the short grass plains would have increased dramatically. Since bison are best adapted to the short grass prairie, Reeves argues that the carrying capacity for the Great Plains was adequate for the maintenance of stable bison herds and therefore major cultural responses to changing environmental conditions were unnecessary (Reeves 1973:1228).

Several researchers (Buchner 1980; Sheehan 1995, 2002) dispute Reeves' ideas about the carrying capacity of the short grass plains stating that Reeves does not give adequate consideration to numerous reports (Albertson *et al.* 1957; Albertson and

Weaver 1948; Ellison and Woolfolk 1937; Tomanek and Hulett 1970 cf. Sheehan 2002) that show that the effects of drought are quite severe on the short grass plains, significantly reducing basal cover. Sheehan (2002) notes Tomanek and Hulett's (1970) report that the basal cover of native vegetation of the short grass prairie decreased from 85 percent before the drought of the 1930s to less than 20 percent at the drought's close. Sheehan believes that if historic droughts can be used as analogues to the Altithermal, then the effects of the long-term Altithermal conditions were likely more severe than Reeves contends. Buchner (1980:9) also notes that Reeves does not consider the effect of the climate upon the availability of drinking water which is clearly as important to both bison and human populations as is the vegetation.

Reeves (1973) offered several alternative explanations, in addition to his ideas about carrying capacity, to explain the lack of archaeological evidence supporting an Altithermal occupation of the Plains. One other explanation is simply skewed sampling. Archaeological investigations have not been carried out in all areas of the Plains with equal force. Reeves (1973:1231) proposed that archaeologists have not sought out sites of this time period and have relied on salvage work to locate such deposits. This has resulted in the uneven distribution of these sites. Indeed, many references for Early Middle Period sites have come from cultural resource management reports. If this type of data was added to the inventory of Early Middle Period sites, the distribution may reflect differently (Walker 1992: 127).

Another idea put forth by Reeves (1973), which has gained a great deal of support in recent years (Artz 1992; Ferring 1992; Mandell 1995; Vance *et al.* 1995) is that geomorphic processes, especially erosion and deposition, has had dramatic effects on the preservation and detection of sites from this time period. This is especially significant because many sites dating to this time period have been located on river terraces where erosion and deposition rates are high. Geoarchaeological studies have shown that geomorphic processes have affected the preservation and detection of mid-Holocene archaeological sites. It was likely the reduced vegetation cover combined with the infrequent but intense rainfalls during the warm dry Altithermal that facilitated the erosion

and net transport of sediments out of small drainage basins into larger ones. A subsiquent vegetation recovery and erosion decrease favoured later sediment storage in these small valleys. It appears that one reason for a paucity of archaeological sites dating to the mid-Holocene is that they are likely deeply buried in terraces and alluvial fans of large-order streams, or have been eroded or removed from the small-order streams. Also, the fact that younger surfaces dominate the landscape makes detection of these sites impossible without earth moving equipment or geophysical tools. As more knowledge is gained about where these sites may be potentially located, more research can be directed at finding and studying these Middle Period sites (Mandel 1995). These ideas are beginning to gain a great deal of support as evidence is accumulating in the form of many deeply buried sites being found including several in south-central Saskatchewan. These sites include Gowen 1 (Walker 1992), Gowen 2 (Walker 1992), the Norby site (Zurburg 1991), the Cory site (Walker and Amundson *et al.* 2002), and now the Below Forks and St. Louis sites which were both buried under almost two metres of sediment.

Projectile points dating to the mid-Holocene are variable in form and as a result have been misidentified by archaeologists in many instances. This misidentification is especially prevalent in projectile points found as surface finds as they are often associated with a later time period such as Besant (Walker 1992; Meyer personal communication 2005). Therefore, there may be more mid-Holocene sites recorded than archaeologists are currently aware of.

2.3 Current Concepts on Human Responses to the Altithermal

The above section has briefly summarized the history of research into the mid-Holocene Altithermal climatic period. From this it should be clear that the working assumption has been that the mid-Holocene was a time of severe drought and decline in ecological productivity across the Plains. The Altithermal was a period of general decreased precipitation and increased temperature, this point now being generally accepted in the archaeological literature, however, there is evidence that the environmental conditions varied across the Plains and possibly throughout this period

(Meltzer 1999: 413). The perceived effects of the Altithermal are considered most pronounced on the southern High Plains where a forager response to drought is indicated including hand-dug wells, and expansion of diet breadth (Meltzer 1999). On the Central and Northern Plains the conditions were not as severe, yet still seem to have triggered some sort of adaptive response among human populations of this time period.

While it cannot be proven that climate change led to culture change during the mid-Holocene, the archaeological record has indicated a number of large-scale trends in human subsistence, technology, settlement, and demographics that have been perceived as a response to the Altithermal climate. A major trend with sites from this time period is that they seem to have been open campsites of limited areal extent and short occupational duration. This seems to be reflected in the sparse cultural material found at these sites and may be a result of population reduction and perhaps group fission in response to climatic conditions. Thus, these sites are usually located adjacent to reliable sources of water (Walker 1992). By analysing all dated sites of this time period on the Northern Plains, Walker (1992) concluded that the average number of sites occupied in the 2500 year time span of the Altithermal is low. The average number of sites prior to 6100 BP is lower than the average number of sites after 6100 BP. He concludes that the period immediately before 6500 BP may have been the peak of the Altithermal conditions.

The long-standing theory that subsistence practices shifted to more intensive foraging probably occurred in some areas of the Plains but not in others. In areas where a larger number of bison could be supported, communal bison hunting may have continued during the Altithermal. On the Northern Plains, bison remained the main food reliance, although hunting practices may have changed from large scale communal hunts to smaller scale operations (Walker 1992).

Although archaeologists still have a substantial amount of work ahead of them to determine the exact nature of the Altithermal climatic period and the human responses to this climatic event, there is increasing archaeological evidence to suggest that the concept of a cultural hiatus is untenable. There is a large amount of accumulating data that supports at least sporadic, if not continuous occupation of the Plains throughout the

Altithermal, the majority of these occupations likely being centred around reliable sources of water, such as the Saskatchewan and Missouri rivers. Walker (1992) contends that the hypothesis that the northern, eastern, and western boundaries of the Plains served as refuge areas during the Altithermal may only be accurate for the most severe drought periods. Periodic or even seasonal migrations out onto the short grass plains may have been entirely possible.

The important point to note is that the conditions of the Altithermal were time transgressive, episodic, and unequal in their effect across the Plains. Responses to the changing climate therefore would not be the same across the entire Plains region nor throughout time as conditions would have been extremely variable. While sites dating to this time period are relatively rare in the archaeological record on the Northern Plains, this may not be entirely due to a reduced occupation of the area. Sites of this time period may remain undetected due to the geological forces described above that have either removed or deeply buried the sites. Also, Early Side-Notched projectile points contain similar attributes to later side-notched varieties such as Besant projectile points. The misidentification of these earlier types may also contribute to the perceived absence of these sites across the Plains (Walker 1992).

Leyden (2004) conducted a study using stable hydrogen isotopes found in fossil bison bone recovered from archaeological sites in Saskatchewan, the results of which help to confirm the aforementioned responses to the Altithermal proposed by Hurt (1966) and Walker (1992). The intent of Leyden's study was to reconstruct the dietary preferences of bison relative to a reconstructed climatic context. He then identified foraging behaviour among prehistoric herds from the southern Saskatchewan Plains and discussed the implications of these data for archaeological investigations dating to the mid-Holocene. He found that bison from the Early Middle Holocene sites in southern Saskatchewan do not demonstrate the same foraging behaviours as regionally equivalent populations in the Late Holocene. Bison from the Early Middle Holocene may have failed to discriminate in forage selection during times of moisture stress, while at the same time being subject to temperate drought, these factors indicating that populations would

have faced pressures during the Altithermal that were not previously the case. As a result of this research, Leyden contends that bison attrition rates grow higher during the Altithermal and that herds were forced to migrate toward the periphery of the Plains and other areas of refuge. Human groups would have been equally affected and would have had to respond by increasing conservation, diversifying their resource base, and by relocating in response to the movement of the bison herds (Leyden 2004).

It should also be noted that the bison on the Plains during the early Holocene were larger, extinct forms of bison, *Bison occidentalis* and *Bison antiquus*. Research indicates (McNeil *et al.* 2004) that the two species may have been separated until after the deglaciation of the Wisconsin ice sheets. *B. antiquus* were isolated on the southern side of the ice sheets and *B. occidentalis* on the north side. After deglaciation *B. occidentalis* migrated south. These extinct varieties may not have demonstrated similar behavioural patterns as the modern forms. They may have been more solitary and less gregarious, although archaeological evidence from the early Holocene suggest they may have been stampeded into deep arroyos and sand dunes indicating some similarities (Frison 1991:273-275). By approximately 5000 years ago bison had evolved into the modern form (*Bison bison*) (Frison 1991). This coincides with the end of the Altithermal climatic period (7500-4000 BP).

2.4 Background for Cultural Terminology

The following sections provide a synthesis of some of the available data concerning the cultural trends seen in the archaeological record between 7500-4000 BP. It is intended that this will provide a framework for discussing the significance of the St. Louis site and the Below Forks site. In order to conduct a comparison of these two sites with other sites and other time periods on the Plains it is necessary to select a chronological framework or culture history. Figure 2.1, modelled after that of Walker (1992), outlines the four most recent chronological frameworks that have been devised for the Northern Plains. In general, these culture histories defined for the Northern Plains are based on stratigraphy, projectile point typology, and radiocarbon dating.

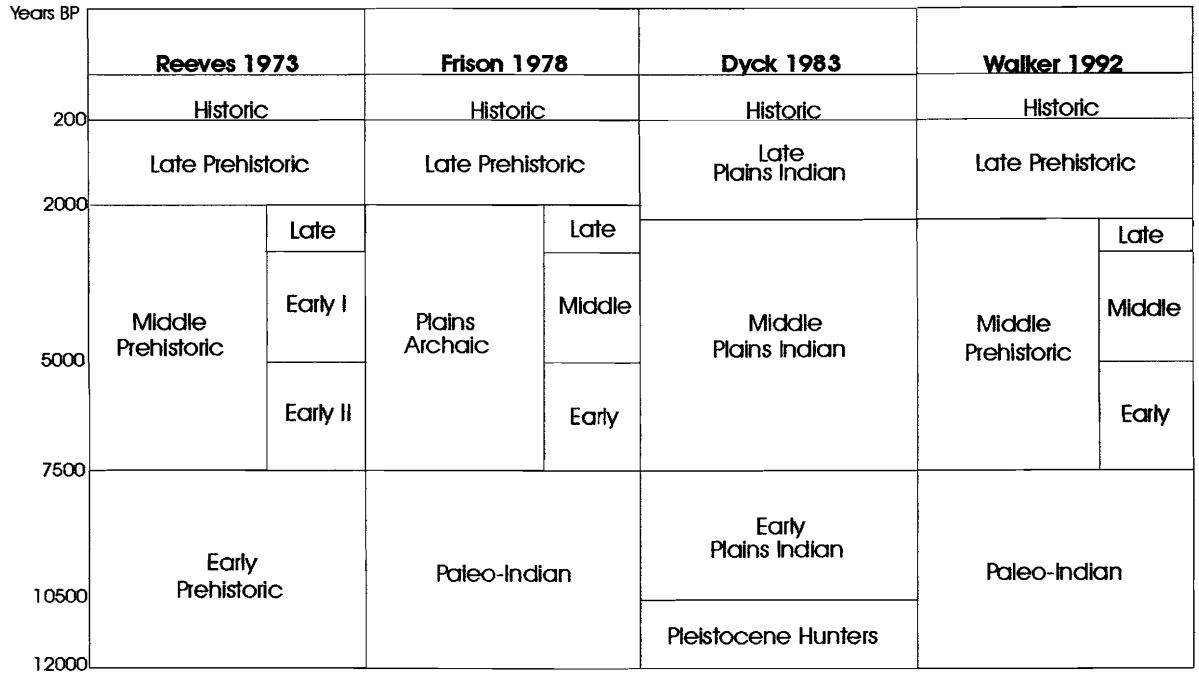

Figure 2.1 Recent cultural chronologies for the Northern Plains (after Walker 1992:120).

Dyck's (1983) framework is not appropriate for this thesis because it does not recognize the finer chronological distinctions in what Dyck terms the Middle Plains Indian period, the period which coincides with the dates of the St. Louis and Below Forks sites. The framework proposed by Reeves can be confusing because of repetitive terms, and that proposed by Frison is well organized yet the term "Plains Archaic" cannot be applied to the larger Northern Plains region. The term archaic is used by Frison to refer to subsistence technology used and adapted for the foothills and mountains of the Bighorn Basin. This thesis will therefore follow the framework defined by Walker (1992) which uses elements of both Frison (1978) and Reeves (1973). This is the framework best suited for this thesis because it was defined for the larger Northern Plains and it is simplistic yet recognizes distinctions within the Middle Prehistoric Period.

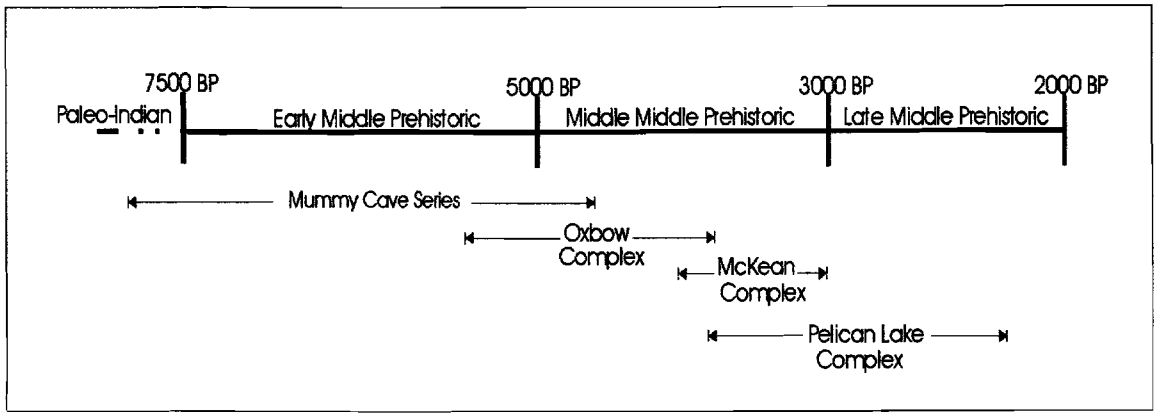

Figure 2.2 Regional culture history organized into Walker's (1992) framework (based on radiocarbon dates from Kasstan 2004, Morlan 2003, and Walker 1992).

Figure 2.2 presents the major cultural units for the Northern Plains organized into Walker's (1992) chronological framework. These units were established by archaeologists as a method of organizing archaeological inventory of similar style and antiquity, such as projectile points. The chronological framework is organized in a similar mannor, however, a change in the framework represents a major technological change. For instance, the transition from the Paleo-Indian Period to the Early Middle Prehistoric Period is based on the fact that the projectile point styles change from the lanceolate paleoindian projectile points to the side-notched projectile points. This change is believed to be the result of a change in weapons technology from a spear to an atlatl propelled dart (Dyck 1983). Likewise the change from the Late Middle Prehistoric Period to the Late Prehistoric Period is marked by the appearance of clay pottery and side-notched arrow points. For the purposes of this thesis only the cultural units (Mummy Cave and Oxbow) which coincide with the radiocarbon dates and projectile point styles of the Below Forks and the St. Louis occupations need to be discussed.

Plains archaeology is without a standardized nomenclature for organizing time periods or material culture. In order to avoid confusion, the nomenclature used in this thesis will follow that of Dyck (1983). Artifacts, sites, and features are generally linked together based on projectile point styles, radiocarbon dates, and stratigraphy. Dyck links these units into more abstract concepts and defines them as a "complex" or "series". The

meaning of these terms are as follows:

> A **complex** is a large composite archaeological unit. It consists of interconnected site features, and artifacts, tied together by similarities infunction, style, technology, and subsistence-settlement-system. The parts of a complex are found within a common segment of time. The change in terms from culture to complex reflects the notion that an archaeological complex is not necessarily equivalent to an ethnological tribe or culture. It may be equivalent, but it may also spread across ethnological groupings (Dyck 1983:69).

> A **series** is a sequence of archaeological components sharing a common geographical space (sometimes within a single site, sometimes within a region), but belonging within separate segments of time. A series is a crude unit of archaeological analysis used for convenience before sites, features, and artifacts are ready for reclassification into complexes . . . (Dyck 1983:69).

In this thesis the Oxbow Complex and Mummy Cave Series are investigated. Mummy Cave is classified as a series because several point styles and cultural components exist within the mid-Holocene that are all referred to as Mummy Cave (Walker 1992). More data need to be collected in the form of excavated sites with well documented stratigraphy, diagnostic artifacts, and radiocarbon dates before further separation of these components into complexes can be made. The remainder of this chapter will focus on defining the Mummy Cave Series and the Oxbow Complex.

2.5 The Early Side-Notched/Mummy Cave Series.

2.5.1 Point Typologies

The question of the origin of the Mummy Caves Series is problematic. Sites and artifacts from the Early Middle Prehistoric Period are poorly known on the Northern Plains. However, the few sites that have been dated to this time period show an abrupt and widespread appearance of side-notched projectile points in terminal Paleo-Indian assemblages and are associated with the beginning of the Early Middle Prehistoric Period. Kasstan (2004) examined the radiocarbon chronology of the culture history for

the Northern Plains based on reports from Morlan (2003), Novecosky (2002), and Wilson and Burns (1999) and determined that the Early Side-Notched/Mummy Cave series has a time span of 7800-4500 rcybp on the Northern Plains.

Like many of the cultural periods defined on the Northern Plains, the Early Side-Notched/Mummy Cave Series is defined and recognized by a general projectile point style which also coincides with a specific range of radiocarbon dates. Projectile points are considered to be the most diagnostic time sensitive artifacts in Plains assemblages until the appearance of pottery. However, because of the relatively small sample size of artifacts dating to this time period a variety of terms have been employed by authors in an attempt to define these point styles and consequently some confusion over the nomenclature exists. Reeves (1973) first proposed the term Mummy Cave *Complex* to refer to all the Northern Plains complexes and complexes defined in the peripheral areas of the Plains that date between the beginning of the Early Side-Notched sequence to the beginning of the Oxbow Complex. Dyck (1983) proposed the term Mummy Cave *Series* recognising that there is a strong possibility that this period may contain more than one complex. Agreeing with Dyck, as discussed above, this thesis will use the term series. Regardless of terminology, Reeves included point styles in the Mummy Cave Complex (or series as referred to here), which are found in the Northwestern Plains and Rocky Mountain regions, known as Bitterroot and Salmon River Side-Notched. Bitterroot is apparently the earlier of the two styles, and is thought to have developed in either Idaho, where it was first discovered, or to have evolved out of related Great Basin types to the south (Swanson and Sneed 1966 cf. Dyck 1983:92).

The term "Mummy Cave" is coined from the Mummy Cave Site located in northwestern Wyoming at the western edge of the Plains. Here a long sequence of side-notched projectile points was uncovered in stratified deposits during the 1960s and the site has remained under intense study since the original excavations (Husted 1995; Husted and Edgar 2002). Other point styles have also been described for this period such as Simonsen Side-Notched, which Reeves (1973:1244) believes was a Central Plains culture that originated in the eastern Plains and ultimately may have given rise to

the Bitterroot Side-Notched point style. Another western point style or complex has been termed the Mount Albion Complex (Benedict and Olson 1978). Sites containing this point style are generally located at the present timberline in western Colorado and have been considered culturally distinct from other cultural complexes of the time (Buchner 1980). However, others see the Mount-Albion Complex as an archaeological continuum (Benedict 1981).

In reviewing the literature it is clear that the projectile point typologies used to define the Mummy Cave Series are not well defined and therefore sorting the artifact assemblages cannot be consistently replicated. In an attempt to designate point types during Gowen 1 site research, A. R. Schroedl used a statistical method to derive an objective point style typology for a series of Early Middle Prehistoric Period assemblages (Walker 1992:132). Based on this statistical analysis, Walker (1992) distinguishes five point types that form a sequence, with overlap, spanning more than 2500 years, as seen in Figure 2.3.

Projectile Point Type	**Approximate Age (years BP)**	**Site or Locality Found (Dyck and Morlan 2002)**
Blackwater Side-Notched	7600-7200	Mummy Cave; Stampede (Alta.)
Northern or Bitterroot Side-Notched	7100	Mummy Cave; Aberta; Montana
Hawken Side-Notched	6400	Hawken; Wyoming; Colorado Plateau
Gowen Side-Notched	5900	Gowen 1; Montana; Alberta; South Central Saskatchewan
Mount Albion Corner-Notched	5700	Hungry Whistler; Colorado Front Range

Figure 2.3 Early Middle Period point typologies (Walker 1992).

The projectile points recovered from the lowest component of the Below Forks site are diagnostic of the Early Side-Notched/Mummy Cave Series, and fit into Walker's (1992) scheme as Gowen Side-Notched forms. This interpretation is also supported by dates of 5500 to 6000 rcybp (Kasstan 2004). Unfortunately, no *in situ* projectile points were recovered from the Early Middle Period components of the St. Louis site so the above classification scheme cannot be employed for this site.

2.5.2 Lifeways

The timespan for the Mummy Cave Series roughly corresponds to the Altithermal climatic interval described at the beginning of this chapter. To briefly reiterate, these climatic conditions may have been influential in settlement patterning and population size of human groups, although further research is necessary to fully test this (Sheehan 1994; 1995, 2002; Meltzer 1999). There is, however, evidence from a number of sites (see Walker 1992: Appendix 1 for a list of these sites) to support this hypothesis. On the Northern Plains there is a general trend for Early Middle Prehistoric sites to be located very close to reliable water sources, particularly on alluvial terraces of river valleys, and for habitation sites to be of limited extent with sparse, single component cultural assemblages.

Technology and typology of lithic artifacts both suggest a sparse population with only a small opportunity for communication and trade. This is evidenced by the highly variable point styles, as discussed in the previous section, and by the fact that the lithic sources for stone artifacts generally come from local sources. Kasstan (2004) reports that the Early Side-Notched cultural groups used 90% local materials and 10% exotic material (statistics taken from Walker 1992). These statistics indicate that trade was reduced from earlier Paleoindian times, but was still occurring only on a smaller scale. At the Norby site (Zurburg 1991), located on the Saskatoon Terrace in Saskatoon, Saskatchewan, Swan River chert (local) is the predominant lithic source, followed by Knife River Flint (exotic) and quartzite (local). The Gowen sites (Walker 1992), also located on the Saskatoon Terrace, exhibit a heavy reliance on quartzite cobbles (local) and split chert pebbles from an unknown source. The pebbles here involve a bipolar technology used across the Northern Plains to make scrapers and wedges. In the lowest occupation at the Below Forks site Swan River Chert (local) comprises 95% of the raw material used at the site. These are examples of the heavy reliance on local lithic sources seen in sites in Saskatchewan, possibly indicating an economy that relied very little on trade.

Bone artifacts are relatively rare during the Early Middle Period and will be

discussed in further chapters, however, a summary of the most interesting bone artifacts from this time period is warranted here. The Gowen sites seem to offer the widest variety of bone artifacts including awls, flaking tools, flaked bone knives, a bone tube, a possible netting hook, and a paint applicater (Walker 1992). The Stampede site (Gryba 1976) in southeastern Alberta has yielded a bone needle and a possible antler flaking tool was found at Boss Hill (Doll 1982) in central Alberta.

A key element in the interpretation of subsistence practices of the Early Side-Notched/Mummy Cave Series cultures is the perceived hypothesis of an intensification of resource utilization including an increased reliance on plants and small vertebrates in some parts of the Plains, and an all-around maximization in recovery of proteins and fats from animal resources (Frison 1991:84; Walker 1992:144). Attempts have been made in Saskatchewan to identify plant material and micro-vertebrates in sites of this antiquity using methods of flotation and water screening (Corbeil 1995; Ramsey 1993;Webster 1998). While a heavy reliance on plants and small vertebrates was prevalent in some parts of the Plains, notably the western montane and eastern regions, there is little evidence for this reliance in the Northern Plains. A lack of preservation of these remains on the Northern Plains may be the reason for there absence, however. All Early Side-Notched/Mummy Cave Series assemblages here are dominated by bison. Conditions in the Northern Plains during the Altithermal were not likely dessicated to an extent in which larger bison herds could not be supported. Bison hunting therefore remained the mainstay, whether in communal situations or smaller scale operations (Walker 1992). Reeves (1973) argues for a continuum of communal bison hunting throughout the Altithermal period arguing that there was no need for a major shift in procurement strategy. He bases this argument on a Mummy Cave Series component at the base of Head-Smashed-In Buffalo Jump, presuming that Mummy Cave peoples used the jump in the same manner as it was used in later periods. This site is the only example of a possible Early Middle Period bison jump on the Canadian Plains. The Hawken site in northeastern Wyoming is a large-scale arroyo bison trap. This site being a special case as it is the only large scale kill site in that area of the Plains during this time period. Frison

notes that the Black Hills may have served as an oasis supporting large herds of bison while the rest of the surrounding plains were dessicated. Other sites from this time period such as Gowen 1 and 2, the Norby site, Oxbow Dam (Nero and McCorquodale 1958; Green 1998), Long Creek (Wettlaufer and Mayer-Oakes 1960), the St. Louis site, and the Below Forks site have low numbers of bison. However, bison is still the major food resource at these sites and this suggests that bison hunting, although still continuous, may have involved the procurement of small groups of animals perhaps at the river's edge, floodplain margins, or at oxbow lakes (Walker 1992:130). Studies on the faunal remains from the Mona Lisa site (Wilson 1983:367), both of the Gowen sites, and the Norby site indicate that the bison are somewhat larger than modern forms. These findings suggest that *Bison occidentalis* may have been present.

A variety of other animals were also occasionally exploited during the Early Middle Prehistoric Period such wapiti (elk), deer, and small mammals. A detailed discussion of the site specific subsistence strategies will be provided in chapter seven, however, it is noteworthy that canid bones are commonly found in sites of this time period. The Gowen sites assemblages had a large number of canid bones which Walker classifies as dog or wolf/dog hybrids (*Canis familiaris*). The Oxbow Dam site, the St. Louis site, and the Below Forks site also have possible *Canis familiaris* in their assemblages.

Bone grease production is a very important innovation that can be traced back to the Mummy Cave Series. Bone grease was important for the preparation of pemmican. It was the grease from bone marrow that was mixed with the powdered meat to provide a staple food source during the winter when starvation was a risk. Walker (1992) clearly reveals that all the diagnostic traits of bone grease production at both of the Gowen sites. These traits include fragments of articular surfaces of limb bones in association with large quantities of fire broken rock, hearths, boiling pits, and bone spill piles. The extraction of bone grease was a seasonal activity usually performed in the fall when water could be boiled with heated rocks outside (Dyck and Morlan 2001:118). There is also evidence in the Mummy Cave component at the Stampede site for bone grease

production (Gryba 1976 cf. Dyck and Morlan 2001:118).

Burial practices are often the only glimpse archaeologists have into the spiritual or ceremonial aspects of past cultures. Little is known of this aspect of the Mummy Cave Series as few burials dating to this time period have been reported for the Northern Plains. Whitemouth Falls Feature 10-76 is a Mummy Cave burial site located in southeastern Manitoba (Buchner 1980). In this case the individual was identified as a female. The bones were covered with red ochre and a clamshell dish filled with ochre was placed near her head. The skullcap of a bison had been placed over the lower leg region. The Stoney Beach burial (Walker 2002) is a Mummy Cave burial located in southern Saskatchewan. Here the remains of a female and an infant were interred in ochre stained soil. The Gray site is a large burial site in southwest Saskatchewan that has largely been associated with the later Oxbow Complex. However, two burial units contain large side-notched points and the earliest radiocarbon dates for the site extend into the temporal period for the Mummy Cave Series (Morlan 1993; Millar 1981c).

2.5.3 Terminal Mummy Cave Series and the Emergence of the Oxbow Complex

Reeves (1973) first noted that similarities existed between Mummy Cave Series assemblages and early Oxbow assemblages. He noted an association of Oxbow projectile points with Bitterroot and Salmon River Side-Notched points in sites located in the Rocky Mountains, and he also noted this association at the Oxbow Dam site is southeastern Saskatchewan, the type site for the Oxbow Complex. Similarly, Walker (1992) has proposed that the Oxbow Complex likely emerged from an Altithermal aged Mummy Cave Series group, such as Gowen. He suggests that this was an *in situ* development that likely occurred within the Saskatchewan Basin. He based this proposal on the fact that the Saskatchewan Basin has an exceedingly long continuation of the Oxbow Complex, with dates from Gowen 2 (6000 BP) being the oldest for any Oxbow materials in the region. Also, sites in the immediate Saskatoon area, the Red Tail (Ramsay 1993) and Amisk (Amundson 1986) sites, have produced radiocarbon dates ranging from 5300-4900 years BP (see Appendix III for a list of radiocarbon dates used

in this thesis). These dates were obtained from components believed to Oxbow, the Amisk site Oxbow component underlies three superimposed Oxbow layers and the Red Tail site Oxbow component underlies a large series of McKean components, however, no diagnostics have been recovered from either of these components. Later Oxbow sites in the area such as the Moon Lake site (Dyck 1970) and the Harder site (Dyck 1977; Morlan 1994) have identical lithic technologies and subsistence patterns as is seen at the earlier Gowen sites, suggesting a continuence from Gowen directly to Oxbow (Walker 1992).

Like the Mummy Cave Series, the Oxbow Complex assemblages include ridged and flat topped end scrapers, flake perforators and gravers, spokeshaves, wedges, hammerstones, anvils, and basally concave projectile points. Bipolar split technology continues, particularly for the production of scrapers and wedges. Like the Mummy Cave Series most of the lithic materials used to make stone tools come from local resources. Kasstan (2004) reports the Oxbow Complex on the Northern Plains used >95% local lithic resources and only a trace amount of exotic materials are found in Oxbow sites.

2.6 The Oxbow Complex

2.6.1 Initial Research

The Oxbow Dam site, located in southeastern Saskatchewan, was excavated by Nero and McCorquodale in 1956. This became the type site for the Oxbow Complex. Later research at other Oxbow sites, however, indicated that the Oxbow Dam site may in fact represent a more complex picture of Middle Period occupation. The artifacts recovered from the original excavations are atypical of Oxbow artifacts recovered from other sites, and the original radiocarbon date of 5200 ± 130 rcybp was outside the temporal range for the Oxbow Complex. The problem attributing to these issues is one of cultural mixing. Later research indicated that the Oxbow Dam site actually may represent a transitional period between the Mummy Cave Series and the Oxbow Complex or that it may not even be Oxbow at all. This problem resulted in further excavations

during 1995-1998 by Green (1998) and a reanalysis of the site. Green's excavations resulted in a new radiocarbon date of 4277 rcybp which is a typical date for the Oxbow Complex as reported from other sites. The new data indicate that this site is likely a later expression of the Oxbow Complex (Green 1998). This new interpretation provided by Green has been extremely important in reinterpreting a site that for so long has been used to suggest a Mummy Cave-Oxbow transition. While continuity does exist between the Mummy Cave Series and the Oxbow Complex it is important that the evidence to back this theory up is strong, and the original research did not provide this.

The Long Creek site (Wettlaufer and Mayer-Oakes 1960), also located in southeastern Saskatchewan, was excavated a year after the original excavations at the Oxbow Dam site. Here, in layers seven and eight, the excavators recognized similarities in the point styles and radiocarbon dates with the point styles and radiocarbon dates from the Oxbow Dam site. These excavations at Long Creek resulted in the formal definition of the Oxbow "Culture". However, many archaeologists do not consider the artifacts from layer eight to be typical of the Oxbow Complex (Green 1998; Meyer 1981; Reeves 1973). Reeves (1973) considers these points to be similar to the Bitterroot or Salmon River Side-Notched point of the Mummy Cave Series.

In 1965, Wormington and Forbis compiled a synopsis of archaeological sites in the prairie provinces and adjacent states. Here they chose to broaden the concept of the Oxbow "Culture" into the Oxbow "Complex". This term was used to imply that a number of cultural groups could have been using the same lithic technologies and subsistence patterns at the same time within a given region (Dyck 1983:69). In this study they described the Oxbow point as having excessive thickness, side-notches, and deeply incised bases which produced the characteristic eared effect. The Oxbow Complex is generally defined by one point style, although variation within this style can occur, unlike the Mummy Cave Series that is defined by a wider range of point styles.

2.6.2 Oxbow Hunting Strategies

Although bison are the most predominant species found in Oxbow Complex

assemblages, no Oxbow bison kill site has been reported to date (Millar 1981b:84; Dyck 1977:10, 1983:96; Amundson 1986:28; Morlan 1994:758). This may be due to a sampling bias or possibly Oxbow Complex groups utilized a hunting strategy similar to that of the Mummy Cave Series groups in that they took smaller numbers of bison as opposed to mass kills. It is possible that this adaptive strategy which involved small-scale, opportunistic kills as opposed to large-scale mass bison kills, was instrumental in the success of the Oxbow Complex. This selective hunting was likely extremely important for earlier Mummy Cave Series groups in order to survive during the Altithermal period. Since it is likely that the Oxbow Complex emerged from the Mummy Cave Series perhaps they continued using this procurement strategy. Paleoenvironmental evidence (Lemmen and Vance 1999) indicates that the extreme Altithermal conditions were subsiding by the time Oxbow Complex began to flourish. This form of subsistence may have been beneficial to both bison and human groups over the long term (Green 1998).

Other animals were utilized as food resources during the Oxbow Complex, and have been viewed by archaeologist in the past as evidence of starvation responses. However, Green (1998) believes that this perception is likely due to archaeologists' reliance on ethnographic information where during historic times Plains groups were feeling the extirpation of the bison and therefore reliance on other food sources may have been viewed as a starvation response by explorers and fur traders. There is little evidence to suggest that this was the case during Oxbow times when the bison hunting strategies appear to have been successful. Perhaps the bison hunting strategies were successful enough to allow exploitation of other animals at will. In summary, it appears that bison hunting practices developed by Mummy Cave series groups in response to the Altithermal were simply carried over into later Oxbow times.

2.6.3 The Use of Domestic Dogs

It seems that in many Oxbow assemblages (Harder, Oxbow Dam, Long Creek, St.

Louis) canid remains are second in number only to bison. Although a variety of canid species have been reported in these sites - wolf, coyote, fox, and dog - the remains of dogs are of considerable interest. The presence of dogs in many Oxbow sites reflects a strong and close association of Oxbow people and their dogs. The presence of canid remains in Oxbow sites was first recorded by Nero and McCorquodale (1958) at the Oxbow Dam site. Here they noted that distinguishing between a medium sized wolf and a domestic dog was virtually impossible with the postcranial remains they uncovered, and therefore referred to these canid remains as medium sized wolf (?). McCorquodale later assigned the canid remains at Long Creek to *Canis familiaris* based on osteometric analysis (Green 1998). Dog remains recovered from the Gray site appear to have been purposely smeared with red ochre and interred with human remains. Analysis of these canid remains by Dr. Howard Savage, at the University of Toronto, convinced him that certain modifications of the bones, specifically the linea aspera and the vertebrae, indicate the use of these dogs in pulling heavy loads, perhaps a travois as was seen in historic times. The burial of dog remains with human remains, and the fact that these animals were trained as pack animals, implies a close human-dog relationship during Oxbow times (Forbis 1993). At the opposite end of the spectrum, burned and butchered dog remains identified in the reanalysis of the Oxbow Dam site (Green 1998) materials reveal that these canids were also used as food.

2.6.4 Communication, Trade, and Ceremonialism

The Oxbow Complex reveals the first evidence of long distance trade in nonlithic materials. These materials include copper, from the Great Lakes region, and beads made of marine shells from the Atlantic coast. Of considerable interest, is the apparent association of the Oxbow Complex with prehistoric copper artifacts. Although these copper artifacts are not numerous in Saskatchewan, they are significant in signalling that there was some kind of interaction or trade between people in Saskatchewan and people in the east, in Manitoba and especially Lake Superior where these artifacts are more common (Dyck 1980)

The notion that the Oxbow Complex was rich in ceremonialism is in large part due to the discovery of the Gray site, an Oxbow burial ground located in southwestern Saskatchewan. Excavations covering 60 percent of this site revealed 99 burial units and 304 individuals. Radiocarbon dates indicate that this site was used as a burial ground for approximately 2200 years ranging from 6400 to 3700 years BP (Millar 1981a; Morlan 1993) (see Appendix III for radiocarbon dates).

Bones recovered at the Gray site indicated variable weathering and decomposition, which likely resulted from differential exposure to the elements prior to final burial. Based on historical observations in dealing with the practicalities of a nomadic lifestyle, moving a deceased person any distance was made easier by temporary exposure and defleshing. Transportation was then made easier by wrapping the remaining bones in a hide bundle. At the Gray site ochre was found in a number of burial units. It was mixed with pit fill in the secondary burials and rubbed on long bones and crania in several instances. Other segments of bone were blackened with smoke smudge (Millar 1981a).

A variety of artifacts were associated with the internments at the Gray site. Lithic artifacts included large, notched spear points or bifaces, Oxbow points that varied from typical to atypical forms, scrapers, and worked flakes. There were a variety of bone tools, and also items that represented long distance trade such as shell gorget pendants and the aforementioned copper beads and rolled copper artifacts. Eagle phalanges and talons were found in five burial units and represent items of personal adornment. Canid remains were found in a number of burial units and in one instance a complete canid skeleton was found in a heavy ochre stained substrate and may have even been bundled reaffirming the apparent bond between humans and dogs during the Oxbow Complex. Other faunal remains recovered from the site included bison, antelope, deer, duck, skunk, jackrabbit and a variety of other small mammals and birds (Millar 1981a).

The Greenwater Lake Burial (FcMv-1) (Walker 1981), near Porcupine Plain, is another single burial attributed to the Oxbow Complex based on radiocarbon dates (4515 ± 121 S-1447) and the recovery of an Oxbow projectile point. This burial is important

because it represents a single primary extended interment of a male in his early twenties. This is the only other burial that can be positively attributed to the Oxbow Complex. The St. Brieux site burial is another single primary burial and radiocarbon dates (5110 ± 91 S-520) place this site within the Oxbow Complex. However, no diagnostic artifacts were recovered and therefore exact cultural provenience is unknown (Walker 1981).

2.6.5 Settlement Patterns

Like many of the Early Side-Notched/Mummy Cave Series sites, a large number of Oxbow sites have also been found next to stable sources of water. Some examples of such sites are the Oxbow Dam site (Nero and McCorquodale 1956; Green 1998), the Long Creek site (Wettlaufer and Mayer-Oakes 1960; Bryant 2002), the Amisk site (Amundson 1986), the Red Tail site (Ramsey 1993), the Dog Child site (Walker personal communication 2005), the Thundercloud site (Webster 1998), the St. Louis site (Amundson *et al.* 2005), and the Below Forks site (Meyer 2003), all located in Saskatchewan, and the Sun River site in Montana (Greiser *et al.* 1985:849). However, the large number of Oxbow projectile points recovered from surface scatters outside of the river valleys on the Plains contributes to evidence indicating that human populations were also utilizing the landscape outside the so called "refugium" areas (Meyer personal communication 2005).

Oxbow Complex sites have also been discovered in the forested areas north of the Plains and Parklands. Several theories have been offered as to the nature of these sites. Buchner (1981) offered a hypothesis which he termed the "anomalous winter hypothesis". This hypothesis is based on the concept of bison occupying the grasslands during the spring, summer, and fall and then moving into the more sheltered parklands for the winter. Buchner (1981) proposes that human groups would have moved ahead of the herds into the parklands in order to hunt bison throughout the winter. However, because of an increase in the severity of winters, due to the climate change out of the Atlantic (Altithermal) into the Sub-Boreal Climatic Episode, bison herd migration may have been disrupted and the herds may not have even arrived in the parklands. Therefore, the

response of the Oxbow people would have either been to starve or to move deeper into the Boreal Forest to find other game such as moose and caribou. This hypothesis then suggests that the Oxbow sites located in the forested areas are younger than those to the south because the Sub-Boreal Climate would have produced more severe winters as time moved on (Buchner 1981). Spurling and Ball (1981) conducted a statistical study on location and radiocarbon dates of Oxbow sites and came up with similar results, suggesting that the sites on the southern grasslands were older than those in the north. Green (1998) notes several problems with the study by Spurling and Ball and it is apparent that a reanalysis of Oxbow radiocarbon dates is required to shed further light on these problems.

Recent studies have taken opposing views to the "anomalous winter hypothesis". A study conducted by Malainey and Sheriff (1996) suggest that bison herds did not winter in the parklands as has been for so long believed. They suggest that bison would have stayed on the grasslands as these areas provide the best conditions for grazing animals. They base this idea on the fact that precipitation levels are higher in the parkland and groves of trees break up the wind allowing more snow to accumulate. This would require too much energy for a grazing animal to nuzzle or paw through the snow to reach the forage. The open grasslands receive less precipitation and in the areas near the foothills frequent Chinooks would have decreased snow levels allowing easier access to forage. They also note that the only areas suitable for winter grazing of modern cattle are in the southern parts of the prairie provinces. Malainey and Sheriff (1996) also observe that predicted movement of bison cannot be found in historic fur traders records. Observations in these records indicated that it was rare for bison to reach the parkland forts during the winter, and the majority of the herds were instead found out on the open plains. They suggest that the parkland/forest adapted peoples would have been enticed out of these areas and onto the plains by the bison, not the other way around as was suggested by Buchner (1981). To back this up Malainey and Sherriff note the archaeological record and the number of winter sites that are found on the grassland/parkland boundary, particularly in the Saskatoon area (Malainey and Sheriff

1996:352). It should be noted here that this study was not a focus on the Middle Prehistoric Period in particular, but was a generalization for all periods with similar climatic conditions as seen in historic times. Due to the fact that the Oxbow Complex existed in a time when conditions were returning to those of present day this study has some merit in being applied to that time period.

Dyck (1983:100) noted that Oxbow sites found in the Parkland and Boreal Forest may not need to be explained by the "anomalous winter hypothesis", but maybe that Oxbow people had occupied these northern sites before the vegetation in the area reverted to forest. He suggests that perhaps when the vegetation did return to forest Oxbow people were so familiar with the landscape they remained in these areas they previously inhabited. One problem with all of these hypotheses is that radiocarbon samples are rare in the forest because the acidity of the soils destroys bone and wood. Much research is still needed in these areas to determine the exact nature of these northern Oxbow sites.

2.6.6 Terminal Oxbow Complex and the Emergence of the McKean Complex

As mentioned above there are several problems with the radiocarbon dates from many of the northern Oxbow sites. However, in spite of these problems it seems that many of the late Oxbow dates come from sites on the periphery of the Plains (see Green 1998 for a complete list of radiocarbon dates) indicating an Oxbow population decline on the grasslands. Could the Oxbow populations have been slowly pushed northwards for reasons other than following the movements of bison herds? Gibson (1981) and Reeves (1978 cf. Vickers 1986) suggest that the movement may have been due to population pressure from the south. In a recent study, Webster (2004) notes that there is a 500 year overlap in acceptable radiocarbon dates for the Oxbow Complex (5500-3860 rcybp) (Morlan 1993) and the McKean Series (4410-3150 rcybp) (Morlan 1993). Therefore, evidence for cohabitation should be evident at some sites. This, however, is not the case and it appears that there is always a period of sediment accumulation between Oxbow and McKean occupations in archaeological sites. This then does not support a theory

that McKean gradually developed out of the Oxbow Complex. Webster concludes, based on current radiocarbon evidence and site distribution data, that the homeland for McKean is likely in the mountains surrounding the Yellowstone drainage or in the Bighorn Basin. The spread out of the homeland is likely related to the development of post-altithermal climatic conditions, but may also be the result of an increase in population pressure in the homeland area that forced people to spread north. It is yet unclear, however, whether the people associated with the Oxbow Complex felt the pressures of this new group and as a response moved north or if a population decline was already underway on the Canadian Plains and the remaining Oxbow Complex people had moved north for other unknown reasons (Webster 2004:101-105). A great deal more research is required to solve these problems.

2.7 Conclusions

The intent of this chapter was to set out the environmental and cultural framework in which to discuss the results of the faunal analysis of the St. Louis site and the Below Forks site. In summary, the Mummy Cave Series occurred at the height of the warmer Altithermal climatic period which may have been the driving force behind the fact that the majority of the sites from this period are located along major waterways and peripheral areas of the Plains. Bison hunting was the main subsistence strategy, although it may have operated on a smaller scale. Long distance trade may have also been diminished from earlier times during this time period as may be reflected in the use of mainly local lithic material.

The Oxbow Complex may have emerged from Mummy Cave Series groups as similar subsistence practices are observed, such as small scale bison hunting and the reliance on secondary sources. There is also a clear technological continuity. The climate during this time period may have been cooler and wetter than the conditions of the Altithermal, although the majority of Oxbow Complex sites are still located in the waterways and peripheral areas. Bison hunting was still the main subsistence practice, although no kill sites have been located at present.

The St. Louis site and the Below Forks site are sites having both Mummy Cave Series and Oxbow Complex components, both are located along major waterways, and both fit well within the theoretical framework concerning subsistence practices presented in this chapter. The remainder of this thesis will focus on discussing these sites and how they compare to other sites of these time periods.

Chapter Three

Physiography, Stratigraphy, and Radiocarbon Dates

Biophysical Resources

3.1. The St. Louis Site (FfNk-7)

3.1.1 Geography and Soils

The St. Louis site is located within the South Saskatchewan River Valley, approximately 1.6 kilometres east of the town of St. Louis, Saskatchewan in the SW of 1-46A-27-W2M. The site can be classified into two different ecological regions depending upon which of the two main models is followed. The first model, defined by Harris *et al.* (1983), places the site within the Parkland Ecoregion. This ecological region is characterized by a mosaic of grassland and forest vegetation forming a transition between Southern Boreal Forest and the Grassland Ecoregions. It is divided into two ecodistricts, the Aspen Grove and the Aspen-Bur Oak. The St. Louis site is located in the Aspen Grove Ecodistrict (see Figure 3.1 for boundary delineation). This is the model that is followed by the SCAPE project and subsequently will be used in this thesis, however, some references will be made to the second model when greater detail is needed in describing the physiography. The second model, frequently used in the published literature, was defined by Acton *et al.* (1998), and places the site within the Boreal Transition Ecozone. This model is also used by the *Atlas of Saskatchewan* (Fung 1999). This ecozone is defined similarly to the first model as a transitional zone between the boreal forest to the north and the grasslands to the south and extends both the southern and northern ecozone boundaries farther north than the first model does.

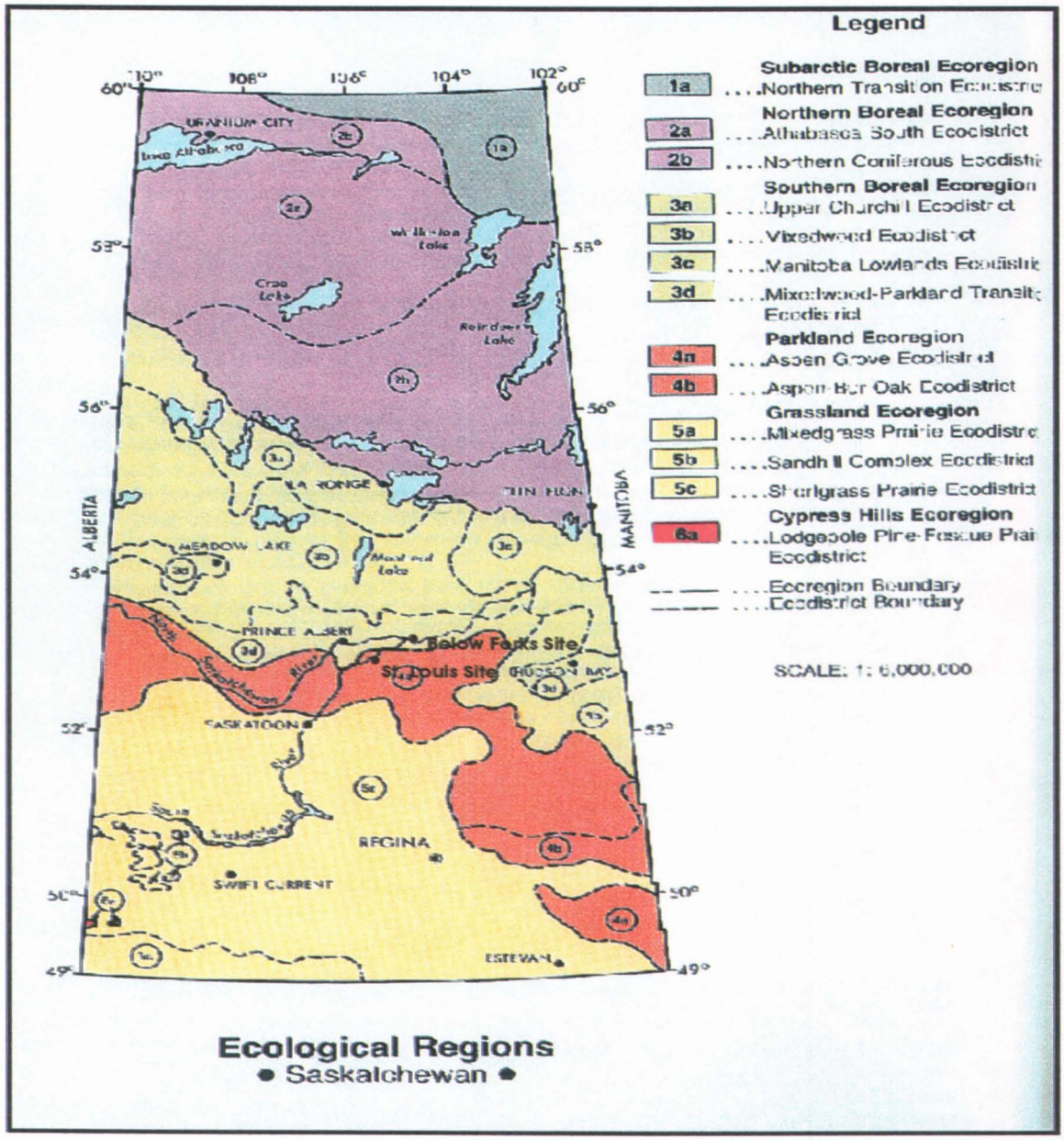

Figure 3.1 Ecological Regions of Saskatchewan (taken from Harris *et al.* (1983), additions made by the author).

Following Harris guidelines, the physiography of the Aspen Grove Ecodistrict can be described as a gently undulating to rolling morainic upland, including glaciofluvial, glacial lacustrine, and aeolian plains. Acton *et al.* (1998) defined the area surrounding the site as the Prince Albert Plain. This is a hummocky glaciolacustrine plain that slopes in

a north to east direction with elevations ranging from 520 metres above sea level (mASL) to 410 mASL. The topography mirrors the underlying bedrock that consists of silt and clay shales of late cretaceous age. Overlying this bedrock is approximately 100 metres of glacial deposits. The landscape between the Saskatchewan rivers is sloping, while the eastern part of the Prince Albert Plain is gently undulating.

The river valley landscape, where the site is located, can be described as an alluvial wetland, characterized by low local relief and frequent flooding. The soil in the valley is of variable texture, and has poorly drained subsoils, however, the soils are not excessively saline.

The landscape of the upland plains, out of the river valley that surrounds the site, is described as lacustrine. These are nearly level sand/silt deposits with infrequent shallow depressions or sloughs (Acton 1980). The soils in this area are Black Chernozemic, indicative of soils forming under grasses and forbs, that overlay glacial lake clay. Surface textures range from medium to heavy and are comprised of silty loam. The Chernozemic soils in the St. Louis area are classified as a mixture of Blaine Lake and Melfort soils (Mitchell *et al.* 1962).

3.1.2 Climate

The modern climate of both sites is classified, using Köppen's climate classification scheme, as *Dfb*. This is the humid continental zone, characterized by long, cold, humid winters and rather warm summers (Fung 1999:96). Prince Albert is the closest centre to both sites where weather monitoring occurs, and so will be the location from where the climate data are gathered. The temperature range is 37.4 °C throughout the year, with January being the coldest month having a mean temperature of -18.2 °C and July being the warmest month having a mean temperature of 19.2 °C (Fung 1999). The average annual amount of precipitation is 40.6 cm with 29% of that attributed to snow fall. From 1961 to 1990 the mean number of frost free days was 149. The mean percent of daylight hours having bright sunshine is 46.2%. The average wind speeds range from 12 to 16 km/h and mainly blow from the northwest, except during early spring when they

blow, on average, out of the southeast. Wind speeds are the strongest from May to September and calm winds are prevalent in the fall and winter months. The highest recorded wind speed in the province, between 1961 and 1993, was recorded in Prince Albert on August 19, 1984 at 163 km/h (Fung 1999:115). This shows how widely wind speeds can range throughout the year.

3.1.3 Hydrology

The St. Louis site lies in the South Saskatchewan drainage basin, a drainage area that surrounds the South Saskatchewan River through its length in Saskatchewan. There are relatively few lakes in this basin, but the area does possess a number of small ponds or sloughs. Some of the local runoff of precipitation and snow melt will accumulate in these ponds and sloughs, but 90% of the precipitation will be returned to the atmosphere through evaporation or transpiration. The external surface drainage flows into the Carrot River or into the South Saskatchewan River via Red Deer, McFarlane, and Peonan Creeks (these latter drainages do not flow into the Carrot River) (Acton *et al.* 1998).

The closest source of water to the site today is the South Saskatchewan River located approximately 300 metres north. The site is situated on an abandoned river terrace, the active terrace being the next terrace north, beside the river. However, during the time of site occupation the terrace that the site is located on would have been active and next to the river. Flooding of this terrace would have been a rare occurrence during this time. Much of the water in the South Saskatchewan originates from melting ice, snow, and rainfall on the slopes of the eastern Rocky Mountains and the Alberta Foothills. Before the construction of the Gardiner Dam, the South Saskatchewan River was subject to more frequent flooding than is seen today. This occurred when there was excessive water runoff in the source areas, mainly during the spring. Ice jams would have also caused river flooding.

Also today, there is a small, dry channel next to the site running between the active and abandoned terraces from west to east. This channel is fed from the river when water volumes are high. Local observers reported that they had not seen water in the

channel since the construction of the Gardiner Dam. This channel would not have been present during the time of site occupation as it was created after the terrace was abandoned (Amundson personal communication 2004).

The cultural levels of the site are located well above the current water table and no groundwater was encountered while excavating. However, a back-hoe excavated a two to four metre deep pit in the bottom of the channel bed that tapped into a groundwater source. The ground water that seeped out and filled this pit was used for water screening during the excavations.

3.1.4 Flora

The Aspen Grove Ecodistrict can be characterized as a grassland-woodland mosaic. This represents a transitional area between the boreal forest to the north and the grasslands to the south, in that it holds characteristics of both areas. This district was named after the pattern of native vegetation seen in the area, where aspen groves occur on moister sites, such as north facing slopes or depressions. The St. Louis site sits at the northern boundary of this vegetation zone where there is more continuous aspen cover than is seen at the south boundary.

Agriculture is the main land use, with 80% of the land in the Prince Albert Plain having been cultivated (Acton *et al.* 1998). There have been significant changes to the vegetation in this area since the arrival of European settlers. Historical records from the nineteenth century show that many areas had less tree cover than they do now. Frequent fires kept aspen groves smaller and shorter, and kept the aspen from encroaching onto the mixed grass prairie to the south (Fung 1999). The frequency of fire events is apparent at the St. Louis site as most levels contain thin layers of charcoal and stained soil. The construction of the Gardiner Dam, and the resulting infrequency of flooding events, may have also affected the native floral communities in the South Saskatchewan River Valley where the site is located. Ice rafting in the winter and spring would have prevented aspen grove communities from becoming established on the active terrace. Willows would have been the predominant species in this area before dam construction (Amundson personal

communication 2004).

The area's upland has mainly been cultivated. However, before European settlement and the advent of agriculture these areas would have been grassland patches interspersed with aspen groves. The majority of grasslands in the Parkland are classified as fescue prairie dominated by plains rough fescue (*Festuca hallii).* Other subordinate species would have included western porcupine grass (*Stipa curtiseta*), June grass (*Koeleria macrantha*), and sedges (*Carex sp.*). A variety of forbs would have also been present in the fescue prairie including northern bedstraw (*Galium boreale*) and three flowered avens (*Geum triforum*).

The site is situated on a north facing slope within the South Saskatchewan River valley. The present river valley vegetation consists of riparian woods dominated by trembling aspen (*Populus tremuloides),* but also containing eastern hardwoods such as green ash (*Fraxinus pennsylvanica)*, Manitoba maple (*Acer negundo*), American elm (*Ulmus americana)*, and plains cottonwood (*Populus deltoides* var. *occidentalis).* The ground vegetation under the tree canopy consists of beaked hazelnut (*Corylus cornuta*), which was apparent from the hundreds of hazelnut shells that had been cracked open by fire found under the ground surface, sarsaparilla (*Aralia nudicaulis)*, snowberry (*Symphericarpos albus*), rose species (*Rosa sp.*), saskatoon (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana* var *melanocarpa*) and a variety of herbs.

3.1.5 Fauna

The Parkland Ecological Region is an area with ecological diversity that is reflected by the variety of wildlife. The arrival of European settlers and the subsequent ecological changes have resulted in the extirpation of some species and the recent immigration of others.

Mammalian Fauna

There are a wide variety of mammals that inhabit the Boreal Transition Ecozone. Large mammals were most affected by the arrival of European settlers. The most

noticeable species to have been extirpated would be the bison (*Bison bison*). Other large mammals that were extirpated at this time were the grizzly bear (*Ursus arctos*), the gray wolf (*Canis lupus*), and the wolverine (*Gulo gulo*). Species such as the Norway rat and the house mouse were introduced to the area by European Settlers, along with several species of domesticated animals.

Bison were the dominant herbivores in the area during precontact times, and also the main food source for people during this time. Other large herbivores still present in the area include white-tailed deer (*Odocoileus virginianus)*, mule deer (*Odocoileus hermionus*), and moose (*Alces alces*). White-tailed deer tend to inhabit more wooded areas along the South Saskatchewan River valley.

Many carnivores are present in the ecozone, the largest being the coyote (*Canus latrans*), and the mountain lion (*Felis concolor*). Smaller carnivores still present include the red fox (*Vulpes vulpes*), badger (*Taxidea taxus*), river otter (*Lutra canadensis*), striped skunk (*Mephitis mephitis*), and a variety of weasels (*Mustela sp.*).

Two leporid species, the snowshoe hare (*Lepus americanus*) and the white-tailed jackrabbit (*Lepus townsendii)*, and a large number of rodents are present in the area. The beaver (*Castor canadensis*), porcupine (*Erethizon dorsatum*), and muskrat (*Ondatra zibethicus*) are the largest of the rodents found. Smaller rodents include seven species from the family Sciuridae including the woodchuck (*Marmota monax*), Richardson's ground squirrel (*Spermophilus richardsonii*), and the red squirrel (*Tamiasciurus hudsonicus*). The northern pocket gopher (*Thomomys talpoides*) is present as well. There are several microrodents present in the *Cricetidae* family and the *Zapododae* family. There are five shrew species (family *Soricidae*) present in the area along with five bat species (family *Vespertillionidae*).

Avian Fauna

Because the parklands contain both grassland and forest environments, a rich diversity of avian fauna exists. Birds are abundant on the northern boundary, closest to the forest edge. Song birds such as the western meadow lark (*Sturnella neglecta*) and a

variety of sparrows are prevalent in both areas, while predatory birds such as the red-tailed hawk (*Buteo jamaicensis*) and the Swainson's hawk (*Buteo swainsoni*) nest in the woodlands and hunt over the grasslands. A variety of other predatory birds, such as owls, also exist in the area, nesting in the dense woodlands. The forest floor is home to a variety of game birds such as the Ruffed Grouse (*Bonasa umbellus*). During the spring and late autumn migrations great flocks of warblers and various sparrow species invade the area. At one time Canada Geese (*Branta canadensis*), Sandhill Cranes (*Grus canadensis tabida*) and the Whooping Crane (*Grus americana*) nested around larger sloughs, but these birds are now found north of the parkland. There are also a variety of ducks and shore birds present near more permanent sloughs and rivers (Bird 1961). Turkey Vultures were observed circling the site during the first season of excavations. These scavenger birds breed near St. Louis. Woodpeckers (*Dendrocopos* sp) are year round inhabitants of dense aspen woodlands and were observed on tree trunks at various times during the excavations.

Amphibians and Reptiles

A moderate to rich population of amphibians occurs in this ecological region including the tiger salamander (*Ambystoma tigrinum*), the Canadian toad (*Bufo hemiophrys*), the wood frog (*Rana sylvatica*) and the leopard frog (*Rana pipiens*). Reptiles are few, the most common being the red-sided garter snake (*Thamnophis sirtalis*). More rarely, the green snake (*Opheodrys vernalis*) and the red-bellied snake (*Storeria occipitomaculata*) occur. The western painted turtle (*Chrysemys picta belli*) is a common inhabitant of backwaters and oxbows in the parkland.

Fish

The closest communities of fish to the site are located in the South Saskatchewan River. Most abundant are species of pike, suckers, and minnows. Sturgeon (*Acipenser fulyescens*), which were at one time abundant in the river, are now rare. Yellow walleye (*Stizostedion vitreum*) and crayfish (*Cambarus sp.*) are also abundant.

Molluscs

The river and the surrounding flood plains are home to many species of freshwater molluscs that can be easily located during the summer and late fall. Snails (Gastropoda) are common with the smaller species predominating.

3.2 The Below Forks Site (FhNg-25)

3.2.1 Geography and Soils

The Below Forks site is 2.5 km east of the junction of the North and South Saskatchewan Rivers. It is situated on an abandoned river terrace on the north side of the Saskatchewan River valley. This site, like the St. Louis site can be placed into two different ecological regions (described in section 3.1.1) depending on which of the two main models is used. Harris *et al.* (1983) place the site within the Southern Boreal Forest Ecoregion, and in the Mixedwood-Parkland Transition Ecodistrict. Zoltai (1975) places the Below Forks site area within a Parkland-Boreal Forest Transition Zone. He explains however, that the vegetation of this zone appears to have a greater affinity toward the Boreal Forest than the Aspen Parkland, and could therefore be considered to be part of the Boreal Forest. Again, this is the model that is used by the SCAPE project, and therefore will also be used here. The second model, defined by Acton *et al.* (1998), places the Below Forks site within the same ecoregion as the St. Louis site, this being the Boreal Transition Ecoregion.

The landscape surrounding the Below Forks site is mainly a gently undulating to rolling fluvial-lacustrine plain, with gently sloping topography. However, in areas that are extremely sandy, the sediments have been reworked by wind into dunes creating a hummocky appearance to the landscape. Steep sloping topography can be created, sometimes with high local relief, such as in the area of the site. In the immediate site area the elevation ranges from 455 mASL to 595 mASL. Meltwater sorting of glacial sediments has formed the sandy deposits in the site area (Kabzems *et al.* 1976). The soils in the region surrounding the site are classified as brunisolic, typical of forests. However, since the site lies within the Fort a la Corne Provincial Forest Reserve and is not land that

has ever been used for agricultural purposes, there have been no soil studies done that have gone beyond this description (Acton 1980).

3.2.2 Climate

Prince Albert is the closest formal weather monitoring centre to the St. Louis site and the Below Forks site. Therefore, the same climate description that was provided for St. Louis in section 3.1.2 applies to Below Forks and does not require repeating here.

3.2.3 Hydrology

The Below Forks site lies within the Saskatchewan drainage basin, an area that extends along the Saskatchewan River in a wide band that extends south past Melfort and north past Creighton Lake. The Saskatchewan River is fed by the North and South Saskatchewan rivers, which in turn are fed by runoff in the eastern mountain slopes and foothills, as was described in section 3.1.3. This river is the closest water source to the Below Forks site, as the site sits on a high abandoned terrace on the north side of the river. There is also an oxbow lake located approximately 500 metres to the northeast of the site. The watershed is similar to that described for the St. Louis site in that half of the local precipitation and runoff that is not returned to the atmosphere is collected in a few sloughs or ponds. The other half drains directly into the river (Acton *et al.* 1998). During the time of site occupation the terrace that the site is located on would have been the active terrace, and therefore flooding would have been common. Since the construction of the Gardiner Dam, flooding of the river is less frequent.

The majority of the sediments at the site contain a high amount of sand leading to excellent drainage. No ground water was encountered during excavations at the site.

3.2.4 Flora

The vegetation in the Below Forks site area is somewhat similar to that found at the St. Louis site, since they are both located in river valleys in a transitional zone between grasslands and boreal forest. However, the vegetation at the Below Forks site is more

typical of the Boreal Forest and so is classified in the Southern Boreal Forest Ecological Region (Harris *et al.* 1983; Zoltai 1975). The Below Forks site is situated in the Fort a la Corne Provincial Forest Reserve and therefore, no cultivated land surrounds the site. The most dominant tree species in this region is the trembling aspen (*Populus tremuloides)* followed by jack pine (*Pinus banksiana*), black spruce (*Picea mariana*), white spruce (*Picea glauca*), and balsam poplar (*Populus balsamifer*). American elm, Manitoba maple, and green ash grow on the valley slopes, similar to the vegetation described for the St. Louis site, section 3.1.4. The understory vegetation is similar to the described in section 3.1.4, but also includes bunchberry (*Cornus canadensis*), twinflower (*Linnnaea borealis*), sarsaparilla, bishop's cap (*Mitella nuda*) and dewberry (*Rubus pubescens*). There are no real grassland environments near the site, but grasses are common understory plants. These include northern wheatgrass (*Agropyron dasystachyum*) and hairy wild rye (*Elymus innovatus*) (Harris *et al.* 1983).

3.2.5 Fauna

The variety of faunal species found at the Below Forks site is very similar to that described for the St. Louis site, with only a few differences. The similarity is due to the fact that the sites are located in close proximity to each other and that they are both in somewhat transitional zones, the St. Louis site being at the northern edge of the Parklands and the Below Forks site being at the southern edge of the Southern Boreal Forest. One of the main differences in precontact times would have been that the plains bison was rarely recorded to range past the northern boundary of the parklands, and therefore would have been a rare occurrence at the Below Forks site. Elk (*Cervus elaphus*) is a common ungulate found in the area.

The black bear and the gray wolf can occasionally be seen in the area along with smaller predators not found at the St. Louis site, such as the marten (*Martes americana*) and the fisher (*Martes pennanti*).

Bird, amphibian, reptile, fish, and mollusc species found near the Below Forks site would be similar to those described for the St. Louis site in section 3.1.5.

3.3 Paleoenvironmental Setting of Both Sites

The time period under study at both of these sites falls within the mid-Holocene dating from 7500 BP-4000 BP (Sheehan 2002). This time period is characterized by the warmer and/or drier Altithermal climatic period. This period is discussed thoroughly in chapter two. While few paleoenvironmental studies have been conducted for central Saskatchewan it has been suggested (Ritchie 1976, 1978) that open grasslands expanded as much as 70 km north of present day boundaries placing both sites within a grassland environment during this time period. Laura Roskowski (2004) conducted a geoarchaeological study of the Below Forks site where she also attempted to determine the nature of the paleoenvironment. She reported that environmental proxies in the buried soil horizons indicated that there has been a constant ratio between C3 (90%) and C4 (10%) vegetation at the site over the last 6000 years. This indicates a long-standing stability of flora that may have been attractive for both human and faunal inhabitants. The St. Louis site being in a similar river valley setting, in close proximity, perhaps harboured similar conditions, therefore, offering a suitable place for habitation during a time of climate change that may have reduced human mobility. Regional climatic conditions may have been the driving force behind the geological deposition of the sites, however, the local conditions may have allowed stability of the vegetation between flood events at the Below Forks site and also perhaps at the St. Louis site.

Stratigraphy and Radiocarbon Dates

3.4 Brief Geological History

The St. Louis site and the Below Forks site are both located along major river systems, the South Saskatchewan and the Saskatchewan respectively, and therefore it is necessary to understand the river system processes that have led to site formation. Deposition of sediment is required at an archaeological site to cover and essentially preserve the artifacts left on the surface by the inhabitants. Deposition of river sediments occurs in two main processes. The first is by overbank flow. Sediment particles of silt or clay size are suspended in flood waters and will eventually settle out on a flood plain as

water flow is decreased, resulting in a vertical accretion. The second process is the formation of lateral accreting point bars resulting when coarse lag deposits form in the deeper part of the channel on the inside of the meander loop. Overbank flooding is a less destructive process for preservation of archaeological sites as the settling of sediment covers artifacts as opposed to washing them away (Hertz & Garrison 1998; Rapp & Hill 1998; Gladfelter 2001; Roskowski 2004).

Terraces are previous flood plains that are abandoned as the river cuts deeper into the substrate or as it transgresses horizontally across a river valley. Terraces are usually stable surfaces that are no longer inundated by annual flooding, however, unusually large floods may still inundate a terrace. In many alluvial valleys there are several step like terraces that form a sequence. The oldest terrace will be the highest in altitude and usually the furthest away from the present day river. The terraces will then become proceedingly younger closer to the river. Thus, artifact forms and features found exclusively on particular terrace surfaces have value as chronological markers (Waters 1992; Hertz & Garrison 1998; Rapp & Hill 1998; Gladfelter 2001). The St. Louis and Below Forks sites are located on river terraces and have been subject to the processes described above. The remainder of this chapter will focus on discussing the stratigraphy, cultural occupations and the related radiocarbon dates from each site. This will set the framework for discussing the results of the faunal analysis presented in chapters five and six.

3.5 The St. Louis Site

3.5.1 Brief Overviews of Site Formation Processes

The St. Louis site is located on a middle level terrace approximately three hundred metres south of the South Saskatchewan River. This terrace has an elevation of approximately 435 mASL while the river is elevated at 426-427 mASL. This middle terrace is backed up against an older terrace that is approximately 1.5 km wide. The modern day flood plain is separated from the middle terrace by a narrow channel that in times of high river flow has eroded the middle terrace to a width of 15-20 metres

(Amundson *et al.* 2005).

The stratigraphy of the site is incredibly well preserved and there is no evidence of erosional events, indicating that all geological events that created the terrace have been preserved (see Figure 3.2). At the base of the stratigraphic section there are cross-bedded sands and gravels that are typical of a braided, meandering stream. This would have been the nature of the South Saskatchewan River after the draining of Glacial Lake Saskatchewan. Approximately 10 000 rcybp, the terrace began to build vertically through a series of flood events and through hill wash deposits from the older terrace above. These hill wash deposits are identifiable by the presence of cobbles, gravel, sand, and clay that dip approximately 10° towards the river. Below Layer VIII or after 8400 rcybp the sediments level out and are more well sorted, suggesting an end to the hill wash. After this time the terrace appears to have been built up by flood events only. After 8400 rcybp there appears to have been 16 major flood events. These events are characterized by silty sand layers topped by buried soils. These were likely major flood events. Amundson *et al.* (2005) determined these floods likely took place approximately every 238 years. These high flow floods were likely due to deep mountain snows and decreased vegetation cover on the Plains, this being characteristic of mid-Holocene sediments. Flood events so widely spaced in time would have left a large time span open for vegetation and soil stability, and hence human occupation (Amundson *et al.* 2005). These periods of stability are represented by the buried soils termed paleosols. Each paleosol containing a cultural occupation will be discussed below. It should be noted that only occupation Layers I-IV will be discussed here as occupation Layers V-IX were not analysed for this thesis. Refer to Figures 3.2 and 3.3 for a stratigraphic profile and radiocarbon dates respectively.

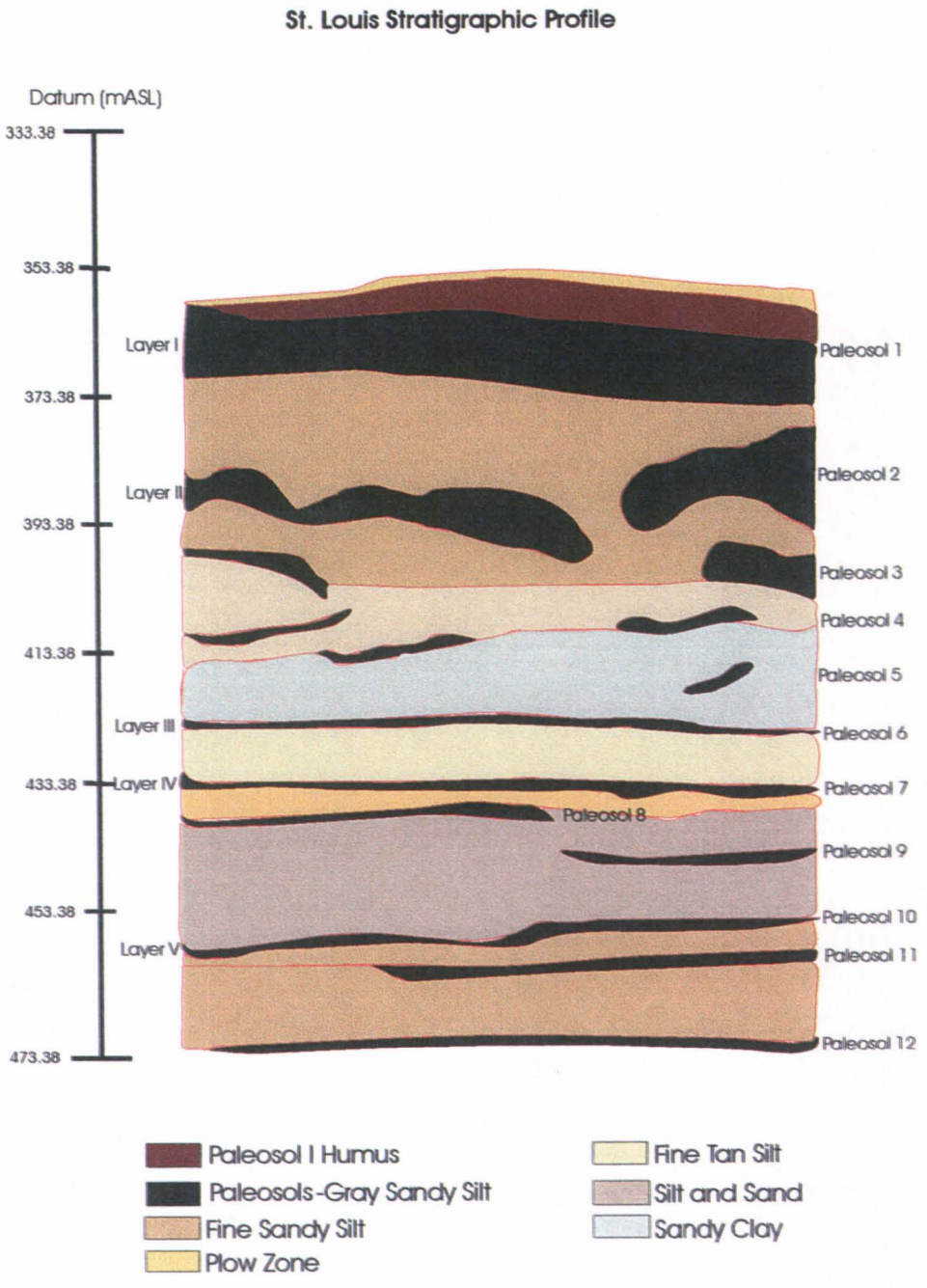

Figure 3.2 St. Louis site stratigraphic profile from unit 103N/122E.

Normalized Radiocarbon Date	Laboratory No.	Material	Layer No.	Affiliation
4590 ± 60 rcybp	Beta-173608	Bone Collagen	Layer I	possible Oxbow
6220 ± 70 rcybp	Beta-173611	Bone Collagen	Layer IV	possible Mummy Cave
7230 ± 70 rcybp	Beta-173613	Bone Collagen	Layer VIa	Unknown
7810 ± 70 rcybp	Beta-173609	Bone Collagen	Layer VII	Late Plano
8400 ± 70 rcybp	Beta-173610	Bone Collagen	Layer VIII	Unknown
9150 ± 40 rcybp	Beta-173611	Bone Collagen	Layer IX	Non-cultural

Figure 3.3 St. Louis site radiocarbon dates.

3.5.2 Layer I (possible Oxbow occupation)

Layer I of the St. Louis site consists of an upper humus layer underlain by gray, sandy silt. This silt is typical of the other paleosols at the site. This is the thickest paleosol (approximately 15 cm) and has been the long standing ground surface for some time. Layer I is located between approximately 350 mASL (the ground surface) and 375 mASL (the bottom of the occupation). The evidence for this comes from the relative thickness of this paleosol compared to the others and from the lack of overbank flood evidence within it. A radiocarbon date of 4590 ± 60 rcybp (Beta-173608) was returned from a bone specimen from this level. It is likely that several occupation events are represented in this layer, although the lack of stratigraphic separation makes it impossible to differentiate the occupations. Therefore, all artifacts recovered from Layer I are considered as one assemblage. No *in situ* diagnostic artifacts were recovered from Layer I and the possible affiliation of this assemblage with the Oxbow Complex is based solely on the radiocarbon date.

3.5.3 Layer II

Layer II is located from approximately 385 mASL to 400 mASL. This layer is separated from Layer I by a layer of fine sandy silt deposited by overbank flooding of the South Saskatchewan River. This paleosol consists of a gray, sandy silt and is

approximately 10 cm thick. There was no radiocarbon date obtained for this layer and no diagnostic artifacts were recovered. The faunal remains recovered from this layer showed evidence of human alterations and are considered to be cultural.

3.5.4 Layer III

Layer III is located approximately 420 mASL in paleosol 6 (see Figure 3.2). This paleosol is overlain by a layer of sandy clay deposited during river flooding. There are four paleosols between Layer II and Layer III, however, these did not contain cultural remains. Layer III contains a small faunal assemblage and a radiocarbon date was not obtained for this layer. No diagnostic artifacts were recovered and the cultural affiliation of this layer is not known.

Layer IIIa

Layer IIIa is not depicted in Figure 3.2 as it was only apparent at the east end of the site. The faunal remains recovered from this layer were not considered to be cultural.

3.5.5 Layer IV (possible Mummy Cave occupation)

Layer IV was found within paleosol 7 located approximately 433 mASL. This paleosol is overlain by a layer of fine tan silt deposited by overbank flooding. This occupation has the highest density of artifacts at the site and a radiocarbon dated of 6220 ± 70 rcybp (see Figure 3.3) was returned for this layer from a piece of bone. There were no diagnostic artifacts recovered from this layer and the affiliation with the Mummy Cave Series is based on the radiocarbon date.

Layer IVa

This layer, like Layer III, is apparent only at the east end of the site and is not depicted in Figure 3.2. There were few faunal remains recovered from this paleosol and they did not exhibit indications of being cultural.

3.6 The Below Forks Site

3.6.1 Brief Overviews of Site Formation Processes

The Below Forks site is also located on a middle level terrace approximately fifteen metres above the modern level of the Saskatchewan River (Saskatchewan Power Corporation 1980 cf. Kasstan 2004). The site sits upon metres of glacial till deposited during the last glacial advance. These till deposits are characterized by quartzite and chert gravels which were subsequently used by the inhabitants of the site for stone tool production (Kasstan 2004; Roskowski 2004). Glacial meltwater flowed into glacial lakes Saskatchewan and Agassiz through the Saskatchewan River system and the resultant delivery of course sediments may have characterized the river as a braided system during this time (Christiansen 1979; Roskowski 2004). The last 10,000 years of deposition at the site is the result of meandering stream and aeolian deposits (Roskowski 2004:15). The site stratigraphy exhibits both overbank flooding and point bar development. The point bar sediments are located above the glacial till and likely coincide with the outflow into Glacial Lakes Saskatchewan and Agassiz . Above these layers are those created during the warmer climate of the mid-Holocene. The Altithermal climate would have resulted in increased destabilisation of valley slope vegetation and caused an increase in sediment accumulation (Mandel 1995; Vance *et al.* 1995). At the Below Forks site this is characterized by a series of upwardly fining sequences made up of silty loam and sandy silt (Roskowski 2004:15-16). After each flood event a period of stabilization would have occurred. The periods of stability resulted in soil formation and are evidenced at the site by dark brown or gray loam paleosols. It is within these paleosols that the cultural occupations were uncovered. The upper two metres of Holocene age deposits at the Below Forks site contain twenty-six well stratified buried soil profiles, indicating at least that many periods of flooding and subsequent stabilization (Roskowski 2004:30). A return to cooler and moister conditions towards the end of the mid-Holocene resulted in stabilized vegetation, decreased sediment accumulation, and abandonment of the river terrace. This time period is represented in the Below Forks site stratigraphy by aeolian deposits of well sorted sands (Roskowski 2004:16). A description of the context of each

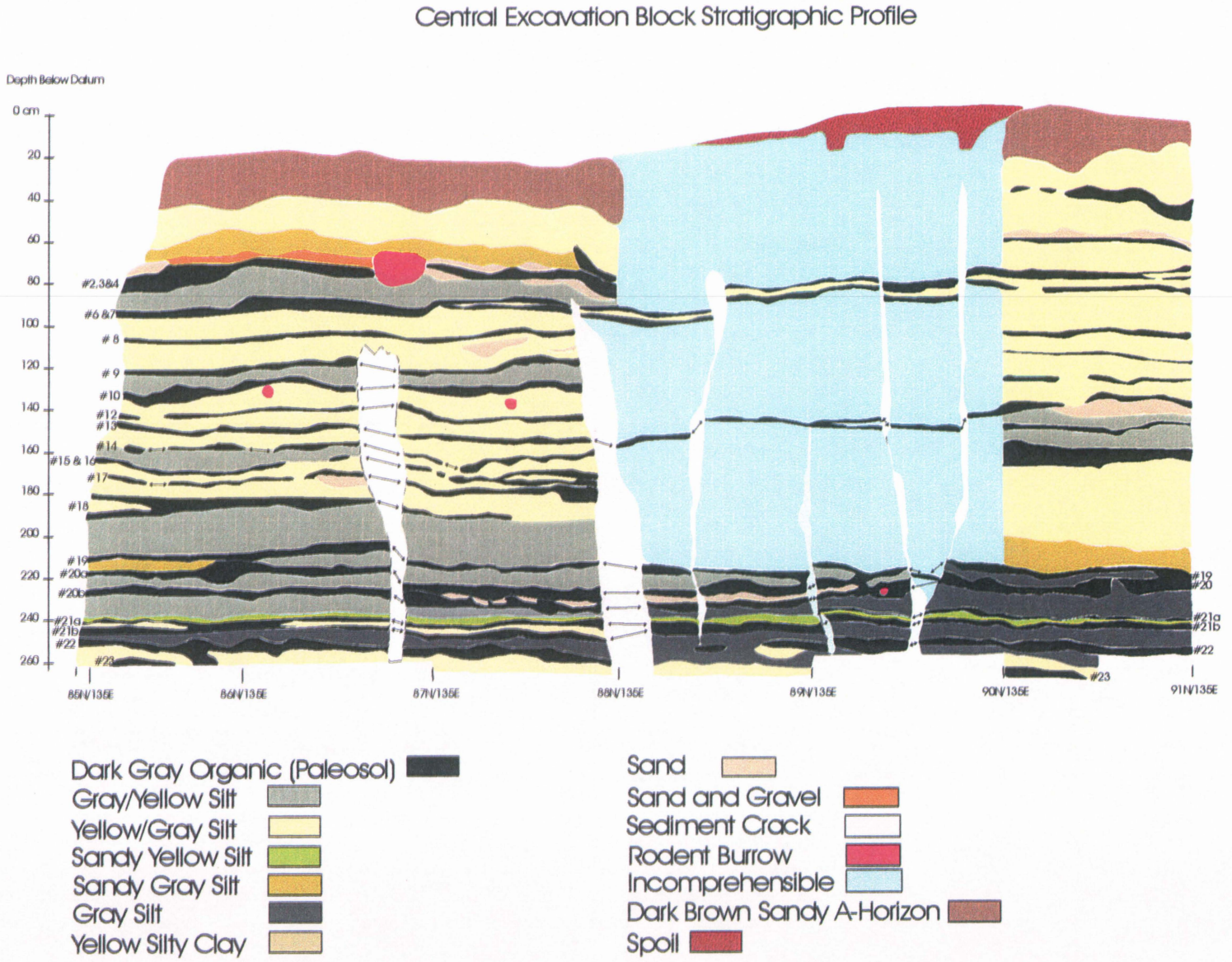

Figure 3.4 Below Forks central excavation block stratigraphic profile (west wall 135E).

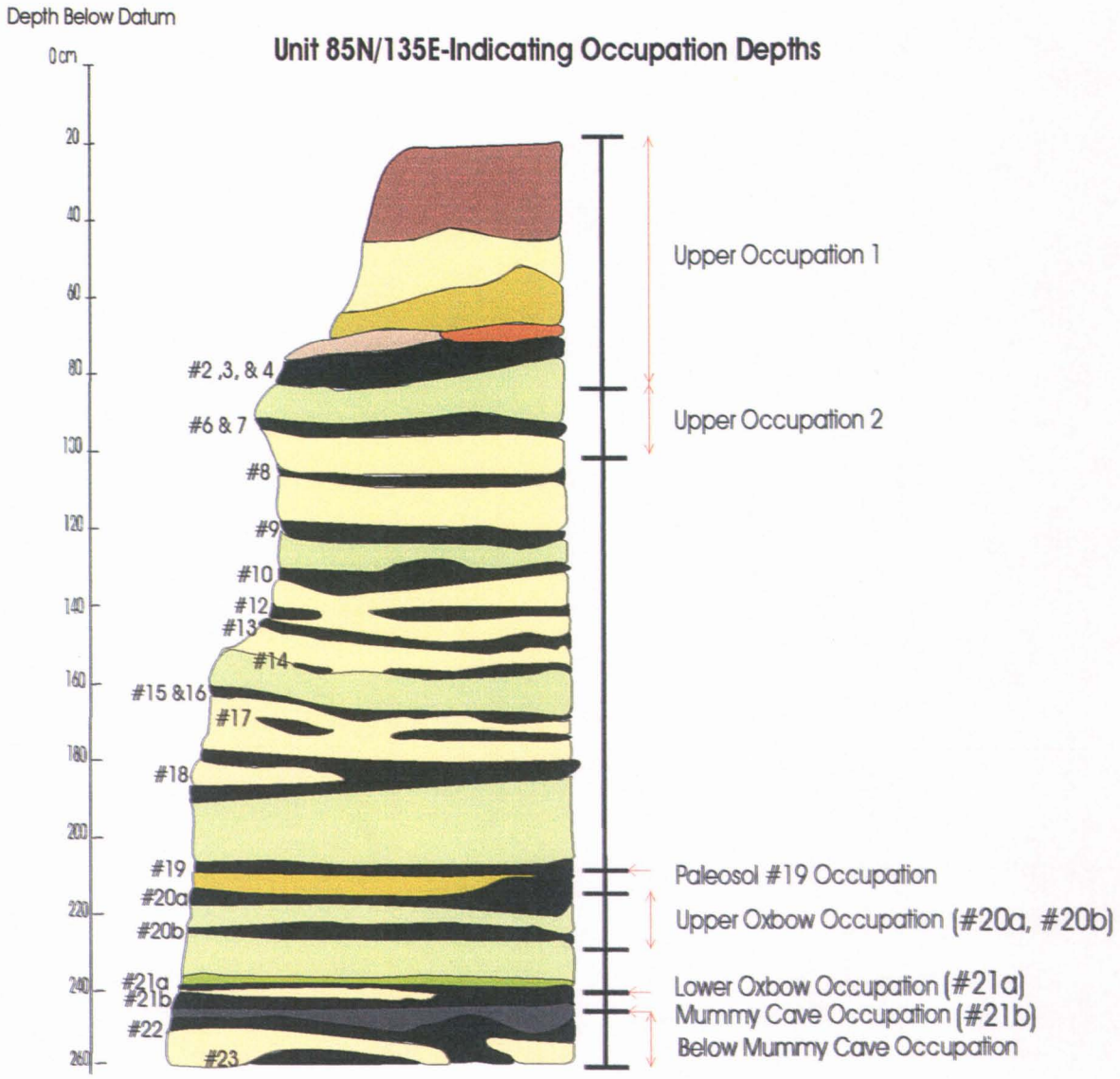

Figure 3.5 Large scale profile of unit 85N/135E-indicating occupation depths (see Figure 3.4 for key)

occupation layer is presented below; each excavation block will be presented separately (for a description of the excavation blocks see chapter four, Figure 4.4).

3.6.2 Central Excavation Block and the 1980 Block Cultural Stratigraphy

The central excavation block at the Below Forks site has extremely complex stratigraphy (see Figure 3.4 and 3.5) and determining where cultural occupations were located was often a challenge. For this reason the site was excavated in ten centimetre arbitrary layers and cultural occupations were identified where there was a stratigraphic separation of artifacts and paleosols. This could not always be done, however, such as in the upper metre of the exaction block where occupations were mixed and compressed to a point where they had to be treated as one. Also, in the central excavation block slumping and cracking of the strata made correlating paleosols and assigning cultural affiliation impossible in many units (see area identified as incomprehensible in Figure 3.4). Paleosols eight through eighteen contained only a small number of artifacts and in most cases it was not clear if faunal remains in these layers were deposited by cultural or natural processes. Because this thesis is mainly dealing with the faunal remains from cultural occupations, these paleosols will not be included in this analysis. Cultural stratigraphy will be discussed in the following sections by each cultural occupation in the same fashion it will be for the faunal analysis. Refer to Figures 3.4, 3.5, for stratigraphic profiles and Figure 3.6 for radiocarbon dates.

Normalized C14 Dates RCYBP	Deviation	Laboratory No.	Material	Excavation Block	Level (Paleosol # or Depth)	Cultural Affiliation
3340	50	TO-10084	Bone	Central Block	4	Unknown
4790	90	TO-10193	Charcoal	Central Block	Between 6-7	Inversion
3540	70	TO-11020	Charcoal	Central Block	11	Unknown
3630	60	TO-10194	Charcoal	Central Block	13	Unknown
4570	60	TO-10195	Charcoal	Central Block	19	Unknown
4750	90	TO-10196	Charcoal	Central Block	20a	Oxbow
4790	70	TO-10085	Bone	Central Block	21a (20b)	Oxbow
6100	140	TO-9354	Bone	Central Block	21b	Mummy Cave
4060	270	S-2034	Bone	1980 test unit	176-183 cm bs	Rejected Date
5740	100	S-1994	Charcoal	1980 test unit	175 cm bs above lowest occupation	Unknown
5845	140	S-2245	Bone	1980 test unit	176-183 cm bs	Possible Mummy Cave
6010	80	TO-9355	Bone	Eastern Block	100 cm bs Lowest occupation	Mummy Cave
5520	60	TO-10083	Bone	Eastern Block	100 cm bs Lowest occupation	Mummy Cave
5920	60	TO-11027	Bone	Eastern Block	100 cm bs Lowest occupation	Mummy Cave
-70	50	TO-10082	Bone	Eastern Block	Upper occupation	Rejected Date
1093	130	TO-10918	Charcoal	Central Block	3.5 m bs	Rejected Date

Figure 3.6 Below Forks site radiocarbon dates.

Upper Occupation One

The upper eighty centimetres, or paleosols 1 through 5 of the central block was analysed as one assemblage as this portion of the sediment was heavily mixed from plant roots and rodent burrows. The gray loam paleosols were also compressed here as this has been the stable land surface for approximately 3000 years. Therefore, it was impossible to determine where one occupation ended and another began. A radiocarbon date of 3340 ± 50 BP (TO-10084) was returned from paleosol 4, however, due to the disturbance of the sediment and the lack of diagnostic artifacts, no cultural affiliation has been placed on this assemblage.

Sediment in this upper occupation consisted of a dark brown sandy A-horizon underlain by yellow/gray silt and gray silt. Several sand and gravel lenses occur in this section and may be related to rills that roll down from the valley slope. Many of these lenses contain faunal remains that are mineralized indicating they may be of a different antiquity.

Upper Occupation Two

The Upper Occupation Two was identified at the Below Forks site at a depth ranging from 80 to 100 centimetres below the site datum. This occupation contains paleosols 6 and 7. These paleosols are compressed at the west end of the excavation block. Sediment bioturbation occurred here, but not to the same degree as it did in the upper 80 centimetres. This occupation was separate from the Upper Occupation One by approximately 10 centimetres of sterile gray/yellow silt (containing no artifacts) between paleosols 4 and 6 (see Figure 3.4). There were no diagnostic artifacts recovered from this occupation nor were any reliable radiocarbon dates returned, therefore, the cultural affiliation of this occupation is not known. All that can be said in that regard is that the occupation falls between 3340 ± 50 (TO-10084) (paleosol 4) and 3540 ± 70 rcybp (TO-11020) (paleosol 11).

Paleosols 8 Through 18 (approximately 110-190 cm below datum)

As stated above, paleosols 8 through 18 are not included in this thesis. In the majority of excavation units in the central block these levels were taken out by shovel shaving as they were sterile, meaning no cultural artifacts were observed. Faunal remains were collected from these layers in several units and were subject to the same faunal analysis as the rest of the assemblage. From this analysis it was determined that there was not enough evidence (cut marks, burning, and association with lithic artifacts) to conclude faunal remains were deposited by cultural processes.

Sediments through this section (110 to 119 cm below datum) consisted of yellow/gray silt or gray/yellow silt separated by dark gray loam paleosols. Sand lenses and rodent burrows were also present (see Figure 3.4).

Paleosol 19 Occupation

Paleosol 19 contains only a small number of artifacts, but nevertheless is recognized as cultural based on the lithic debitage uncovered as well as a number of snowshoe hare specimens. This paleosol is separate from paleosol 18 by approximately twenty centimetres of gray/yellow silt. It is separated from paleosol 20 and 20a by the same sediment material, although 19 is compressed with 20 and 20a in several locations. This made separation of artifacts difficult in several units. The depth of this paleosol ranges from approximately 205-215 cm below site datum (see Figure 3.4).

Upper Oxbow Occupation

The Upper Oxbow Occupation is located in paleosol 20a and 20b. Paleosol 20a was radiocarbon dated to 4570 ± 90 rcybp (TO-10196). These paleosols are separated at the west end of the block and compressed together through the centre and east end of the block. This occupation is attributed to the Oxbow Complex as an Oxbow point base was recovered from the assemblage. Faunal remains from this occupation also reveal signs of human induced butchering and processing. Paleosol 20 is surrounded by a gray silt at the east end of the excavation block. The depth of paleosols 20 and separated 20a and 20b

ranges from approximately 215 to 230 cm below datum.

Lower Oxbow Occupation

During the field work at the Below Forks site it appeared to the excavators that there was a second lower Oxbow occupation present in paleosol 20b. Because the stratigraphy of the site is so complex a reanalysis of the stratigraphic profiles was conducted by Dr. David Meyer and the author. In this reanalysis it became apparent that the lower Oxbow occupation was actually located in paleosol 21a. Therefore, the radiocarbon date of 4790 ± 70 rcybp (TO-10085) which was submitted for this occupation and originally thought to be taken from paleosol 20b is more likely from paleosol 21a.

Regardless of paleosol numbering this occupation was identified only at the east edge of the central block in units 83N/138E, 84N/138E, 85N/138E, and 86N/138E. This occupation was identified as a separate occupation from the Upper Oxbow occupation based on the fact that it was located in a separate paleosol and there was a thin (5 to 10 cm) layer of sterile soil between the two. This occupation's assignment to the Oxbow Complex is due to the discovery of an Oxbow point in this assemblage.

Sediment surrounding this paleosol consists of an overlying sandy yellow silt and an underlying gray silt. The depth of the paleosol is approximately 240 cm below site datum.

Mummy Cave Occupation

The Mummy Cave occupation is located in the central, eastern, and 1980 excavation blocks. The context of the eastern block will be discussed below. In the central block the occupation is located on paleosol 22. It is overlain by gray silt and underlain by yellow/gray silt. The depth of the occupation ranges from 250 to 260 cm below site datum. The affiliation with the Mummy Cave Series is based on the recovery of a triangular projectile point preform and a radiocarbon date of 6100 ± 140 BP (TO-9354) in the central area and 5845 ± 140 rcybp (S-2245) in the 1980 block. In the 1980 block the Mummy Cave occupation is located approximately 175 to 185 cm below the surface. This is the richest, most pronounced occupation at the Below Forks site. This occupation is

apparent on the cutbank face as a nearly continuous layer of debitage, core fragments, fire broken rock, and faunal remains encased in a dark gray loam.

Below Mummy Cave Occupation

It became apparent in the process of the faunal analysis that there were faunal remains in paleosol 22, below that of the Mummy Cave occupation in the central excavation block. It is unclear whether this occupation is cultural as the faunal remains did not exhibit signs of butchering and few lithic artifacts were uncovered. No diagnostic artifacts were associated with this assemblage nor was a radiocarbon date submitted. This assemblage was separated from the Mummy Cave occupation by a thin layer (three to five centimetres) of sterile gray silt, and was considered as a possible separate assemblage only in units 88N/135E, 86N/136E, 83N/138E, 83N/137E. Several other units indicated the possible presence of this deep assemblage, however, the stratigraphic separation was too narrow to rule out the possibility of it being the bottom of the Mummy Cave occupation.

The two units in the 1980 excavation block portrayed a definite occupation below the probable Mummy Cave occupation. The cultural affiliation of this lower occupation is unknown as no radiocarbon date was submitted or were any culturally diagnostic artifacts recovered here. This occupation may correlate with the possible occupation below the Mummy Cave assemblage in the central block of excavation units. A greater degree of stratigraphic separation may be prevalent in the 1980 excavation units.

3.6.3 Eastern Excavation Block Cultural Stratigraphy

The occupation depths in the eastern excavation block are considerably shallower than they are in the central block. The bottom of the lowest occupation in the eastern block is located 120 cm below datum. The shallow location of the strata (compared to the central area) is due to the slope of the river terrace that the site is located on. The central excavation block is located up-slope, therefore, a greater separation of paleosols occurs there as the area received more deposition. The strata are compressed together or pinch out as they are traced downslope toward the eastern end of the site. The sand and gravel

lenses that were seen in the central area of the site are not present at the eastern end indicating that colluvial activity was not a major contributor to deposition. Fluvial processes were the main means of sediment deposition at the eastern end of the site (Kasstan 2004). The stratigraphic profiling for the eastern excavation block was conducted by Steve Kasstan for the purpose of his master's thesis (Kasstan 2004). See Figure 3.7 for a detailed diagram of the profile. There were three occupations present in the eastern excavation block and the context of these will be presented in the subsequent sections.

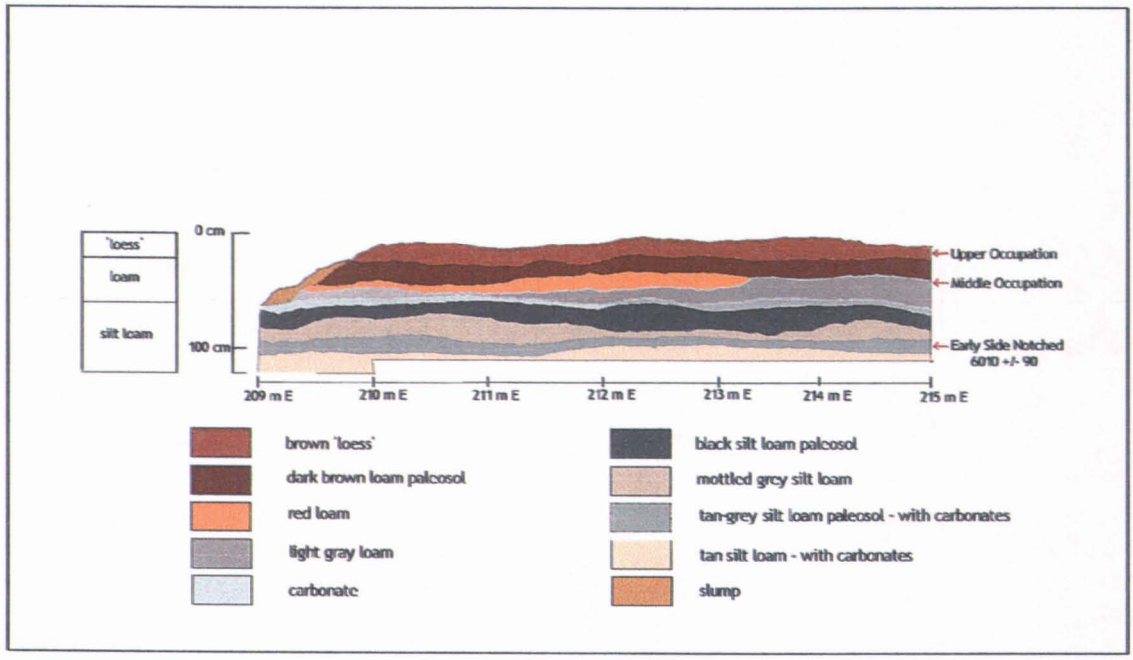

Figure 3.7 Below Forks eastern excavation block stratigraphic profile (taken from Kasstan 2004).

Upper Occupation

The Upper Occupation was located approximately zero to twenty centimetres below datum and is located in the brown loess cliff top deposits on top of the upper A-horizon (Kasstan 2004). No diagnostic artifacts were recovered from the occupation and the radiocarbon date that was submitted was rejected as it came back at -70 ± 50 (TO-10082), therefore the cultural affiliation in unknown. Only a very small number of faunal

remains were recovered here, although four taxa were identified. No features were observed. Kasstan's (2004) three dimensional models indicate artifacts were organized into an activity area in the northwestern portion of the site.

Middle Occupation

This occupation was located in a red/orange horizon located 30 to 60 cm below datum. It is not clear what caused the colouration and hypotheses such as forest fires, ground water chemistry, and human actions have been proposed. This occupation is located above a horizon of carbonate sediments which in turn are located above a significantly dark paleosol at 65 to 75 cm below datum. This paleosol represents a period of long stabilization, however, no cultural materials were present within it. The Middle Occupation like the Upper Occupation contains very few faunal remains and no hearth features were observed. Lithic artifacts were also sparse (Kasstan 2004). There was no radiocarbon date obtained for this occupation.

Lower Occupation

The lowest occupation in the eastern block was located at 80 to 120 cm below the site datum in a carbonate rich paleosol. After some investigation into the causes of the creation of carbonate rich soils, likely being the result of extensive evaporation, wind erosion, and temperature, Kasstan (2004) concluded that the carbonate sediments may provide evidence of the mid-Holocene climate during which the paleosol was formed. This occupation is identified as a Mummy Cave occupation based on the recovery of Early Side-Notched projectile points reminiscent of the Gowen forms. Artifacts in this level are dense and three dimensional models suggest activity areas included a lithic reduction station and a pit of burned bone (Kasstan 2004:112). Radiocarbon dates of 5520 ± 60 (TO-10083), 5920 ± 70 (TO-11020) and 6010 ± 80 (TO-9355) rcybp also indicate a Mummy Cave antiquity. These factors suggest that this occupation is likely to be affiliated with the Mummy Cave occupation in the central block of excavations, although they cannot be correlated stratigraphically.

Chapter Four

Previous Research and Methodologies

4.1 The St. Louis Site (FfNk-7)

4.1.1 Discovery and Research Conducted to Present Date

The discovery of the St. Louis site, in May of 2002, was the result of a Cultural Resource Management (CRM) study conducted by Leslie (Butch) Amundson and Kristin Enns-Kavanagh of Stantec Consulting Ltd., Saskatoon. The study was conducted for Saskatchewan Highways and Transportation in relation to the planned construction of a new bridge and connecting highway in the area. Surveying within the right-of-way led Amundson and crew to an area where the highway approaching the bridge would cross a narrow terrace within the South Saskatchewan River Valley. Small test pits were excavated in this terrace along a road cut to the east of the right-of-way. From one of these test excavations a large canid tooth was uncovered that had five parallel lines incised across it. This find, and the fact that Amundson recognized the high potential for intact, buried sites to be located within river terraces, led to the use of a D-7 caterpillar to remove the thick vegetation within the terrace right-of-way. Eight deep test pits were then excavated in this area, with a track-hoe and a one-yard bucket. These test pits were advanced in 30 centimetre levels and dirt from each level was piled separately. A 40 litre sample of dirt from each pile was then hand screened through a 4mm-mesh hardware cloth. If archaeological materials were encountered during this process, the entire pile was screened (Amundson *et al.* 2005). The deep tests revealed bison bone and lithic debitage almost continuously to a depth of more than two metres. An initial sample of deeply buried bone from one of these deep test pits radiocarbon-dated to 7960 ± 60 yrs rcybp (Beta-168388) (Amundson and Meyer 2003; Amundson *et al.* 2005). This date places this occupation within the late Plano Tradition. Later submissions of bone revealed that this

was a multi-component site ranging 8400 ± 70 BP to 4590 ± 60 rcybp. This later date suggested that there were Mummy Cave and Oxbow components at this site, these components being those that are studied in this thesis. By studying the well-preserved stratigraphy of the site in detail, Amundson was able to determine that this was a multi-component, intact site and a decision was made to conduct mitigative excavations (Amundson and Meyer 2003; Amundson *et al.* 2005).

Due to time restrictions in a CRM project the upper five layers of the site were removed with a three metre wide front end loader equipped with a snow bucket in order to expose the older, deeper layers of the site. This sediment removal was carried out on the right-of-way centre line extending 30 metres east and west and 15 metres north and south. Being that this thesis investigates only the upper four layers of this site, a large portion of the artifacts studied here were excavated in this manner. The front end loader shaved off these layers two to five centimetres at a time. When artifacts were encountered they were flagged and the area around the artifacts was excavated by hand tools. These artifacts were then photographed and mapped and their three dimensional location was recorded with a theodolite and laser EDM. These artifacts were then given an artifact card and collected in individual plastic bags. Any fragile material was wrapped in aluminum foil before being removed. Occasionally, areas were encountered that warranted a 50 cm by 50 cm shovel test and many artifacts were recorded as find spots as well. Previous to this process the slumped soil from the north edge of the terrace was cleared away with the track-hoe in a series of 1.2 metre steps and several detailed stratigraphic profiles were drawn. This was done to have control over the artifact contexts during the removal of the upper layers and during excavations (Amundson *et al.* 2005).

Plate 4.1 Removal of upper layers with a front end loader and snow bucket.

The first excavations at St. Louis were conducted in September 2002 under the direction of Butch Amundson. This season of excavations was sponsored by Saskatchewan Highways and Transportation, and some additional crew members were provided by Dr. David Meyer through the SCAPE project. At the end of this first field season Amundson and crew had carefully excavated sixty-seven square metres in 1m by 1m units to depths ranging from Layer VI to layer VIII and three of these units were continued through Layer IX (For dates and depths of these layers see chapter three, Figures 3.2 and 3.3). Some of the major finds of this excavation season were a lithic working station and the basal half of a Plano projectile point found near a hearth feature in Layer VII, and the remains of fish, grouse, rabbit, and bison in Layer VIII. Also of considerable importance in the first season of research was the discovery of four bison skulls that had horn tip span measurements that ranged from 84-114 cm, putting them well within the measurement range for extinct bison species such as *Bison antiquus* and *Bison occidenttalis* (Meyer 2004).

Dr. David Meyer, of the University of Saskatchewan, agreed to continue excavations at the St. Louis site as part of the SCAPE project. This led to an additional

excavation season from June 23 to August 1 of 2003. The first two weeks of the 2003 excavation were supervised by Butch Amundson while the remaining time was supervised by David Meyer with assistance from graduate student Patrick Young and the author. A number of graduate and undergraduate students were employed for the excavation along with two members of the One Arrow Reserve and a local high school student.

The majority of the 2003 excavations were concentrated on expanding the excavations from 2002 in Layer VII through IX. There were eight square metres continued in the 2002 block (Block 1, see Figure 4.1) through to Layer IX, however, no cultural materials were recovered from Layer IX. Meyer noticed burned and calcined bone being exposed in a runoff north of Block 1 and as a result twenty-seven square metres were placed here in what became Block 2 (see Figure 4.1). This block was excavated through Layers VII and VIII. A detailed discussion of what was encountered in the excavations of Layers V through to IX is beyond the scope of this thesis, as this thesis covers only the upper four layers. See Meyer (2004) for a more concise description of these occupations.

In Block 3 (see Figure 4.2), positioned east of Blocks 1 and 2, thirty-one square metres were excavated in two subblocks. Block 3 was located on the east bulldozed slope and so the paleosols presented varied from unit to unit. The most easterly units of this block basically began at the original surface and these units were taken down to the bottom of paleosol IV. Paleosol IV had been previously dated to 6220 ± 70 rcybp (Beta-173611). From this paleosol a fair amount of debitage and faunal remains were uncovered as well as one ovoid bifacial knife. In paleosol I of these units a 'pile' of fire broken rock was encountered, possibly being a dump of sorts. The western sub-block of Block 2 was farther down slope and began at paleosol V. Here a bison skull was uncovered with horn tips spanning about 75 centimetres, again falling into the range for extinct forms of bison (contemporary bison having an average horn core span of 60 centimetres).

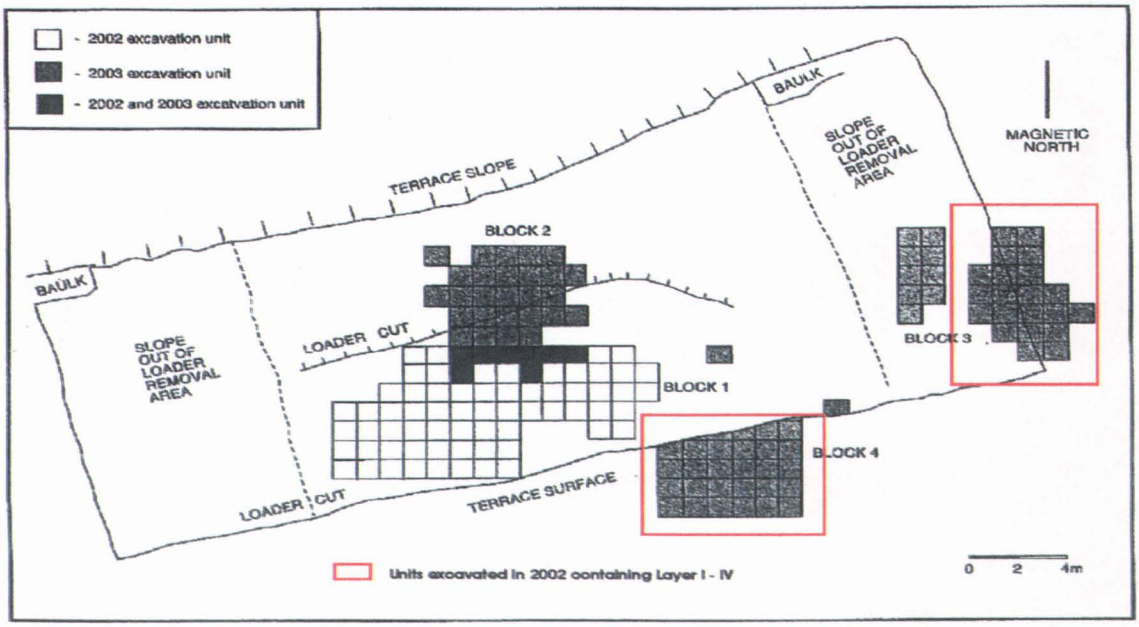

Figure 4.1 St. Louis excavation units emphasising Layers I through IV (from Meyer 2004, revisions by the author).

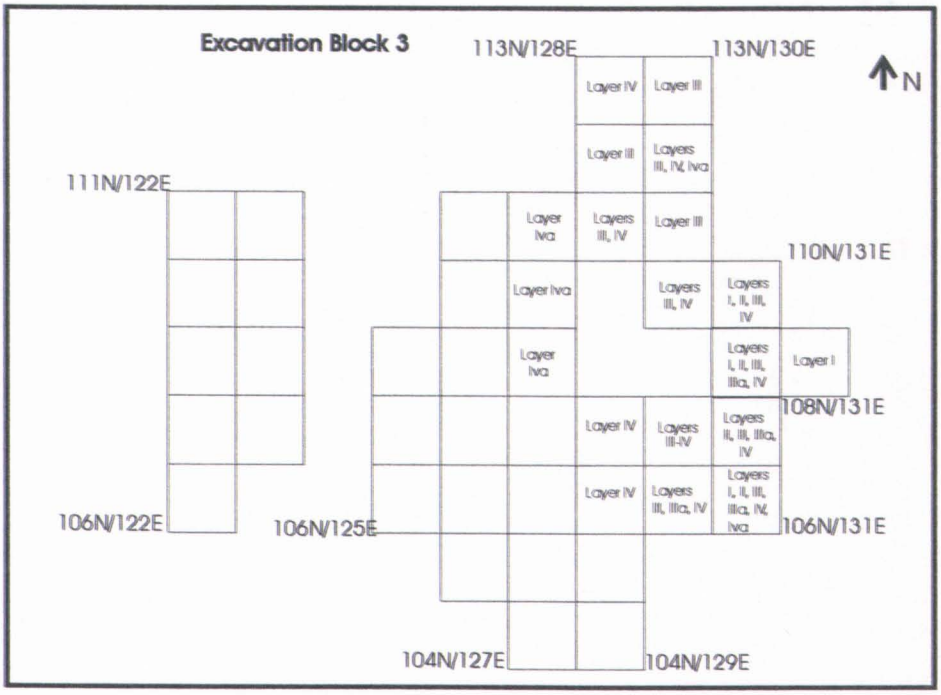

Figure 4.2 St. Louis Excavation Block 3 depicting units containing Layer I, II, III, IIIa, IV and IVa .

There are no cultural materials associated with the bison skull, however, charring on the occipital portion could suggest human intervention (Meyer 2004).

Unit 106N/116E was excavated adjacent to the face exposed by heavy equipment so that a profile from the original surface down to the deepest terrace deposits could be seen. Here stratigraphy from the rest of the site could be compared and a paleosol below paleosol IX was encountered, however, the radiocarbon date on this was rejected as the carbon content was low (Meyer 2004).

Block 4 (see Figure 4.3) of the excavation was placed at the south of the site on the intact terrace surface. Here, the author placed a seventeen square metre block that was excavated through Paleosol I, extending to a depth of approximately thirty centimetres. This paleosol was not particularly productive and only a few bone fragments and fire broken rocks were encountered. It was this excavation block that the Saskatchewan Archaeological Society assisted excavating. This occurred over two long weekends in July with fifteen participants the first weekend and twenty the second weekend.

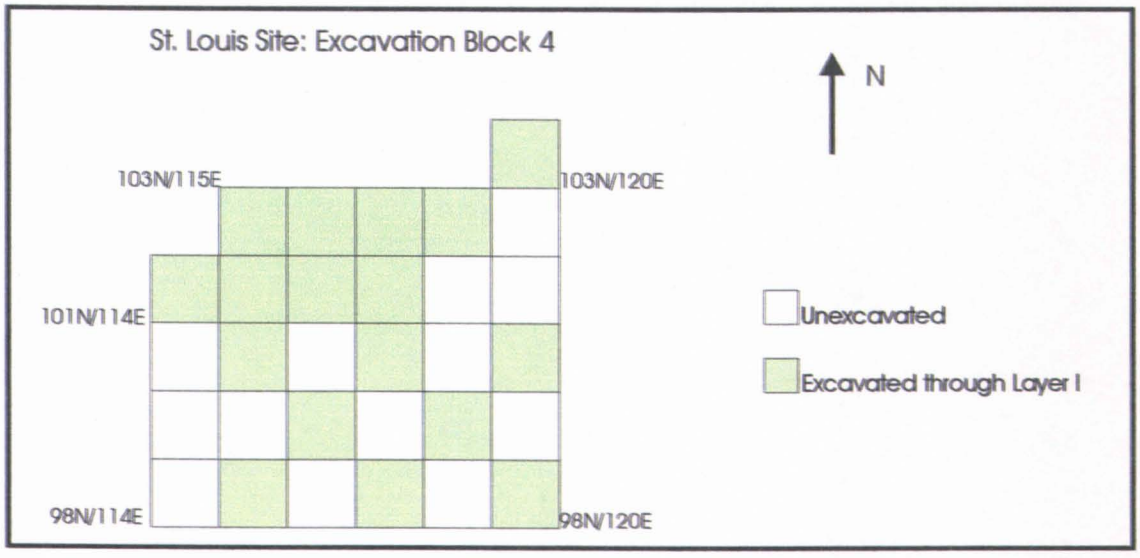

Figure 4.3 St. Louis site Excavation Block 4.

4.1.2 Methodology

The excavations during both the 2002 and 2003 field seasons employed standard archaeological field techniques. All excavations were completed utilizing the same site datum. This datum was located on the original terrace surface at the northeastern edge of the site. This was a real world elevation set by the surveyors employed by the bridge construction engineers. This datum was 435.16 metres above sea level (mASL). Subsequent datums were then placed around the excavation blocks, their elevations being measured from the original datum using a theodolite and a stadia rod. All artifacts were then provenienced from the closest subsequent datum.

The grid during the 2003 season was established on the existing grid from the 2002 excavations. The southwestern most unit of the 2002 block (Block 1) was labelled unit 100N/100E in the southwest corner of the unit. All unit numbers expanded from this. Excavation procedures involved excavating 1 by 1 metre units in 50 cm by 50 cm quadrants proceeding down through natural levels. The backdirt from each quadrant was water screened through 3 mm (1/8 inch) mesh screen. Any artifacts found in the screen were then placed in a bag for that quadrant according to specific quadrant and level. The water was pumped up to the site from a dugout placed below the site in 2002. The water that filled the dug out was ground water and was a necessary aid to screening as the silty clay matrix of the site was almost cement hard.

Any artifacts larger than approximately 3 cm were left *in situ* until the level was completed in that unit. Each artifact was given a three point provenience, measured from the southwest corner of the unit. Each occupation floor was photographed and when needed the colour photograph was printed out and used as the planview for that unit. The Block 4 units also had a planview hand drawn for each unit. Each artifact that was provenienced was assigned a ticket with an original number. The number was then recorded on the planview. Quadrant bags were also assigned a ticket. A soil sample was taken from any features that were encountered and as well, the feature was mapped onto a planview. Friable bone was wrapped in aluminum foil before being removed from the field

in order to be transported to the lab. Stratigraphic profiles were drawn for each excavation block on the largest exposed wall.

4.1.3 Laboratory Procedures

The 2002 artifact collection, including the artifacts removed with heavy equipment, was transported back to the Stantec laboratory in Saskatoon. Here the artifacts were cleaned and sorted. Cataloguing of the artifacts was conducted by Stantec employees. Any faunal remains recovered in paleosols I through IV were later turned over to the author for further analysis.

During the 2003 excavations the village of St. Louis made their French Culture Centre available for a field laboratory. A SCAPE employee was in charge of this lab and she cleaned the artifacts as they came in from the field as well as checked the accompanying forms for any errors. At the close of the season the artifacts were moved to the University of Saskatchewan labs in the Archaeology building. Here any further cleaning was conducted as well as cataloguing. The cataloguing was conducted by SCAPE employees and the author. This stage of cataloguing was carried out using a database called Archwizard which was designed to be used by all SCAPE archaeological projects. While cataloguing these artifacts the faunal remains from paleosols I through IV were separated and also turned over to the author for further analysis.

Recataloguing of the faunal materials from paleosols I through IV was conducted using Microsoft Excel 2000™. The recataloguing was necessary as a more in depth analysis was required for this thesis. The original catalogues were exported into an Excel file and attribute fields were added. The cataloguing processes recorded general information such as the catalogue number, the provenience information, and the count and dry weight (g) of the faunal specimens. When possible the bone was identified to taxon and element along with the portion and side (left, right, or axial) of the element. The degree of weathering was determined and any cultural (cut marks, green fracture etc.), carnivore, or rodent modifications to the bones were noted. Bones were also checked for indications of burning, root etching, and types of breakage.

Identifications of faunal specimens were made using the University of Saskatchewan comparative collection material. After a specimen had been catalogued it was placed in a secured plastic bag, along with a printed label containing information about provenience and identification. Faunal specimens were then placed in storage boxes. The same cataloguing procedure was employed for the Below Forks site faunal remains.

4.2 The Below Forks Site (FgNp-25)

4.2.1 Discovery and Research Conducted to Present Date

The Below Forks site, like the St. Louis site, is situated on a relic river terrace. As a result of river erosion, consolidated silt has slumped away from the face of the terrace leaving a six metre high cliff. During the Forks Survey in 1980, the cliff face was examined carefully and a densely packed layer of lithic debitage, fire-cracked rock, and faunal remains located over two metres below the cliff surface was observed. This occupation layer extended over a distance of approximately thirty metres. Further inspection indicated that there was no occupation layer below this, but there were some sparse cultural materials above, mainly concentrated a half metre below the surface (Meyer 2003). This site is again similar to the St. Louis site in that it contains well preserved stratigraphic deposits with many dark organic layers, several of which contain cultural materials. In 1981 a bone sample from the dense occupation layer was radiocarbon-dated to 5845 ± 140 BP (S-2245). A piece of charcoal from a palaeosol a few centimetres above this was radiocarbon-dated to 5740 ± 95 BP (S-1994). These dates suggested that a Mummy Cave occupation had been encountered. To try to learn more about the site a 1 by 2 metre unit was excavated in 1980 and another in 1989. No diagnostic artifacts were recovered from these excavations. As a result of the SCAPE project the 2000, 2001, and 2002 field seasons were more intensive (Meyer 2003). Figure 4.4 indicates the locations of all excavation units excavated at the site.

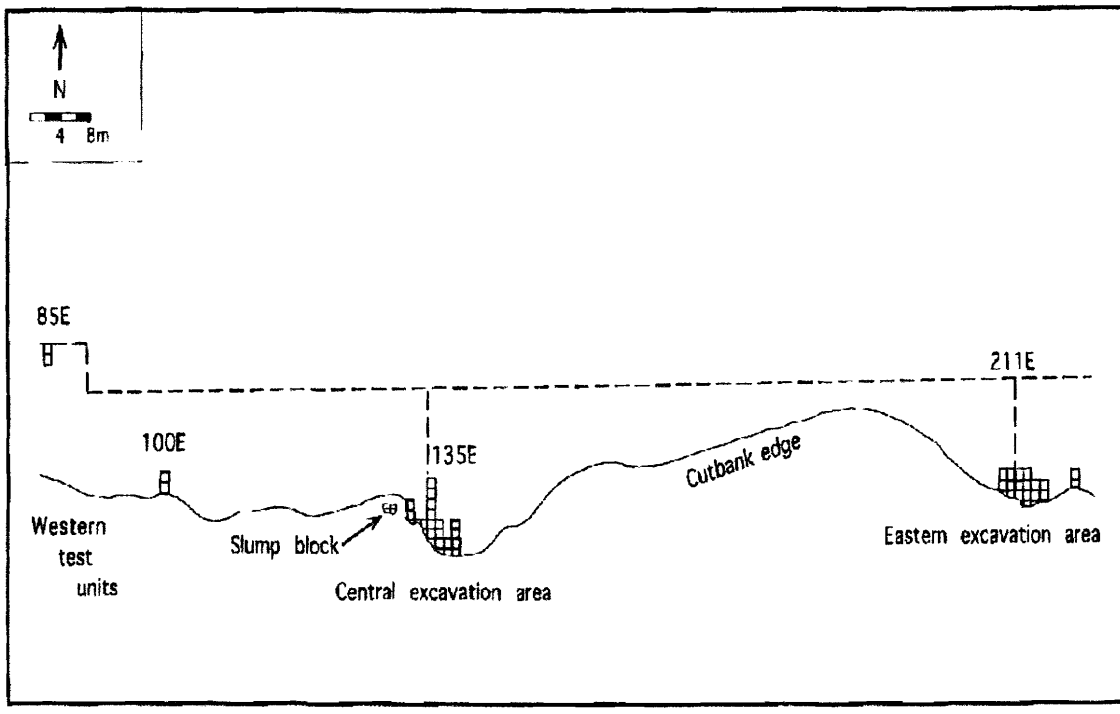

Figure 4.4 Map of all Below Forks site excavation units (from Meyer 2003).

In the 2000 field season eight square metres were excavated completely and another seven were started. Some of the units were excavated to a depth of two and a half metres. Not only was the 6000 BP paleosol encountered here, but three other paleosols in the upper metre and a half were encountered. It was then clear that this was a multi-component site. All of these occupations contained thousands of Swan River Chert flakes. The 6000 BP occupation also contained bone fragments, some fire-cracked rock, clam shell fragments, and a few stone tools, including a projectile point preform. The latter was found at the eastern end (see Figure 4.5 for depiction of Eastern Block excavation units) of the site where the lowest occupation level is only one metre below the surface. Several stone tools were also found at the base of the cliff face, these having eroded out of the wall above (Meyer 2003).

The 2001 season expanded on two 1 by 2 metre excavations done in 2000 at the eastern end of the site to now include twenty-one completely and partially excavated 1 by 1 metre units. Two occupation levels were encountered in these units, the deepest being

located one metre below the surface. A bone fragment was submitted from this level for an AMS radiocarbon date, and produced a date of 6010 ± 80 rcybp (TO-9355). This date indicated that this occupation level is the same age as the deepest occupation level encountered in the central excavation area. From this deep level in the eastern block thousands of Swan River Chert flakes were found along with several bone fragments, including canid, as well as fire-cracked rock. A small corner-notched projectile point was found here as well. In the upper occupation level there were many Swan River Chert flakes and bone fragments, but no diagnostic artifacts were found.

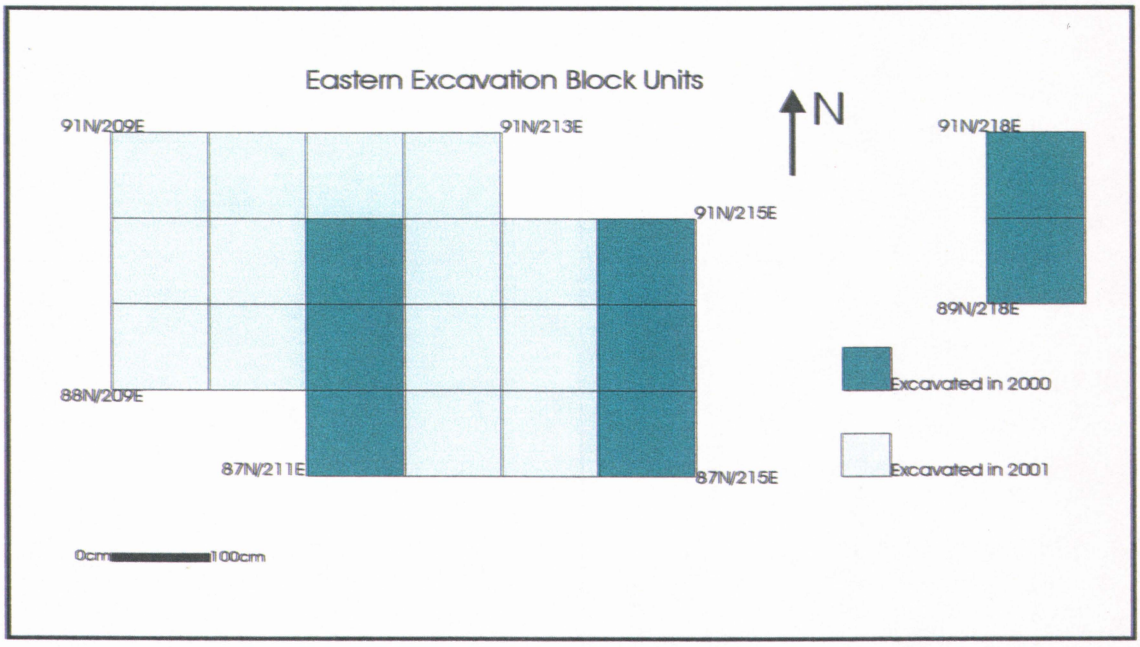

Figure 4.5 Eastern Excavation Block units (from Kasstan 2004, revisions made by the author).

In the central area (see Figure 4.6), nineteen new 1 by 1 metre units were opened and twelve of these units were completed and excavated to a depth of two and a half metres. Some faunal remains, debitage, and fire-cracked rock were recovered, but no tools or diagnostic artifacts were found. At the west end of the site they reopened the unit that was dug in 1980 and took it down through two more ten centimetres levels. Here bone fragments, including disintegrating bison skull fragments, and a few pieces of

debitage and fire-cracked rock were recovered. The deepest level in these units was undated, while the level above it, excavated in 1980, correlates to the Mummy Cave level in the central area with a radiocarbon date of 5845 ± 140 rcybp (S-2245)(Meyer 2003).

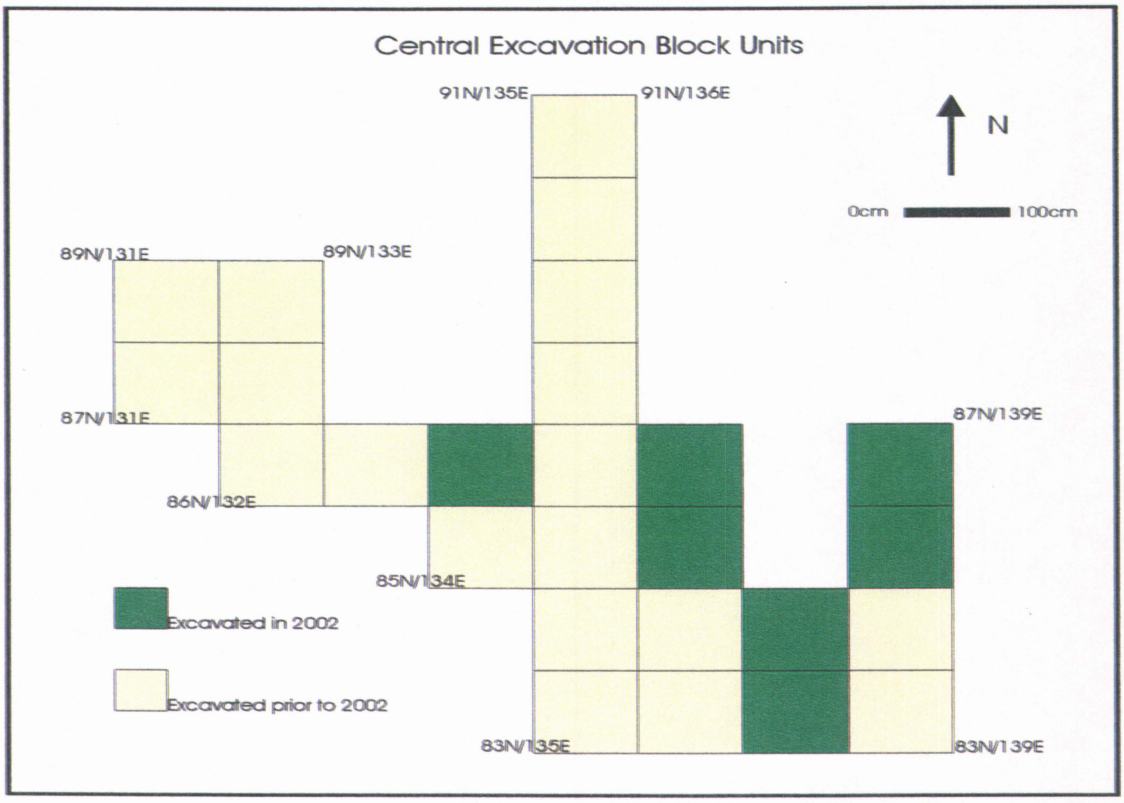

Figure 4.6 Central Excavation Block units.

The 2002 field season concentrated on finishing one partial and six complete units in the central area opened in 2001. The Oxbow level, located a few centimetres above the deepest 6100 BP Mummy Cave level, continued to produce a small amount of cultural material, including a complete projectile point. This projectile point has incipient ears and appears to be a variant of the Oxbow type. Also in this level flecks of red ochre were found along with a caribou antler that is of a size suitable for use as a billet in percussion flaking. A fragment of a bison scapula from this Oxbow level was radiocarbon dated to 4790 ± 70 rcybp (TO-10185) (Meyer 2003).

4.2.2 Methodology

The Below Forks site was excavated using standard archaeological field techniques. The square metre units were excavated in ten centimetre thick arbitrary levels to depths that varied depending on where they were located in the site. This was due to the fact that the 6000 BP paleosol varied in depth across the site. The site was excavated with a combination of trowel, shovel, and hatchet. Excavation units often had to be soaked with water in order to loosen the very hard carbonate enriched matrix. Each unit was excavated in 50 by 50 centimetre quadrants and the backdirt was screened through 1/4 inch or 1/8 inch mesh. Artifacts in the Oxbow and Mummy Cave layer were screened through the finer mesh. A rubber mallet was often needed and used to break up the matrix in order for it to go through the screen. Any artifacts found in the screen were again assigned to a bag recording the level and quadrant. Artifacts larger than one centimetre were left in situ and provenienced and mapped onto hand drawn planview forms. The planview recorded the artifact position, artifact type, features, sediment discolourations, and position of the cutbank edge. The provenience was taken from the southwest corner and depths were taken below the excavation block arbitrary datum. Any features that were encountered were mapped onto a planview, cross-sectioned, and a sediment sample was taken. Stratigraphic profiles were drawn for every unit (Kasstan 2004).

4.2.3 Laboratory Procedures

All of the artifacts excavated at the Below Forks site were transported to the University of Saskatchewan laboratories in the Archaeology Building. Here the artifacts were cleaned, sorted, and catalogued. The sediment samples that were taken from features were dry screened in the laboratory using a nested series of screens with mesh sizes of 1/4", 1/8", 1/16", and 300 microns. Sediments smaller than 300 microns were discarded (Kasstan 2004). Cataloguing of the materials was done throughout the winters of 2000, 2001, and 2002 and was completed in 2004 (Meyer 2003). This stage of the cataloguing was conducted using the Archwizard database. The faunal remains were set

aside and later turned over to the author for further analysis. These faunal specimens were then recatalogued in the same fashion as described for the St. Louis faunal remains, described in detail in section 4.1.3 of this chapter.

4.2.4 Additional Research

The Below Forks site has been the subject of several Master's theses encompassing a variety of topics. Kasstan (2004) conducted an analysis on the stone debitage to determine the nature of lithic tool production of the Mummy Cave Series. Roskowski (2004) gathered sediment samples from each stratigraphic layer and analysed them with the intent of determining paleoclimate at the site. Murray (personal communication 2004) extracted snail shells from each stratigraphic layer at the Below Forks site and will study stable isotopes in these shells in order to also determine the paleoclimate.

4.3 Analytical Procedures

There are many terms used in this thesis to describe the faunal remains and the statistical studies applied to these remains. The definitions provided by Grayson (1984:16) will be followed in this thesis. Here Grayson defines a **specimen** as "a bone or tooth, or fragment thereof, . . . while an **element** is a single complete bone or tooth in the skeleton of an animal. Element is also used when referring to a specific anatomical unit, such as humerus, radius, femur, etc. In terms of these definitions, a complete humerus is an element and a specimen, while a distal humerus is a specimen. Webster (1998) notes that when dealing with non-vertebrate remains, such as shells or seeds, the term specimen can be applied but element cannot because an element suggests that something is part of a whole. Webster's adjunct will also be applied to this thesis. The term **fragment** will follow the explanation provided by Brink and Dawe (1989:80) where they recognize that a fragment is a fraction of an element that cannot be identified to a specific element but is recognizable to the level of class of elements such as long bone or tooth enamel. From

these descriptions it should be obvious that there is some overlap within these terms. This thesis will avoid using overlap when at all possible.

The main quantitative measurements used in this thesis are as follows: **N** (number), **NISP** (number of identified specimens), **MNI** (minimum number of individuals), **MNE** (minimum number of elements), **MAU** (minimum number of animal units), and **%MAU.** These methods of quantification have become the standard for faunal analyses. The NISP refers to all bones that have been identified to a specific element or class of elements in a taxon (Brinke and Dawe 1989, Lyman 2001). The bone that is classified as unidentifiable is not included in NISP's. MNI is used to determine the minimum number of individual animals needed to account for all of the identified specimens (Lyman 2001:510). In this thesis the MNI takes sides into account. MNE counts the minimum number of elements needed to account for the specimens observed. MNE counts can include complete elements, specimens, and discrete anatomical landmarks for a specific element (such as the deltoid tuberosity on the humerus) (Lyman 2001:510). In this thesis the MNE is determined by counting anatomical landmarks (for a list of the landmarks counted for each bone see Appendix I). The landmark with the highest count then becomes the MNE count for that element. The MNE values are used to calculate the MAU, the MAU being the minimum number of animal units needed to account for the specimens observed. The MAU values can be used to determine how humans affect an assemblage with their butchering practices and how taphonomic forces determine which elements survive (Binford 1978). MAU is derived by dividing the MNE value by the number of times that particular element occurs in the animal's complete skeleton. The MAU values are then used to create %MAU by dividing the MAU values by the highest MAU value. The %MAU are tabulated in an effort to determine the representation of each element in the archaeological assemblage.

An archaeological **assemblage** refers to a set of faunal specimens recovered from a specific archaeological or geological context in which the researcher defines the boundaries (Grayson 1984:17). Either the faunal material from the whole site can be considered the assemblage, or the specimens can be separated into a series of assemblages

(Corbeil 1995). In this thesis the faunal material from both the St. Louis site and the Below Forks site is separated into assemblages based on stratigraphic separation.

The faunal remains in an assemblage will be described as either **cultural** or **natural** (non-culture). These definitions were established by Thomas (1971:366):

> Without discussing whether man's influences are indeed "natural" within an ecosystem, I arbitrarily define *cultural* bone as those fragments of non-human tooth and osseus material deposited as the result of human activity. Bone deposited from other mechanisms is termed *natural* bone.

The terms **light**, **medium**, and **heavy** are used to describe the degree of root etching seen on the bones. Light refers to bone that has at least one root etch, medium refers root etching that is present over up to 30% of the bone surface, and heavy refers to root etching that is severe enough to obscure the recognition of other modifications such as cut marks.

During the faunal analysis for this thesis it was necessary to assign a size class for many of the specimens, mainly non-bison specimens, that could not be identified to a specific taxon but could be placed in a grouping based on size and weight. Table 4.1 presents the size classifications and lists of species in each classification that is used in this thesis. The avian classifications are based on size alone and not weight.

Table 4.1 Size classifications used in this thesis (after Webster 1999:40)

Size Class	Weight	Associated Terms	Examples
SC6	200-700 kg	Very Large Mammal	Bison, Moose, Elk, Deer
SC5	25-200 kg	Large Mammal	Wolf, Pronghorn
SC4	5-25 kg	Medium Mammal	Coyote, Badger, Beaver
SC3	700-5000g	Small-Medium Mammal	Fox, Hares, Skunk
SC2	100-700g	Small Mammal	Ground Squirrels, Muskrat
SC1	<100g	Micro-Mammal	Mice, Voles
SC5	-	Large Bird	Crane, Eagle

Size Class	Weight	Associated Terms	Examples
SC4	-	Medium Bird	Raven
SC3	-	Small-Medium Bird	Ducks, Grouses
SC2	-	Small Bird	Robin
SC1	-	Micro-Bird	Warblers, Sparrow
SC2	-	Small Vertebrate	Ground Squirrel, Meadow Lark
SC1	-	Micro-Vertebrate	Mice, Frogs, Salamanders, Warbler

Table 4.1 (continued) Size classifications used in this thesis (after Webster 1999:40)

Chapter Five

The St. Louis Site Faunal Assemblage

5.1 Introduction

The faunal remains included in this study consist of those from the upper four layers of the St. Louis site, representing Mummy Cave Series and the Oxbow Complex occupations. This is consistent with similar levels at the Below Forks site. All of the faunal remains from these upper layers recovered in the 2002 and 2003 field seasons were included in this analysis except for the those that were recovered from the initial eight deep test excavations conducted by Stantec Consulting Ltd.. These materials are not included in this study because there was no way to determine the stratigraphic provenience.

This chapter and chapter six present the results of the faunal analysis by stratigraphic layer in an attempt to determine subsistence strategies of the occupants and to determine the nature of the activities being conducted at the site. The format of data presentation will follow that presented by Webster (1999).

5.2 Layer I Faunal Assemblage (possible Oxbow occupation)

A total of 1692 faunal specimens weighing a total of 15.82 kg was recovered from Layer I. Unidentifiable bone fragments made up 77.4% of the assemblage with 23.5% of these exhibiting evidence of heat alteration. Of the 383 identifiable faunal items only 3.9% exhibited signs of heat alteration. Table 5.1 summarizes this information.

Table 5.1 Summary of faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight(g)	N	Weight(g)
Unburned	368	26.8	14041.8	1002	73.1	1526.3	1370	15568.1
Burned	15	4.6	59.3	307	95.3	195.7	322	255
Total	**383**	**22.6**	**14101.1**	**1309**	**77.4**	**1722**	**1692**	**15823.1**

Only two taxa are identified in the Layer I faunal assemblage (Table 5.2). These being bison (*Bison bison)* and a large canid (*Canis sp.*). Identifiable specimens that could not be placed within a specific taxon were assigned to one of the size classifications outlined in chapter four.

Table 5.2 Summary of the Layer I faunal remains.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	343	5
Large-Canid (SC5)	*Canis sp.*	5	1
Miscellaneous			
Very Large Mammal (SC6)		35	-
Total		**383**	**6**

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP=343. MNI and MNE values were calculated by noting the presence or absence of landmarks. A list of these landmarks can be found in Appendix I. Table 5.3 summarizes the bison bone specimens used to compile these calculations.

Taxonomic description: Bison are the largest land mammals in Canada with bulls weighing between 600-1000 kg and cows being generally smaller with an average weight of 420 kg. Bison once could be found over a large expanse of North America ranging

from Northern Mexico to the Great Slave Lake region of the Northwest Territories. With European colonization these animals were hunted to near extinction and now free ranging herds only exist in various national parks in Canada and the United States. Bison are gregarious animals that will migrate over large areas in search of food which includes grasses, sedges, lichens and berries. Habitats can include arid plains, aspen parklands, river valleys, and coniferous forests. Herds enlarge to number into the thousands during the rutting season which peaks during July and August. After an approximate 285 day gestation most bison calves are born between mid April and mid June. Aboriginal people on the prairies depended on the bison for food, shelter, and tools (Banfield 1974:405-407; Saskatchewan Environment and Resource Management 2001:181-183).

Discussion: A minimum of five bison are represented in Layer I of the site, based on the number of radii present. The majority of identifiable bone (74.5%) recovered from this layer could be identified as bison. It is also assumed, based on the thickness of the bone fragments, that the majority of the 1309 unidentifiable bone fragments also are bison. This, however, cannot be proven without identifiable attributes and therefore bone that could be classified to only element group, such as long bone shaft or vertebral fragment, were place in the size class of very large mammal (SC6). Cultural modifications are present on eight of the specimens in the form of chopping marks, cut marks, and scraping marks. Seven of the specimens presented evidence of thermal alteration. Taphonomic processes had only a small effect on the assemblage, with only 26% of the specimens showing evidence of light rootlet etching, and weathering of the bone was light rating only stage 1-2 on Behrensmeyer's (1978) weathering index (see Appendix II for the index). This refers to light, angular cracking and some exfoliation of the outer surface of the bone. Six of the specimens have been altered by carnivores and as a result are crenulated. Interestingly, three of these six crenulated specimens also have cultural modifications present. The majority of the specimens recovered from this layer are of a size similar to modern bison forms. However, a bison skull specimen recovered from this layer shows a tip-to-tip horncore measurement of 72 cm (Amundson *et al.* 2005), placing it within the range for extinct forms of bison (see Frison 1991).

Table 5.3 Summary of *Bison bison* elements from Layer I.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	23	1	3	1.5	42.8
Atlas	5	1	1	1	28.6
Cervical Vertebrae	14	4	4	0.57	16.3
Thoracic Vertebrae	4	1	1	0.14	4.0
Forelimb					
Scapula	13	1	2	1	28.6
Humerus	34	4	4	2	57.1
Radius	46	5	7	3.5	100
Ulna	18	4	6	3	85.7
Internal Carpal	2	2	2	1	28.6
Radial Carpal	1	1	1	0.5	14.3
Unciform Carpal	1	1	1	0.5	14.3
Fused 2/3 Carpal	1	1	1	0.5	14.3
Metacarpal	21	3	3	1.5	42.8
5th Metacarpal	0	0	0	0	
Hindlimb					
Innominate	1	1	1	0.5	14.3
Tibia	33	4	5	2.5	71.4
Lateral Malleolus	2	1	2	1	28.6
Calcaneus	7	4	4	2	57.1
Atragalus	10	3	3	1.5	42.8
Fused C/4 Tarsal	3	3	4	2	57.1
Fused 2/3 Tarsal	4	3	4	2	57.1
Metatarsal	52	4	5	2.5	71.4
Other Elements					
1st Phalanx	20	-	10	1.25	35.7
2nd Phalanx	9	-	5	0.62	17.4
3rd Phalanx	1	-	1	0.12	3.4
Miscellaneous					
Metapodial	2	-	-	-	-
Indeterminate	14	-	-	-	-
Vertebrae	2	-	-	-	-
Indeterminate Phalanx		-	-	-	-
Total	**343**				

Order Carnivora

Family Canidae

Canis sp. (SC5)

Identified faunal remains: NISP=5; right mandible/carnassial tooth (794), right lower 2nd molar (794b), right lower 2nd premolar (794a), right lower 3rd premolar (794c), right lower 4th premolar (794d).

Discussion: These teeth and mandible fragments were all found together. The teeth were heavily worn and likely represent one mature large canid. These specimens are of similar size to the *Canis lupus* specimens in the University of Saskatchewan comparative collection. Therefore, they are likely from a wolf or large domestic dog. No cultural modifications or thermal alterations are present on these specimens. Root etching is light to nonexistent and weathering is rated at stage 2 on Behrensmeyer's (1978) weathering index. The majority of these specimens are complete and the colour of the bone is similar to the rest of the assemblage.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP=35; long bone shaft fragments

Discussion: These long bone shaft fragments can only be classified into size class as they contain no identifiable attributes. Two of the specimens exhibit signs of thermal alteration and another two of the specimens are crenulated due to carnivore gnawing. No cultural modifications were observed. Based on the overall size of these specimens it is assumed that they are bison, but they can only be positively identified as large ungulates.

5.2.1 Seasonality

Immature Bison Elements

Nine immature bison elements have been identified in Layer I of the St. Louis site. These elements include five cervical vertebrae, one thoracic vertebra, one axis, one indeterminate vertebrate, and one skull fragment. These specimens could all have been from the same animal as they were found in association with each other. All nine of these immature specimens were too fragmented to estimate age at death and therefore seasonality could not be determined.

5.3 Layer II Faunal Assemblage (cultural affiliation unknown)

Layer II of the St. Louis site contains a total of 280 faunal specimens having a total weight of 5.0 kg. The majority of bone in this layer is identifiable (61.8%) and very few specimens exhibit any signs of thermal alteration, only 8.4% of the unidentifiable bone (Table 5.4). The fact that this is a relatively small assemblage may be due in part to the excavation procedure. The majority of this layer was excavated with a front end loader and therefore some of the small bone specimens may have been missed.

Table 5.4 Summary of faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	**%N**	**Weight(g)**	**N**	**%N**	**Weight (g)**	**N**	**Weight(g)**
Unburned	173	63.8	4718.6	98	36.2	170.1	271	4989.6
Burned	0	0	0	9	100	10.4	9	10.4
Total	**173**	**61.8**	**4718.6**	**107**	**38.2**	**180.5**	**280**	**5.0**

Two taxa are represented in Layer II and like Layer I these are bison (*Bison bison*) and a large canid (*Canis sp.*). Specimens were assigned to a size class when they could not be placed within a specific taxon (Table 5.5 summarizes).

Table 5.5 Summary of Layer II faunal remains.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	81	4
Large-Canid (SC5)	*Canis sp.*	44	2
Miscellaneous			
Very Large Mammal (SC6)		48	-
Total		**173**	

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP=81; Table 5.6 summarizes the identified bison elements from Layer II. Landmarks used in calculating the MNI and MNE are included in Appendix I.

Taxonomic description: See page 81.

Discussion: There is a minimum of four bison represented in Layer II. This MNI count is based on the number of distal tibia identified. None of the bison specimens exhibit any signs of thermal alteration. Taphonomic processes have had very little effect on the specimens, the majority of the bison bones experienced only light rootlet etching, and weathering of the bone was rated a stage 2 on Behrensmeyer's weathering index (Behrensmeyer 1978) (See Appendix II). Two specimens show signs of carnivore alteration, these specimens are crenulated and punctured. Cultural modification is present on five of the specimens in the form of cut marks. The majority of the bone has been broken by modern forces, likely due to the assemblage being mostly excavated with a front end loader.

Table 5.6 Summary of *Bison bison* elements from Layer II.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cervical Vertebrae	2	1	1	0.14	5.7
Sacrum	2	1	1	1	40
Forelimb					
Humerus	1	1	1	0.5	20
Radius	10	1	2	1	40
Ulna	4	1	1	0.5	20
Radial Carpal	2	1	2	1	40
Ulnar Carpal	1	1	1	0.5	20
Unciform Carpal	1	1	1	0.5	20
Fused 2/3 Carpal	2	2	2	1	40
Metacarpal	8	2	2	1	40

Hindlimb					
Innominate	1	1	1	0.5	20
Tibia	15	4	5	2.5	100
Lateral Malleolus	1	1	1	0.5	20
Calcaneus	3	3	3	1.5	60
Atragalus	2	2	2	1	40
Fused C/4 Tarsal	4	4	4	2	80
Fused 2/3 Tarsal	1	1	1	0.5	20
Metatarsal	5	1	2	1	40
Other Elements					
1st Phalanx	5	-	4	0.5	20
2nd Phalanx	2	-	2	0.25	10
Miscellaneous					
Metapodial	7	-			
Indeterminate	2	-			
Rib		-			
Total	**81**				

Table 5.6 (continued) Summary of *Bison bison* elements from Layer II.

Order Carnivora

Family Canidae

Canis sp. (SC5)

Identified faunal remains: NISP=44; left frontal (727a), right maxilla/premaxilla (727b), right maxilla (727c), frontal/parietal (729a), right frontal/parietal (729b), left maxilla/premaxilla (729c), right temporal (729d), left M^1 (730a).

Discussion: A minimum of two *Canis sp.* are present in Layer II based on the number of maxilla identified. The cranial fragments identified are of similar size to the *Canis lupus* specimens in the University of Saskatchewan comparative collection, but the teeth are somewhat smaller. However, the teeth are slightly bigger than those of the *Canis latrans* specimens. This may then represent a domestic canid. None of these specimens exhibit any signs of thermal or cultural alterations. Taphonomic forces affected these specimens in the same manner as the rest of the faunal remains in this assemblage. Rootlet etching is light and weathering was rated at stage 2 on Behrensmeyer's (1978) weathering index.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP=48; long bone shaft fragments.

Discussion: These long bone shaft fragments can only be identified on the basis of size as belonging to a large ungulate. They are likely bison, but without identifiable attributes they can only be classed into a size category. The taphonomic affects on these bones are the same as was observed for the rest of the assemblage. There were no thermal alterations or cultural modifications on these specimens. The breakage of the specimens was due largely to modern forces, likely the front end loader.

5.3.1 Seasonality

Immature Bison Elements

In Layer II of the site there were three elements that were identified as immature. These included one cervical vertebra, one left distal radius, and one left calcaneus. None of these specimens was sufficient to provide an age estimate, making seasonality evaluation of site occupation indeterminant.

5.4 Layer III Faunal Assemblage (cultural affiliation unknown)

The Layer III paleosol splits at the east end of the site to form two separated paleosols, termed Layers III and IIIa. It was important to excavate these paleosols separately as they may represent separate occupations. Upon conducting the faunal analysis it was determined that Layer IIIa recoveries are not cultural as there were no lithic artifacts found in this layer nor did the faunal remains display evidence of any cultural modifications or breakage patterns that would indicate it was an occupation level. These two paleosols will be discussed separately.

There were 146 faunal specimens recovered from Layer III of the St. Louis site. These had a combined weight of 0.73 kg. Unidentifiable bone made up 80.8% of the assemblage and 53% of these unidentifiable fragments were burned. Excavation methods

throughout this layer included mostly front end loader procedures, although twelve units that were excavated with hand tools. Table 5.7 summarizes this information.

Table 5.7 Summary of faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	28	19.2	654.4	55	37.7	54.7	83	709.1
Burned	0	0	0	63	43.2	22.6	63	22.6
Total	**28**	**19.2**	**654.4**	**118**	**80.8**	**77.3**	**146**	**731.7**

The only identifiable taxon represented in Layer III is *Bison bison*. One specimen was placed into the size class of very large mammal (SC6) as there was an insufficient amount of material present to identify this specimen further.

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP=32; MNE and MAU were calculated by identifying specific landmarks. These landmarks are presented in Appendix I.

Taxonomic description: See page 81.

Discussion: Based on the number of sided petrous temporal identified there is a minimum of one bison represented in Layer III. As identified in previous sections only one specimen showed signs of thermal alteration. Taphonomic processes affected this assemblage in the same manner as the previous assemblages with weathering rating at stage 2 on Behrensmeyer's (1978) scale and rootlet etching being nonexistent to light. One specimen was modified by carnivores and as a result was crenulated, while another specimen had cultural modifications in the form of cut marks. Again, the majority of these specimens were broken by modern forces, probably the result of excavation methods.

Table 5.8 Summary of *Bison bison* elements from Layer III.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	5	1	3	1.5	100
Forelimb					
Humerus	1	1	1	0.5	33.3
Ulna	15	1	1	0.5	33.3
Internal Carpal	1	1	1	0.5	33.3
Hindlimb					
Innominate	1	1	1	0.5	33.3
Femur	2	1	1	0.5	33.3
Miscellaneous					
Rib	3	-	-	-	-
Total	**28**				

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 1; long bone shaft fragment.

Discussion: There was only one specimen that did not have enough identifiable attributes to place it into a taxonomic category in Layer III. Based on size it is likely that this specimen is bison but this cannot be identified for certain. Taphonomic effects are the same on this specimen as the rest of the assemblage. No cultural or thermal alterations were observed and the specimen was broken by modern forces.

5.4.1 Seasonality

There were no immature or foetal bison elements found in Layer III of the site nor were there any other indicators of seasonality present in this Layer. Therefore, the seasonality for Layer III is unknown.

5.5 Layer IIIa Faunal Assemblage

Layer IIIa was identified only at the east end of the site in the course of hand excavations and contained 14 faunal specimens, not considered to be cultural, with three of these specimens being identifiable. Also, three of the specimens were burned and there

was a total weight of 0.09 kg. Because only a small portion of this paleosol was identified and the sample size is extremely small it can only be concluded based on the evidence at hand that this is a non-cultural layer.

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP = 2; rib blade (3356), left proximal femur (3541).

Taxonomic description: see pg 81.

Discussion: There were two specimens in this Layer that were identified to bison. Taphonomic processes had similar results on these specimens as they did on the previous assemblages. Rootlet etching was light and weathering was rated at stage 2 on Behrensmeyer's (1978) weathering index. No cultural or carnivore modifications were observed nor were thermal alterations. The femur exhibited a spiral fracture, or green fracture, which can be considered to be the result of cultural activity. However, natural processes, such as trampling, freeze/thaw, and post-depositional movement, can also produce spirally fractured bone. Therefore, the presence of spirally fractured bone cannot be interpreted as a product of human cultural behaviour without the presence of additional evidence to favour such an interpretation (Agenbroad 1989).

Small-medium Mammal (SC3)

Identified faunal remains: NISP=1; right rib head (3538)

Discussion: Only one specimen was identified to this size class in Layer III. Without the presence of more diagnostic elements the taxon cannot be determined. This specimen exhibits no signs of thermal or cultural alterations.

5.6 Layer IV Faunal Assemblage (possible Mummy Cave occupation)

The Layer IV faunal assemblage at the St. Louis site contained a total of 749 faunal specimens with a total weight of 5.2 kg. The majority of the assemblage (by number) consisted of unidentifiable bone (63.8%), of which 25.7% were burned (Table 5.9). Like the previous assemblage both heavy equipment and hand tools were used to excavate this layer, with twelve units being excavated by hand during the 2003 field season.

Table 5.9 Summary of faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	263	42.6	4660.1	355	57.4	356.8	618	5016.9
Burned	8	6.1	92.0	123	93.9	75.2	131	167.2
Total	**271**	**36.2**	**4750.9**	**478**	**63.8**	**432.0**	**749**	**5184.1**

The Layer IV assemblage is the most diverse of all faunal assemblages at the St. Louis site, containing 5 different taxa. The majority of the identifiable bone can be identified as very large mammal with 32.8% being identified as *Bison sp.* and with another 38.7% only being identifiable into a size class. Like the above assemblages, it is assumed that these specimens are bison but without identifiable attributes they cannot be identified further than size class. The following chart (5.10) presents the identified taxon.

Table 5.10 Summary of Layer IV faunal remains.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison sp.*	129	2
Large-Canid (SC5)	*Canis sp.*	71	2
Snowshoe hare	*Lepus americanus*	1	1
Voles	*Microtus sp.*	2	1

Birds Sharp-tailed grouse	*Tympanuchus phasianellus*	1	1
Fish		2	
Miscellaneous Very Large Mammal (SC6)		65	-
Total		**271**	**7**

Table 5.10 (continued) Summary of Layer IV faunal remains.

Order Artiodactyla

Family Bovidae

Bison sp.

Identified faunal remains: NISP= 129; MNE and MAU are summarized in Table 5.11, these values were calculated using landmarks outlined in Appendix I.

Taxonomic description: By the end of the Pleistocene there seem to have been only two bison species remaining; *Bison antiquus* and *Bison occidentalis*. Fossil remains of these animals indicate that *B. occidentalis* ranged on the Northern Plains and *B. antiquus* on the Southern Plains with a possible area of overlap that moved southward over time (Frison 1991:272). A recent article pertaining to late Pleistocene fauna at the Wally's Beach site (DhPg-8) in Alberta (McNeil *et al.* 2004) supports the notion of *B. occidentalis* being a northern species by indicating that *B. antiquus* were isolated south of the ice sheets during the Wisconsin glaciation and that the northern species (*B. occidentalis*) migrated into southern North America after deglaciation. Identification of the species present at this site is pending further investigation. Modern *Bison bison* morphology is different from both these fossil forms with modern bison being considerably smaller. The tip-to-tip spread of horn corns has decreased during the Holocene at a rate of approximately 32mm/1000 years. There may have been an increase in dwarfing rates during the Altithermal (6500-4500 years BP). This dwarfing may have been due to changing environmental conditions from the cooler Pleistocene which favoured the smaller animals as they required smaller quantities of forage than larger forms (Wilson 1978; Frison 1991). Also, there has been a downward displacement of the

head, the lateral placement of the orbits, and a shortening of the limbs which favoured grasslands grazing (McDonald 1981). It is unclear which fossil form was the progenitor of the modern *B. bison*. Regardless of the progenitor *B. bison* is the only remaining form on the Plains after 5000 BP (Leyden 2004; Frison 1991;Wilson 1978).

Discussion: A minimum of two individuals can be identified in Layer IV based on the number of maxilla, astragalus, and distal metatarsals present. Cultural modifications are present on seven of the specimens in the form of cut marks, chopping marks, and scraping marks. Thermal alterations are rare with only seven specimens being burned. Taphonomic processes are again similar to the above assemblages with weathering rating at stage 2 on Behrensmeyer's (1978) scale and 61.8% of the identified specimens being rootlet etched. Seven specimens have been crenulated and/or punctured by carnivore gnawing and two of the specimens have been altered by insect activity. Over half (53.9%) of the bison specimens have been broken by modern forces again due to the excavation of the majority of the artifacts from this layer by heavy equipment. It is likely that these specimens represent one of the extinct forms of bison, *B. antiquus* or *B. occidentalis*. There were not enough specimens present in this site, however, to conduct statistical analyses in order to determine for certain that these represent an extinct form and therefore this can only be an assumption based on general size comparisons.

Table 5.11 Summary of *Bison sp.* elements from Layer IV.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	9	2	3	1.5	100
Thoracic Vertebrae	2	1	1	0.07	4.6
Forelimb					
Scapula	11	1	2	1.0	66.7
Humerus	6	2	2	1.0	66.7
Radius	15	1	1	0.5	33.4
Ulna	2	1	1	0.5	33.4
Metacarpal	2	2	2	1.0	66.7

Hindlimb					
Innominate	1	1	1	0.5	33.4
Femur	14	1	1	0.5	33.4
Patella	2	1	2	1.0	66.7
Tibia	1	1	2	1.0	66.7
Lateral Malleolus	2	1	2	1.0	66.7
Calcaneus	3	1	1	0.5	33.4
Atragalus	2	2	2	1.0	66.7
Metatarsal	5	1	1	0.5	33.4
Other Elements					
1st Phalanx	6	-	5	0.62	41.3
2nd Phalanx	6	-	4	0.5	33.4
Miscellaneous					
Rib	6	-	-	-	-
Metapodial	2	-	-	-	-
Skull fragments	32	-	-	-	-
Total	**129**				

Table 5.11 (continued) Summary of *Bison sp.* elements from Layer IV.

Order Carnivora

Family Canidae

Canis sp. (SC5)

Identified faunal remains: NISP= 71; MNE and MAU are summarized in table 5.12. These values were determined by noting landmarks similar to those listed for bison specimens in Appendix I. See Plates 5.1 and 5.2 for photographs of these specimens.

Discussion: Based on the number of axial specimens recovered there is one canid present in Layer IV. A near complete vertebral column is present along with the innominate. The skull and mandible are missing and therefore statistical analysis to determine species is not possible, as this requires these elements to be complete. Based on size, these specimens are slightly larger than the modern *Canis lupus* specimens in the comparative collection. Therefore, these specimens likely represent a *Canis lupus* individual or a large domestic dog. Taphonomic processes are similar to the rest of the assemblage with weathering rating a stage 2 on Behrensmeyer's (1978) scale and all specimens show light rootlet etching. There were no thermal or cultural modifications on any of the specimens, however, their association with other artifacts indicated that they are part of the cultural assemblage. All of these canid specimens either were complete

elements or had been broken by modern forces only, again from the heavy equipment used in excavation.

Table 5.12 Summary of canid elements from Layer IV.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cervical Vertebrae	4	1	4	0.57	49.6
Thoracic Vertebrae	19	1	15	1.15	100
Lumbar Vertebrae	8	1	5	0.71	61.7
Caudal Vertebrae	8	1	8	0.40	26.7
Sacrum	1	1	1	1	67
Hindlimb					
Innominate	3	1	2	1	67
Other Elements					
Ribs	28	-	-		
Total	71				

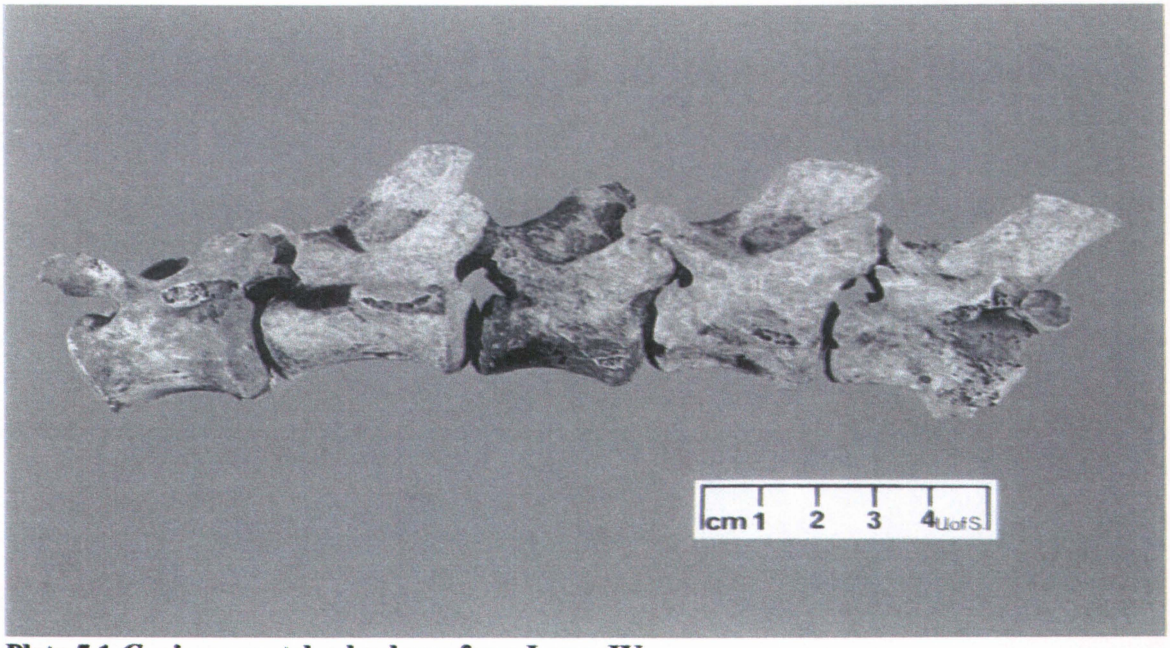

Plate 5.1 *Canis sp.* vertebral column from Layer IV.

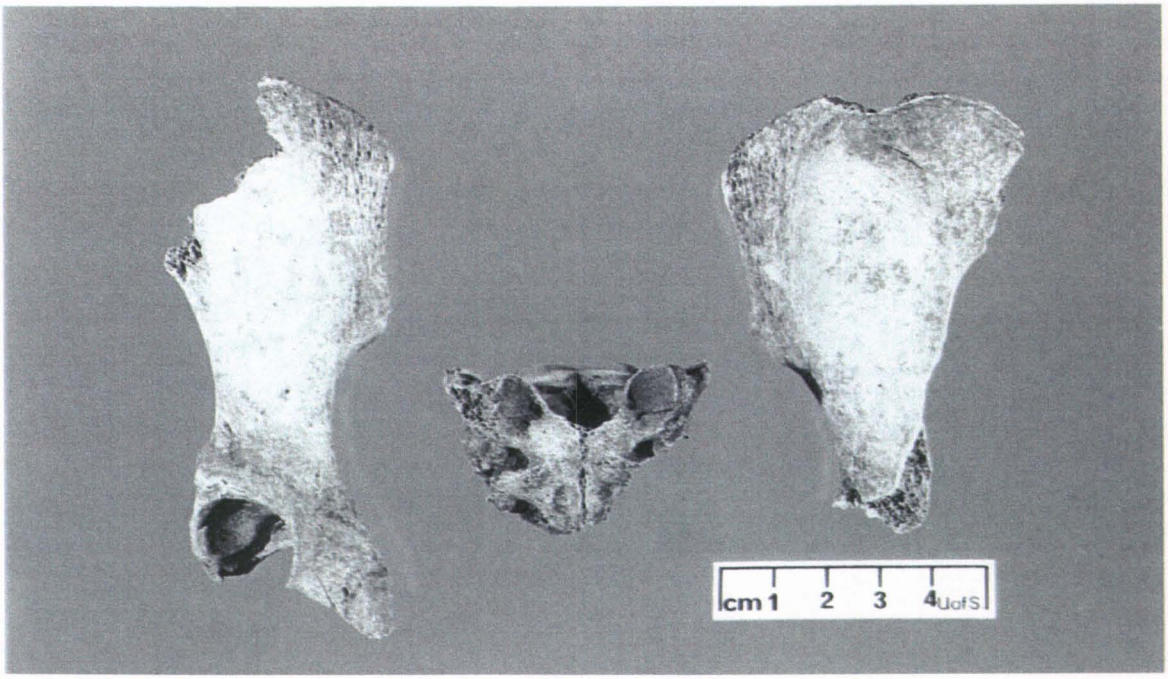

Plate 5.2 *Canis sp.* innominate and sacrum from Layer IV.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP= 1; first hind phalanx (3163), left mandible with teeth present.

Taxonomic description: The centre of the snowshoe hare's range in Canada is in Saskatchewan. Here the species can be found throughout the province but is most common in the Aspen Parkland Ecoregion and in the Boreal Plain Ecozone. These hares prefer the mixed-wood forests where much cover is available. The snowshoe hare relies on grasses and sedges for food in the summer and bark, buds, and even meat of carcasses they find in the winter. A survival strategy is to change colour by the seasons, from brown in the summer to white in the winter, in order to be camouflaged from predators. The hare has large hind feet allowing it to travel over deep snow without sinking. The average weight of a female is 1.56 kg and that of a male is 1.31 kg (Saskatchewan Environment and Resource Management 2001:27-29).

Discussion: These specimens have experienced the same taphonomic effects as the rest of the assemblage. No cultural or thermal alterations were observed and both specimens were complete.

Order Rodentia

Family Muridae

***Microtus sp.* (SC1)**

Identified faunal remains: NISP=2; right mandible, incisor, and indeterminate molar (3359).

Discussion: This specimen was similar to the rest of the assemblage in colour and taphonomic effects. The molar tooth was too heavily worn to determine species.

Order Galliformes

Family Phasianidae

Tympanuchus phasianellus

Identified faunal remains: NISP = 1; left carpometacarpus (3373).

Taxonomic description: The sharp-tailed grouse has been found throughout Saskatchewan, but is most common and is a permanent resident in the settled south of the province (the Prairie Ecozone) mainly in lightly grazed pastures that contain snowberry and rose bushes (Smith 2001:59).

Discussion: This specimen was identified as sharp-tailed grouse based on both size and the distinctive appearance of the carpometacarpus. The specimen displays no cultural or thermal alterations, but is similar in colour and was associated with the rest of the assemblage.

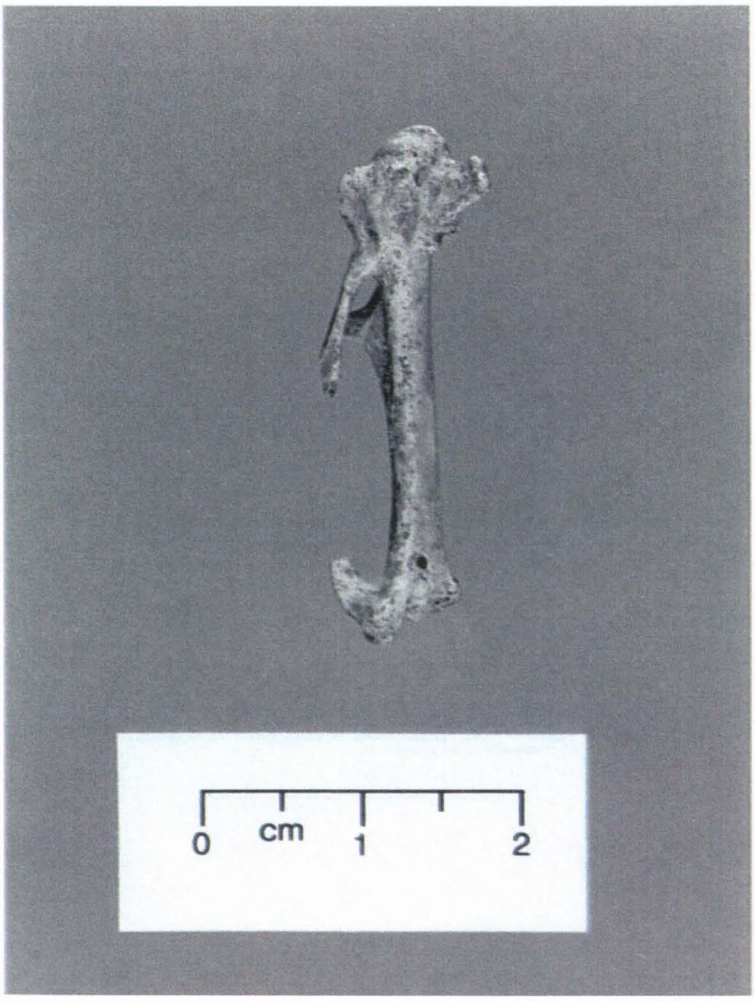

Plate 5.3 *Tympanuchus phasianellus* carpometacarpus from Layer IV.

Fish

Indeterminate Fish (large pike sized)

Identified faunal remains: NISP=2; skull fragments (3358, 2901).

Discussion: These specimens were recovered from the 2003 excavation in units 107N/130E and 109N/130E. There was not enough identifiable material to identify the specimens to a taxon and they were determined to be large fish, approximately large pike sized. There were no thermal or cultural modifications observed on the specimens. Their colour and association with other artifacts indicate they were part of the cultural assemblage.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 65; 64 long bone fragments, 1 enamel fragment.

Discussion: Identifiable attributes on these specimens are lacking and therefore they can only be identified to size class. It is likely that these specimens represent bison, but that can only be speculated. Taphonomic effects are similar to the rest of the assemblage as weathering is rated at stage 2 on Behrensmeyer's (1978) scale and the majority of the specimens show light rootlet etching. Only one specimen was thermally altered and no specimens were culturally modified. Breakage varies from modern to pulverized and therefore some of the breakage is likely to have been cultural.

5.6.1 Seasonality

Immature Bison Elements

Five immature specimens were identified in Layer IV. One thoracic vertebra was too large to determine age because the time span of vertebral epiphyseal fusion is too long. This specimen also exhibited chopping marks. A humerus epiphysis was identified but was too fragmented to estimate age. The shaft of a humerus, however, was identified and when compared to the comparative collection was the same size as an eight month old bison calf. An immature bison scapula was identified, missing the glenoid cavity, the coracoid process and part of the blade. This was compared to the comparative specimens and was determined to be the same size as a bison at eight months gestation. The complete occipital portion of a bison skull was identified in Layer IV. The porous appearance indicated it as immature and when compared to the immature bison specimens in the comparative collection it was the same size as a one week old bison calf.

5.6.2 Discussion

One way to determine the seasonality of an archaeological site is to perform measurements on mandibles, maxilla, and isolated teeth and then analyse these measurements in a statistical manner to determine the age of individuals (Frison 1978;

Todd and Hofman 1987). There are not enough of these elements present in this assemblage to conduct such an analysis and therefore a size comparison was conducted with the comparative collections at the University of Saskatchewan. Although this method is slightly less accurate than the statistical measurements described above, a relatively sound estimate of age can be made. Seasonality can then be judged based on the birthing schedule of bison (mid-April to mid-June).

An eight month old bison would have been available from mid-December to mid-February, while an 8th month gestation bison and a one week old calf would have been available from mid-March until the middle-end of June. Because there is only one month separating these two time ranges it is estimates that Layer IV represents a late winter/early spring occupation. The presence of fish remains supports this seasonality evaluation as they would be available during seasons of open water.

5.7 Layer IVa Faunal Assemblage

Layer IVa is a paleosol present only at the east end of the site and was recognized only during the hand excavations, therefore, the number of faunal remains recovered is small. Like paleosol IIIa there were no lithic artifacts present in this layer nor did the faunal remains exhibit any signs of being modified by human cultural behaviour. Therefore, although the sample size is small it can only be assumed that the faunal remains were accumulated by non-cultural or natural means.

There was a total of 17 specimens identified in Layer IVa with a total weight of 0.34 kg. Thirteen of these specimens were unidentifiable and of these 13 specimens 12 were burned (Table 5.13 summarizes).

Table 5.13 Summary of faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	4	80	327.3	1	20	0.05	5	327.35
Burned	0	0	0	12	100	10.1	12	10.1
Total	**4**	**23.5**	**327.3**	**13**	**76.5**	**10.15**	**17**	**337.45**

Table 5.13 shows that based on number of specimens 76.5% of the faunal assemblage is unidentifiable, however, based on weight alone 96.9% of the assemblage is made up of identifiable specimens.

Only one taxon, *Bison sp.*, was present in Layer IVa, likely due to the small area of this paleosol that was excavated. The remaining unidentifiable faunal specimens were too fragmented to be put in a size class.

Order Artiodactyla

Family Bovidae

Bison sp.

Identified faunal remains: NISP=4; right fused 2/3 tarsal (3559), 1st phalanx (3558), right distal radius (3560), right metacarpal (3557).

Taxonomic description: See page 93.

Discussion: Based on the elements identified above only one bison is represented in Layer IVa. Both the radius and the metacarpal are immature specimens. There were no thermal or cultural alterations on any of these specimens. Weathering was rated at stage 2 on Behrensmeyer's (1978) weathering scale and none of the specimens had been rootlet etched.

5.7.1 Seasonality

There were no specimens identified in this assemblage that could be used to estimate season of site occupation. This is understandable given the extremely small sample size of faunal specimens.

5.8 Discussion and Summary of the Site Assemblages

5.8.1 Layer I Assemblage (possible Oxbow)

There were two different taxa identified in Layer I at the St. Louis site. These were *Bison bison* (MNI=5) and a large canid species (*Canis lupus* size). Less than twenty-five per cent of the assemblage was burned indicating that perhaps grease extraction was not one of the main activities occurring at the site. There may be more than one occupational event in this layer as this upper paleosol has been the stable ground surface for at least 4000 radiocarbon years. Sediment mixing also occurred in this paleosol due to rodent activity and plant root growth.

The entire faunal assemblage may not have been completely recovered as the majority of the occupation was excavated by heavy equipment. Therefore, the large specimens would have been collected while many of the small mammal, bird, or fish remains (if they were present) would have likely been missed. Seventeen one by one metre units were excavated by hand at the south end of the site in the 2003 field season. These units were placed adjacent to the rise of the highest terrace. There were very few faunal remains recovered from these hand excavations (876) and only 100 of these were identifiable to species and element. Many of the faunal remains were fragmented and very few were burned. There were several small piles of fragmented bone and it is possible that this area of the site was used as a refuse dump.

The distribution of artifacts did not indicate any patterning indicative of activity areas. The nature of this assemblage appears to be a butchering or special processing site (Sivertsen 1980). This is indicated by the dispersed and disarticulated limb elements, the presence of mainly limb elements as opposed to axial elements, the relative completeness of many of the specimens, the removal of the distal ends of limbs (possible evidence of marrow extraction), the lack of tool making debitage, and the low diversity of species recovered. There was also a large hammer stone or ax recovered from this layer in the 2002 heavy equipment exactions. This could have been used in butchering processes. A large amount of fragmented unidentifiable bone was recovered and may further indicate processing activities. Also, a small pile of fire broken rock was uncovered at the eastern

end of the site. There was no hearth in association with this pile nor were the rocks within a pit feature. Therefore, it is possible that this was a refuse pile of fire broken rock or another unidentified feature where the rocks were heated and placed together above ground.

The canid specimens identified in the site did not show evidence of butchering or burning but are of similar colour and association with the rest of the assemblage and therefore are considered cultural. It could not be determined if this was a wild or domestic canid.

The seasonality of Layer I could not be identified based on the faunal assemblage recovered. As stated above this assemblage may not be represented in its entirety as excavation methods (heavy equipment) may not have recovered all specimens and therefore the nature of the occupation could only be speculated from the artifacts collected. The occupation is attributed to the Oxbow Complex based on a radiocarbon date of 4590 ±60 rcybp (Beta-173608). No diagnostic artifacts were recovered to strengthen this affiliation.

All specimens in this assemblage and subsequent assemblages at the site were rated at stage 2 on Behrensmeyer's (1978) weathering index. This indicates that the faunal remains were not exposed on the ground surface for a prolonged period of time and that they were likely covered over quickly by sediments as a result of river flooding.

5.8.2 Layer II Assemblage

Layer II contains a small faunal assemblage with only 280 specimens being recovered. The majority of these specimens (61.8%) were identifiable and two taxa were identified; *Bison bison* (MNI=4) and a large canid species (*Canus lupus* size) (MNI=2). Very few specimens (9) were burned and no hearth features were uncovered.

The nature of this occupation is hard to determine because of the small number of faunal remains recovered, although from the evidence at hand it appears to be similar to the Layer I assemblage. The majority of the bison remains were limb elements that were relatively complete with several having had the distal ends removed. The limb elements

were disarticulated and dispersed across the site in no manner that would indicate activity areas. Lithic artifacts were rare with no tools being recovered. The assemblage is known to be cultural as five bison specimens had butchering marks.

Canid specimens were identified in this assemblage and appear to be between the sizes of the *Canis lupus* and *Canis latrans* specimens in the comparative collection. It could not be determined if these were the remains of wild or domestic canids. None of these specimens showed evidence of butchering or burning although they were of similar colour and were in close association with the rest of the assemblage.

There was no radiocarbon sample submitted for this layer and no diagnostic artifacts were recovered. Therefore, cultural affiliation is unknown. Seasonality could not be determined for this assemblage based on the faunal remains recovered.

5.8.3 Layer III Assemblage

Layer III was another small assemblage with only 146 faunal specimens being recovered. The majority of the specimens were unidentifiable (80.8%) and burned (53%). Bison (MNI=1) was the only taxon identified in this assemblage and one of these specimens showed signs of butchering. The nature of this occupation is unknown as the assemblage is small, there were few lithic materials uncovered, and signs of butchering were rare. This assemblage differs from the Layer I and Layer II assemblages as more of the specimens were fragmented and burned. This may indicate further processing of the bison remains, although no features were recovered. Cultural affiliation could not be determined for this occupation as no radiocarbon date was submitted and no diagnostic artifacts were recovered. Seasonality is unknown.

Layer IIIa will not be summarized in this section as it was determined to be non-cultural and therefore is not pertinent to the interpretations of this thesis.

5.8.4 Layer IV Assemblage (possible Mummy Cave)

Layer IV contained the most diverse faunal assemblage at the site. Here five taxa were identified; *Bison sp.* (MNI=2), large *Canis sp.* (MNI=2), snowshoe hare (MNI=1),

a vole (*Mictrotus sp.*) (MNI=1)), sharp-tailed grouse (MNI=1), and indeterminate fish specimens. Processing of faunal remains was occurring during this occupation as the majority of the remains were fragmented (63.8%), although few of the specimens were burned indicating that perhaps grease extraction or use of the bone fragments as fuel was not occurring to a high degree. No hearth features were recovered either.

The nature of this occupation was also difficult to determine as a large portion of it was excavated by heavy equipment. Nevertheless, from the diversity of faunal remains recovered, their fragmented nature, and the presence of lithic artifacts it is likely that this represents a campsite or multiple activity site. Several of the bison specimens (7) exhibited signs of butchering and a bifacial knife was recovered at the east end of the site that could have been used in such activities. The majority of the bison specimens were limb elements that and were likely transported to the site from elsewhere. Very few axial elements were recovered. It should be noted that the bison present in Layer IV are considerably larger than modern specimens and likely represent one of the extinct forms of bison (*B. antiquus* or *B. occidentalis*). With the small sample size, statistical analyses could not be conducted to determine which species was present.

The canid specimen recovered is larger than the *Canis lupus* specimen in the departmental comparative collection and may represent this species or a large domestic dog. No butchering marks were observed. The snowshoe hare, sharp-tailed grouse, and fish specimens also did not show cultural alterations, although their colour and association with other artifacts indicates they were part of the cultural assemblage. These smaller, secondary subsistence sources indicate that a wide range of resources was being utilized with bison still being the main focus. This will be discussed further in chapter seven.

Seasonality of this site was estimated from immature and foetal bison remains to be late winter/early spring occupation. The presence of fish remains supports an open water seasonality. This assemblage has been identified as a possible Mummy Cave Series occupation. This is based on a radiocarbon date of 6220 ± 70 (Beta-173611). No diagnostic artifacts were recovered from this layer to confirm the cultural affiliation.

Layer IVa was identified at the east end of the site and was not determined to be cultural. Therefore, the faunal remains recovered here will not be discussed as this thesis is concerned with faunal remains from cultural occupations only.

Chapter Six

The Below Forks Site Faunal Assemblage

6.1 Introduction

There were fifty-two whole or partial one metre square units opened up in the 1980, 2000, 2001, 2002 field seasons at the Below Forks site. These units were not in a continuous excavation block (as shown Figure 4.4 in chapter four) but were in two main excavation blocks, the central block and the eastern block. Also, there were two units opened in 1980 and two others opened in the north west corner of the site in 2001. The units in the north west corner were not analysed for this thesis as they could not be stratigraphically coordinated to the rest of the site.

The central block, eastern block, and 1980 block materials were analysed for this thesis as Oxbow occupations and/or the Mummy Cave occupation could be identified in each block based on projectile points, radiocarbon dates, and density of artifact concentrations. The occupations could not be traced stratigraphically across the site as the stratigraphy is extremely complex (Figure 3.4 chapter three) and because the excavation blocks were spaced a great distance apart; more than 60 metres between the central and the eastern blocks. Because of these factors the occupations can only be assumed to correlate across the entire site. To address this situation the data are presented by block, after which each occupation is discussed to determine site wide patterns. Paleosols that contain artifacts but could not be correlated across the site, or that had been too disturbed to identify specific occupations were not included in this faunal analysis. See chapter three, Figures 3.4 and 3.5 for orientation of paleosols and occupations.

6.2 Central Excavation Block

6.2.1 Upper Occupation 1 Faunal Assemblage (cultural affiliation unknown)

There are likely several faunal specimens that were analysed in this occupation that are not part of a cultural occupation. These artifacts were located in gravel lenses and may have rolled down from up the slope. Some of these specimens were mineralized and are likely of different age than the rest of the specimens. Because it was difficult to separate out which bones were intrusive and which were cultural all faunal remains, regardless of method of deposit, were included in this assemblage. The number of bones located within these gravel lenses was low.

The Upper Occupation 1 at the Below Forks site contained a total of 1551 faunal specimens with a total weight of 2.27 kg. Unidentifiable bone makes up 88.6% of the assemblage and 67.4% of the assemblage, based on frequency, was burned, while 57.9% of the assemblage based on weight was burned. Table 6.1 summarizes this information.

Table 6.1 Summary of Upper Occupation 1 faunal assemblage based on burning.

	Identified			**Unidentified**			**Total**	
	N	**%N**	**Weight(g)**	**N**	**%N**	**Weight (g)**	**N**	**Weight(g)**
Unburned	140	9.0	1116.1	365	72.2	202.0	505	1318.1
Burned	36	2.3	295.9	1010	96.6	658.7	1046	954.6
Total	**176**	**11.3**	**1412.0**	**1375**	**88.6**	**860.7**	**1551**	**2272.7**

There are eight different taxa represented in this assemblage, with the snowshoe hare having the highest number of identifiable specimens. Some specimens could only be identified into a size class and the majority of these belong to size class six (very large mammal). Unlike the St. Louis site it cannot be assumed that these are bison elements because other large ungulates, such as deer and caribou, have been identified within several of the site's assemblages. Two of these large ungulate specimens are tools and are not believed to represent food resources, however, many large ungulates are present in the site area and likely would have been present during the occupation time periods.

Therefore, bone specimens without species identifying attributes could not be assumed to belong to one large ungulate when in actual fact it could represent one of several. There were also specimens that could only be identified into a class of elements and they were not identifiable to a size class (could have fallen into more than one). These specimens were still considered identifiable and classified as identifiable only to an element group. These will not be discussed in any detail as they will not add specific information to the faunal assemblage. Table 6.2 summarizes the faunal remains.

Table 6.2 Summary of Upper Occupation 1 faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	11	1
Deer	*Odocoileus sp.*	1	1
Snowshoe hare	*Lepus americanus*	73	3
American beaver	*Castor canadensis*	1	1
Northern pocket gopher	*Thomomys talpoides*	2	1
Woodchuck	*Marmota monax*	4	1
Birds			
Anas sp.		6	1
Miscellaneous			
Very Large Mammal (SC6)		54	
Small-Medium Mammal (SC3)		2	
Small Mammal (SC2)		2	
Micro-Mammal (SC1)		4	
Small-Medium Bird (SC3)		6	
Identifiable to element group only		16	
Total		**176**	

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP = 11. MNE and MAU values are summarized in Table 6.3, these values were calculated using landmarks summarized in Appendix I.

Taxonomic description: See page 81.

Discussion: Based on the number of identifiable elements (summarized in Table 6.3) there is one bison represented in the Upper Occupation 1 of the site. Only one of the specimens is burned and there are no cultural modifications present on any of the specimens in this assemblage. Taphonomic processes resulted in the specimens experiencing light rootlet etching and weathering rated at a stage 2 on Berhensmeyer's (1978) weathering index (see Appendix II). Two of the specimens had been affected by carnivores; these were crenulated, pitted, and had signs of tooth drag marks. The number of bison elements in this assemblage is low and it is entirely possible that many of the specimens that could only be placed in the very large mammal size class are also bison. However, this is impossible to know as they could also belong to other large ungulates.

Table 6.3 Summary of *Bison bison* elements from the Upper Occupation 1.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	2	1	1	0.5	50
Atlas	1	1	1	1	100
Hindlimb					
Tibia	1	1	1	0.5	50
Lateral Malleolus	1	1	1	0.5	50
Atragalus	2	1	2	1	100
Metatarsal	1	1	1	0.5	50
Other Elements					
1st Phalanx	1	-	1	0.125	12.5
2nd Phalanx	1	-	1	0.125	12.5
Miscellaneous					
Sesamoid	1	-	-	-	
Indeterminate	1				
Skull Fragments					
Total	**11**				

Odocoileus sp.

Identified faunal remains: NISP = 1; right proximal metatarsal (11095)

Discussion: Only one specimen was identified as deer in this assemblage and no cultural or thermal alterations were observed. Taphonomic effects were similar to that of the bison specimens, although no tooth marks were present.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 73, MNE is summarized in Table 6.4.

Taxonomic description: See page 97.

Discussion: There is a minimum of three snowshoe hares present in this assemblage. The majority of the specimens is located in unit 84N/137E at a depth ranging from 25-35 cm below the datum and likely represent one individual as a nearly complete skeleton is present. There are no visible cut marks present on any of these specimens nor are there any carnivore or rodent modifications present. A left mandible (15440) and a left maxilla are burned black, however, the rest of the specimens do not exhibit any signs of burning. The majority (87%) of the specimens are complete or unbroken. The preservation of the specimens is excellent with weathering rating at stage 2 on Behrensmeyer's (1978) weathering index and rootlet etching was light to nonexistent.

Table 6.4 Summary of snowshoe hare elements from the Upper Occupation 1.

	NISP	MNI (Side)	Total MNE
Axial Skeleton			
Cranium	3	2	2
Mandible	4	2	4
Atlas	1	1	1
Cervical Vertebrae	2	1	2
Thoracic Vertebrae	6	1	*
Lumbar	5	1	*
Sacrum	2	2	2

Forelimb			
Scapula	3	2	3
Humerus	3	2	3
Radius	1	1	1
Ulna	1	1	1
Metacarpal	4	1	4
Hindlimb			
Innominate	1	1	1
Tibia	4	3	4
Femur	1	1	1
Calcaneus	2	1	2
Atragalus	2	1	2
Fused C/4 Tarsal	2	1	2
Metatarsal	6	1	6
Other Elements			
1st Phalanx	6		
2nd Phalanx	1		
3rd Phalanx	1		
Miscellaneous			
Ribs	11		
Total	**73**		

Table 6.4 (continued) Summary of snowshoe hare elements from the Upper Occupation 1.

Order Rodentia

Family Castoridae

Castor canadensis

Identified faunal remains: NISP = 1; left proximal radius (13852).

Taxonomic description: The beaver is a common animal throughout the entire province of Saskatchewan except for the extreme northeast corner. They inhabit slow moving streams, lakes, rivers, and marshes. Beavers build dams and lodges out of mud, green branches and small logs. Their preferred food is aspen bark but they will also eat willow and birch bark along with aquatic plants, and grasses. Beavers do not hibernate, as they remain in their lodges feeding on stock piled food (Saskatchewan Environment and Resource Management 2001:65-67).

Discussion: Beavers are common in the area surrounding the site today and it is likely that this was also the case in the past as the site is located along the Saskatchewan River and there is an oxbow lake to the north of the site. This specimen was affected in the same manner as the rest of the assemblage by taphonomic processes. There is no

evidence of cultural, carnivore, or rodent modification on this specimen, however, it is burned black which may indicate human alteration.

Family Geomyidae

Thomomys talpoides

Identified faunal remains: NISP = 2; left humerus (1688), left femur (1687).

Taxonomic discussion: These solitary rodents prefer to inhabit natural grasslands, cultivated fields, and river banks. Soil preference varies, from moist and loose to sandy soils. These animals do not hibernate and are active in the winter. They mate in April and after a 3-4 week gestation period the young are born. They venture out on their own at two months of age and are full grown at five months. Northern pocket gophers are common in all the prairie provinces below the boreal forest line.

Discussion: These specimens are both immature as the epiphysis have not yet fused. They are both of similar size to the comparative specimens and so it is assumed that they are close to full grown size. These animals are common in river bank areas and it is possible that they represent background fauna or specimens deposited by natural processes. There are no cultural or thermal modifications present on these remains.

Family Sciuridae

Marmota monax

Identified faunal remains: NISP = 4; right tibia (13541), metapodial (13542), right calcaneus (13543), right astragalus (13544).

Taxonomic description: The woodchuck is found throughout North America, and in Saskatchewan it is found mainly in the northern portion of the province. Their preferred habitats are dry, open woods, as well as rocky ravines and grassy meadows. Woodchucks are hibernators, hibernating from early October to March or April.

Discussion: These specimens were all found in unit 86N/136E at a depth of 25 cm below the datum and possibly may be from the same individual. These specimens did not exhibit any cultural or thermal alterations.

Order Anseriformes

Family Anatidae

Anas sp.

Identified faunal remains: NISP = 6; left ulna (13576), left humerus (11683), right coracoid (11684), left ulna (11685), left scapula (11686), left carpometacarpus (11687). See Plate 6.1 for photographs of these specimens.

Discussion: These specimens were identified as belonging to the genus *Anas* based on size and morphology, however, specific species could not be identified. All of the specimens were found in unit 88N/132E except for one ulna (13576), which was located in unit 86N/136E. All specimens were found at a depth ranging from 55-65 cm below the datum. Many of the species in this genus only summer in Canada and spend their winters in the United States, however, species such as *Anas platyrhynchos* (Mallard) can be found in areas of Saskatchewan throughout the year. Therefore, seasonality cannot be inferred with confidence from these specimens. These specimens were not culturally modified but the colour is consistent with the rest of the assemblage.

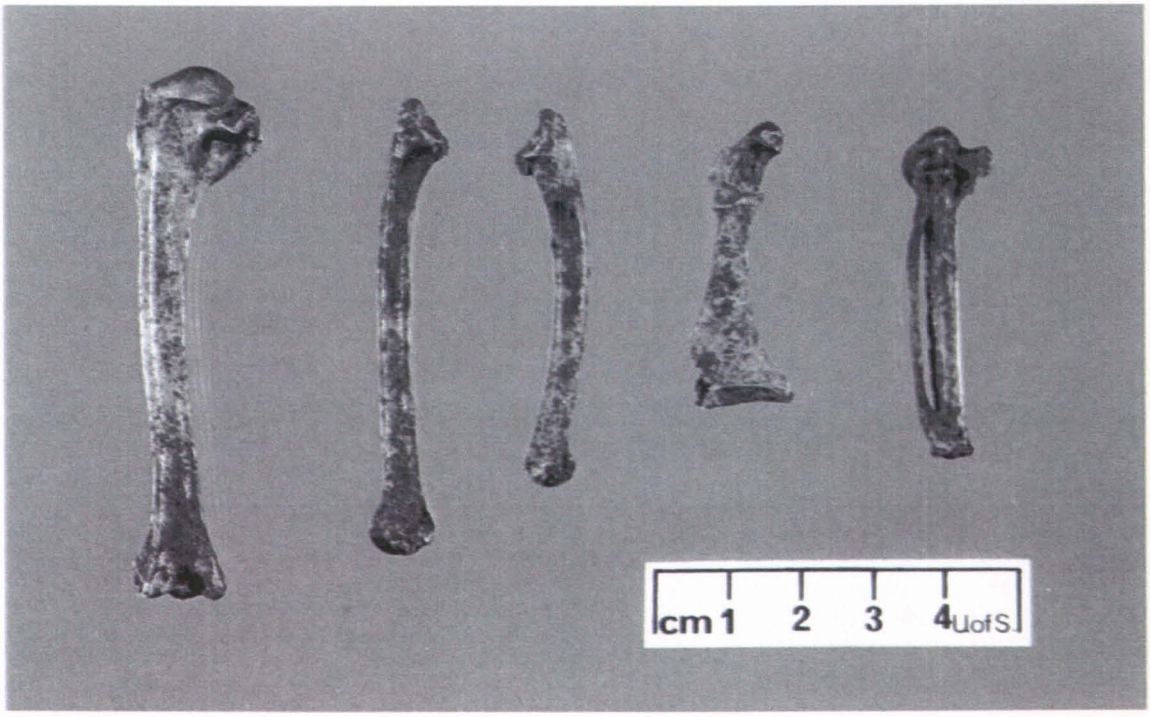

Plate 6.1 *Anas sp.* specimens from the Upper Occupation 1.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 54; MNI and MNE are summarized in Table 6.5 below. Landmarks used are similar to those listed in Appendix I.

Discussion: There is a minimum of one unidentifiable ungulate present in this assemblage. These specimens could not be placed into a taxon because several different species of large ungulates have been either identified in the site assemblages or are common to the area. Also, these specimens were fragmented to a higher degree than the rest of the identifiable specimens in this assemblage. Thermal alteration in the form of burning was present on 50% of the specimens and no butchering marks were observed. Two of the specimens had been modified by carnivores, one having possibly passed through a digestive tract. Taphonomic modifications were similar to the rest of the assemblage with light rootlet etching and weathering rating at stage 2 on Behrensmeyer's (1978) index. Several of the specimens were recovered from gravel lenses and were mineralized. These are likely not part of the cultural assemblage, but due to the bioturbation in this assemblage it cannot be said with certainty if they were intrusive and therefore are included in the assemblage.

Table 6.5 Summary of very large mammal elements from the Upper Occupation 1.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	4	1	1	0.5	100
Mandible	1	1	1	0.5	100
Atlas	1	1	1	0.5	100
Cervical Vertebrae	1	1	1	0.5	100
Forelimb					
Radius	1	1	1	0.5	100
Hindlimb					
Femur	1	1	1	0.5	100
Tibia	1	1	1	0.5	100
Calcaneus	1	1	1	0.5	100
Other Elements					
1st Phalanx	4	-	2	0.25	50
2nd Phalanx	1		1	0.125	25

Miscellaneous					
Ribs	7				
Indeterminate Vertebrae	3				
Indeterminate Axial	1				
Long Bone Shaft Fragment	14				
Indeterminate Teeth	8				
Indeterminate Carpal	1				
Indeterminate Phalanx	1				
Metapodial	2				
Sesmoids	1				
Total	54				

Table 6.5 (continued) Summary of very large mammal elements from the Upper Occupation 1.

Small-Medium Mammal (SC3)

Identified faunal remains: NISP = 2; second phalanx (17423), indeterminate vertebrae (17437).

Discussion: Both of these specimens were found in unit 84N/137E and are likely part of the concentration of *Lepus americanus* specimens, however, without identifiable attributes these specimens could only be placed into a size class. Neither specimen was culturally nor thermally modified.

Small Mammal (SC2)

Identified faunal remains: NISP = 2; indeterminate incisor (11918), skull fragment (12440).

Discussion: These specimens were found in adjoining units 87N/135E and 88N/135E. The incisor was burned black.

Micro-Mammal (SC1)

Identified faunal remains: NISP = 4; indeterminate tooth (12474).

Discussion: This specimen was too fragmented to identify to species. No cultural modifications were present.

Small-Medium Bird (SC3)

Identified faunal remains: NISP = 6; long bone shaft fragment (11919-burned, 13423, 13490), humerus (15734), right humerus (13422), vertebral column (12798)

Discussion: The humerus shaft has been modified by rodent gnawing and an unidentifiable long bone shaft was burned black. No cut marks were present on any of the specimens and all specimens were lightly rootlet etched.

Seasonality

Immature Bison Elements

The Upper Occupation 1 assemblage contained very few bison elements and therefore age determination from mandibles, maxillae, or isolated teeth was not possible. Also making the determination of seasonality difficult was the fact that there were very few immature specimens and no foetal remains. One rib head did not have an epiphysis attached, however, determining age from this rib was difficult as it could not be determined which rib was represented. The other immature specimen was a 1st phalanx. When compared to the comparative collection it was close to the size of a ten month old bison calve.

Other Seasonal Indicators

Only one species was identified in this layer that hibernates throughout the winter. *Marmota monax* (the woodchuck) typically hibernates from early October through until March or April, however, they have been known to emerging from hibernation earlier (Saskatchewan Environment and Resource Management 2001).

Discussion

Based on the analysis of the immature bison specimens and the known birthing schedule of bison (mid-April to mid-June) a ten month old bison would be available from mid-February until mid-April. The presence of the woodchuck also lends support to an occupation seasonality of this time period as they could be ending hibernation during

these months. Therefore, it is possible that there was one late winter or early spring occupation in the Upper Layer 1 of the Below Forks site. This, however, can only be speculated given the extremely small sample size.

6.2.2 Upper Occupation 2 Faunal Assemblage (cultural affiliation unknown)

There was a total 220 faunal specimens recovered from the Upper Occupation 2 with a total weight of 0.68 kg. Unidentifiable bone comprised 89.9% of the assemblage with 64.4% of these being burned. Table 6.6 summarizes these data.

Table 6.6 Summary of Upper Occupation 2 faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	**%N**	**Weight(g)**	**N**	**%N**	**Weight (g)**	**N**	**Weight(g)**
Unburned	18	19.5	348.0	70	80.4	8.8	87	356.8
Burned	5	3.7	185.1	127	96.2	136.5	132	321.6
Total	**23**	**10.0**	**533.1**	**197**	**89.9**	**145.3**	**220**	**678.4**

There are two taxa represented in this assemblage and three categories of specimens that could only be identified to a size class. Table 6.7 summarizes this information.

Table 6.7 Summary of Upper Occupation 2 faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	7	1
Snowshoe hare	*Lepus americanus*	1	1
Fish			
Indeterminate		1	
Miscellaneous			
Very Large Mammal (SC6)		12	
Small-Medium Bird (SC3)		1	
Small Bird (SC2)		1	

Total		**23**	

Table 6.7 (continued) Summary of Upper Occupation 2 faunal assemblage.

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP = 7; MNE and MAU are summarized in Table 6.8. The attributes used in these calculations are summarized in Appendix I.

Taxonomic description: See page 81.

Discussion: Based on the small number of bison elements represented in this assemblage, there is a minimum of one animal represented. The calcaneus and the tarsals were found together in unit 84N/135E. Taphonomic modifications resulted in the specimens being lightly to moderately rootlet etched and weathering was rated at stage 2 on Behrensmeyer's (1978) index. Six of the seven specimens were modified by carnivores and as a result were pitted, punctured, and crenulated. The accessary carpal was hollowed out by carnivore modification. The radius was the only immature specimen and it had been burned black. Cultural modifications in the form of butchering marks were not present on these specimens.

Table 6.8 Summary of *Bison bison* elements from the Upper Occupation 2.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Forelimb					
Radius	1	1	1	0.5	100
Accessary Carpal	1	1	1	0.5	100
Hindlimb					
Tibia	1	1	1	0.5	100
Calcaneus	1	1	1	0.5	100
Metatarsal	1	1	1	0.5	100
Fused C/4 Tarsal	1	1	1	0.5	100
Fused 2/3 Tarsal	1	1	1	0.5	100
Total	7				

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 1; left scapula (18491).

Taxonomic description: See page 97.

Discussion: One specimen was identified as snowshoe hare in this assemblage. There were no butchering marks or carnivore modifications. The specimen was burned black which could suggest human intervention. Taphonomic modifications were the same as for the rest of the assemblage.

Fish

Indeterminate Fish

Identified faunal remains: NISP = 1; radial scales and ceratobrachial (13493).

Discussion: This specimen could not be identified to species based on the limited amount of identifiable material present. The size of the ceratobrachial suggested a perch sized fish. The colour of this specimen was not consistent with the rest of the assemblage suggesting it was intrusive, perhaps washing in with river sediments.

Miscellaneous Faunal Remains

Identified faunal remains: NISP = 14; see Table 6.9 for summary

Discussion: Most of these specimens are identified as very large mammals and represent large ungulates such as bison, elk, moose, or deer. The other two specimens represent bird bones that were too fragmented or immature to identify beyond size class. Both of these were immature and so were missing epiphysis, making identification not possible. Both of the bird remains were burned as were two of the ungulate remains. This could suggest human intervention, although burning can result from other mechanisms, such as forest or brush fires.

Table 6.9 Summary of Upper Occupation 2 miscellaneous specimens by size class.

Size Class	NISP	Elements Present	# Burned
6-Very Large mammal	12	5 rib fragments, 1 vertebral fragment, 2 tooth fragments, 1 skull fragment, 1 left talus, 1 1st phalanx, 1 indeterminate specimen	2
3-Small-Medium Bird	1	left humerus - immature	1
2- Small Bird	1	long bone - immature	1

Seasonality

There was only one immature bison specimen recovered in this assemblage, a left radius that was too fragmented to estimate age. There were not any migrating or hibernating species identified either and therefore a seasonality estimate is not possible.

6.2.3 Paleosol 19 Faunal Assemblage (cultural affiliation unknown)

There were 443 faunal specimens recovered in Paleosol 19 weighing a total of 0.15 kg. The majority of these were unidentifiable (88.9%) and 51.5% of the assemblage, based on frequency was burned, while 29.4% was burned by weight. Table 6.10 summarizes this information.

Table 6.10 Summary of Paleosol 19 faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	21	4.7	32.5	194	90.2	76.3	215	108.8
Burned	28	6.3	4.1	200	87.7	41.2	228	45.3
Total	**49**	**11.0**	**36.6**	**394**	**88.9**	**117.5**	**443**	**154.1**

There were two taxa identified in Paleosol 19, the rest of the identifiable specimens could only be identified to size class. Four size class categories were used in this assemblage. This is the only assemblage in which bison was not identified. Table 6.11 summarizes.

Table 6.11 Summary of Paleosol 19 faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Snowshoe hare	*Lepus americanus*	19	1
Birds			
Sharp-tailed grouse	*Tympanuchus phasianellus*	1	1
Miscellaneous			
Very Large Mammal (SC6)		2	
Small Mammal (SC2)		4	
Micro-Mammal (SC1)		1	
Small-Medium Bird (SC3)		2	
Small Bird (SC2)		1	
Identifiable to element group only		19	
Total		**49**	

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 19; right innominate (11720), femur (11722), left innominate (11732), right tibia (14850), left tibia-burned (16756), left talus (16757), 2nd phalanx-burned (16758), indeterminate phalanx-burned (16759), calcaneus-burned (16760), 1st phalanx-burned (16766), 1st phalanx-burned (16767), 2nd phalanx-burned (16774), left humerus-burned (16775), left ischium/pubis (16776), metacarpal (18976), indeterminate molar (18980), 1st phalanx (20269).

Taxonomic description: See page 97.

Discussion: The majority of these specimens were found in unit 84N/136E and the remainder of the specimens were found in various adjoining units. Taphonomic

processes had minor effects with none of the specimens exhibiting rootlet etching and weathering was rated at stage 2 on Behrensmeyer's (1978) index. There were no obvious cultural modifications identified, although eight of the specimens had been burned which could suggest human intervention.

Order Galliformes

Family Phasianidae

Tympanuchus phasianellus

Identified faunal remains: NISP = 1; right coracoid (18534)

Taxonomic description: See page 98.

Discussion: This specimen was identified as sharp-tailed grouse based on size and morphology. No cultural or thermal alterations were identified and taphonomic modifications were the same as for the rest of the assemblage.

Miscellaneous Faunal Remains

Identified faunal remains: NISP = 29; see Table 6.12

Discussion: The majority of the miscellaneous faunal remains were identified as tooth fragments likely from an ungulate of an unknown size. The majority of these specimens were burned and found in unit 85N/136 E. The specimens identified as small-medium bird were found near the sharp-tailed grouse specimen and may belong to this species, although they were too fragmented to identify with confidence. The small bird ulna was also too fragmented to identify to species, although its size is comparable to a kingfisher.

Table 6.12 Summary of Paleosol 19 miscellaneous specimens by size class.

Size Class	NISP	Elements Present	# Burned	Other Modifications
6-Very Large mammal	2	1 Long bone shaft, 1 Distal Metapodial	-	Long bone is crenulated.
2-Small Mammal	4	3 Incisor, 1 Mandible fragment	2	
1-Mico-Mammal	1	1 Mandible fragment	-	
3-Small-Medium Bird	2	1 Distal Humerus, 1 Ulna shaft	-	
2-Small Bird	1	1 Proximal Ulna		
Identifiable to Element Group Only	19	1 Long bone fragment, 1 Rib fragment, 17 Tooth fragments	17	

Seasonality

There were no immature or foetal bison specimens recovered in this assemblage nor were there any migrating or hibernating species. Therefore, seasonality cannot be determined from faunal indicators.

6.2.4 Upper Oxbow Faunal Assemblage

The Upper Oxbow occupation was identified across the central block of excavation units in paleosol 20a at a depth that varied throughout these units. This occupation was assigned to the Oxbow Complex based on the association of an Oxbow point base. There were 3225 faunal specimens recovered from this occupation with a weight totalling 3.2 kg. The majority (94.4%) of the specimens by number in this assemblage were unidentifiable, although the majority (81%) by weight were identifiable due to the fact that these were generally larger, more complete specimens than those that were unidentifiable. Table 6.13 summarizes this information.

Table 6.13 Summary of the Upper Oxbow faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	115	4.2	2483.7	1196	91.2	257.9	1311	2741.6
Burned	67	2.0	111.4	1847	96.5	348.7	1914	460.1
Total	**182**	**5.6**	**2595.1**	**3043**	**94.6**	**606.6**	**3225**	**3201.7**

There are three taxa identified in this assemblage and five categories of elements that could only be identified to size class, although some of these specimens are likely to represent some of the species identified in the assemblage. *Bison bison* represent the majority of specimens identifiable to taxon and many of the specimens identified only as very large mammal may also be bison. Snowshoe hare is also highly represented in this assemblage. See Table 6.14.

Table 6.14 Summary of the Upper Oxbow faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	18	1
Snowshoe hare	*Lepus americanus*	20	1
Northern pocket gopher	*Thomomys talpoides*	5	1
Fish		4	
Miscellaneous			
Very Large Mammal (SC6)		85	
Small-Medium Mammal (SC3)		14	
Small Mammal (SC2)		19	
Micro-Mammal (SC1)		2	
Small-Medium Bird (SC3)		1	
Micro-Bird (SC1)		1	
Identifiable to element group only		13	
Total		**182**	

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP = 18; MNE and MAU are summarized in Table 6.15. See Appendix I for landmarks used to derive these calculations.

Taxonomic description: See page 81.

Discussion: Based on the elements identified there is a minimum of one bison represented in this assemblage. Taphonomic processes resulted in the specimens being lightly rootlet etched and weathered at a stage 2 on Behremsmeyer's (1978) weathering index. Five of the specimens were burned all of which were found in unit 88N/135E. Carnivore modification was present on three of the specimens, these being pitted, punctured, and crenulated. Two of the specimens had evidence of butchering, having both cut marks and chopping marks. One of these specimens was a scapula sent away for radiocarbon dating. No foetal or immature specimens were recovered.

Table 6.15 Summary of *Bison bison* elements from the Upper Oxbow occupation.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	2	1	2	0.50	100
Premolar	1	1	1	0.25	50
Lumbar Vertebrae	1	1	1	0.20	40
Forelimb					
Scapula	2	1	1	0.5	100
Metacarpal	1	1	1	0.5	100
Fused 2/3 Carpal	1	1	1	0.5	100
Hindlimb					
Femur	1	1	1	0.5	100
Metatarsal	1	1	1	0.5	100
Fused 2/3 Tarsal	1	1	1	0.5	100
Fused C/4 Tarsal	1	1	1	0.5	100
Talus	1	1	1	0.5	100
Other Elements					
1st Phalanx	4		4	0.5	100
2nd Phalanx	1		1	0.125	25
Total	**18**				

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 20; right distal tibia (11247), metapodial-burned (12039), left metatarsal-burned (13023), 1st hind phalanx (13037), 1st hind phalanx (13038), 2nd hind phalanx (13039), 2nd front phalanx (13040), right distal metatarsal-burned (13041), left distal metatarsal (13047), right distal metatarsal (13048), proximal tibia-burned (13706), distal metatarsal-burned (13707), right scapula-burned (13995), left innominate-burned (15577), right proximal metatarsal-burned (16783), metatarsal-burned (17613).

Taxonomic description: See page 97.

Discussion: There is a minimum of one snowshoe hare represented in this assemblage. Nine of the specimens were burned which could indicate human intervention. No other butchering marks, carnivore, or rodent modifications were observed. Taphonomic processes were the same as the rest of the assemblage with light rootlet etching and weathering rating at a stage 2 on Behrensmeyer's (1978) index.

Leporidae Indeterminate

Identified faunal remains: NISP = 5; indeterminate molar fragments (13716, 15899).

Discussion: The teeth specimens were found in the same units as several of the *Lepus americanus* specimens and may belong to this species, however, the teeth were too fragmented for a positive species identification. Taphonomic processes were the same as for the rest of the assemblage.

Order Rodentia

Family Geomyidae

Thomomys talpoides

Identified faunal remains: NISP = 4; premaxilla/maxilla (11486), left femur-burned (12551), right tibia-burned (12560).

Taxonomic description: See page 114.

Discussion: These specimens were recovered in units 87N/135E and 89N/135E. There were no modifications on the specimens except for burning, which could indicate human intervention. Based on the elements identified a minimum of one individual is represented.

Fish

Indeterminate Fish

Identified faunal remains: NISP = 4; vertebral centrum (13016-burned, 15978, 15982, 20273), mandible fragment (15982).

Discussion: These specimens could not be identified to species as there were no species distinguishing attributes present. The vertebrae were missing the spinous processes and foramina that would help to indicate species. The mandible fragment was likewise too fragmented.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 87; elements represented and MNE summarized in Table 6.16. Landmarks used in these calculations are similar to those listed in Appendix I.

Discussion: Again these specimens could only be identified to size class as there were not enough physical attributes to identify them to species. These specimens may represent bison or they may be another large ungulate not otherwise identified in this assemblage. Based on the NISP value seventeen of the specimens had been burned, the

majority of which were indeterminate tooth fragments. One long bone fragment had a cut mark and three of the specimens were crenulated by carnivore gnawing. The majority of these specimens were fragmented and the taphonomic modifications were the same as for the rest of the assemblage.

Table 6.16 Summary of very large mammal elements from the Upper Oxbow occupation.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Incisor	1	1	1	0.25	25
Lumbar Vertebrae	7	2	2	0.34	34
Forelimb					
Scapula	3	1	2	1.0	100
Hindlimb					
Femur	1	1	1	0.5	50
Innominate	2	1	1	0.5	50
Miscellaneous					
Skull fragments	2	-	-		
Vertebral fragments	3	-	-		
Indeterminate teeth	35	-	-		
Ribs	8	-	-		
Indeterminate phalanx	12	-	-		
Indeterminate appendicular	9	-	-		
Indeterminate axial	1	-	-		
Sesmoids	1				
Total	**85**				

Small-Medium Mammal (SC3)

Identified faunal remains: NISP = 14; distal humerus (13996), indeterminate vertebral fragment (13997), rib-burned (15560), skull fragments-burned (15563), rib-burned (15570).

Discussion: Based on NISP, twelve of the specimens were burned. No butchering, carnivore, or rodent modifications were observed. Taphonomic modifications were the same as for the rest of the assemblage and the specimens are considered to be part of the cultural assemblage.

Remaining Miscellaneous Faunal Remains

The remainder of the miscellaneous faunal specimens will be presented in Table 6.17. The very large mammal and the small-medium mammal size classes were presented in separate sections due to the fact that the NISP for each size class was large enough to warrant individual description.

Identified faunal remains: NISP = 61; see Table 6.17 for summary.

Discussion: The majority of the specimens summarized in the table below represent tooth enamel fragments that could have been placed in either the very large mammal size class or the large mammal size class. The rest of these specimens could be identified to element group, but they could have been placed in more than one size class. The remaining size classes are those of small mammals, micro-mammals and birds. These specimens were too fragmented or there were not enough identifiable attributes to place them into a taxon. When compared to the comparative specimens the micro-bird was approximately the same size as a tree swallow. No cultural or carnivore modifications were observed on any of these specimens.

Table 6.17 Summary of the Upper Oxbow occupation miscellaneous specimens by size class.

Size Class	NISP	Elements Present	# Burned	Other Modifications
2-Small Mammal	19	2-Indeterminate incisors 10-Indeterminate teeth 1-Mandible +incisor 4-Indeterminate appendicular 1-Phalanx 1-Ulna	2	
1-Micro-Mammal	2	2-Indeterminate incisor	1	
3-Small-Medium Bird	1	1-left distal coracoid	-	
1-Micro-Bird	1	1-right proximal ulna		
Identifiable to Element Group Only	13	2-skull fragments 11-vertebral fragments	2	

Seasonality

There was one immature specimen in this assemblage, however, this was a vertebral centrum that was too fragmented to be identified to taxon and was assigned to size class six (very large mammal). No age approximation could be made from this specimen. There were no hibernating or migrating species in this assemblage either. Therefore, seasonality of site occupation could not be determined for the Upper Oxbow occupation at the Below Forks site.

6.2.5 The Lower Oxbow Faunal Assemblage

There were 285 faunal specimens recovered from the Lower Oxbow assemblage with a total weight of 0.5 kg. Unidentifiable specimens made up 96.8% of the assemblage due to the highly fragmented condition of many of these faunal specimens. Table 6.18 summarizes.

Table 6.18 Summary of the Lower Oxbow faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	8	5.0	466.2	152	95.0	32.6	160	498.8
Burned	1	0.8	0.4	124	99.2	14.7	125	15.1
Total	**9**	**3.5**	**466.6**	**276**	**96.8**	**47.3**	**285**	**513.9**

There were three taxa identified in this assemblage and one artifact that could only be identified to the level of size class. The majority of the faunal remains in this assemblage were unidentifiable, however, they could be identified as mammal remains. No bird or shell remains were found in this occupation.

Table 6.19 Summary of the Lower Oxbow faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	1	1
Snowshoe hare	*Lepus americanus*	1	1
Caribou	*Rangifer tarandus*	1	1
Fish		1	
Miscellaneous			
Small Mammal (SC2)		6	
Total		**10**	

Order Artiodactyla

Family Bovidae

Bison sp.

Identified faunal remains: NISP = 1; right proximal femur (18597).

Taxonomic description: This specimen is exceptionally larger than the bison specimens in the comparative collection and may represent *B. occidentalis* or *B. antiquus*. See page 93 for further discussion of these species.

Discussion: This is the only specimen in the assemblage identified to bison. Some of the fragmented unidentifiable bone may also represent bison but this cannot be determined as other large ungulates are present in the assemblage. There were no cultural or thermal modifications observed on this specimen. Carnivore modification was present in the form of tooth drag marks. Taphonomic processes had only slight effects with rootlet etching being light and weathering rating a stage 2 on Behrensmeyer's (1978) weathering index.

Family Cervidae

Rangifer tarandus

Identified faunal remains: NISP = 1; antler (16025)

Taxonomic description: In Canada the barren-ground caribou (*Rangifer tarandus groenlandicus*) is found to inhabit the arctic tundra, and subarctic taiga, and the woodland caribou (*Rangifer tarandus caribou*) is found in the boreal coniferous forests. This includes the Boreal Forest of Saskatchewan, although their present day southern limit is north of the Below Forks site area. Caribou antlers are extremely variable with one antler seldom mirroring another. Antlers of mature males are much larger than those of mature females and often it is hard to distinguish the antlers of young males to those from females. Two main tines branch off the antler close to the burr, one of these acts as an eye shield. Caribou males grow antlers approximately every six months, with velvety burrs forming in March, growing through the spring and summer, and then dropping between November and February. Females begin their antler growth from June to September, carrying them until April or May. The dropping is associated with the birth of fawns. Caribou are social, gregarious animals and are usually observed in bands of ten to fifty or in loose herds of approximately a thousand animals (Banfield 1974).

Discussion: This specimen may have been used as a billet for percussion flaking (see Plate 6.2). The size is suitable for such a tool and the burr has been smoothed. There were no other caribou specimens identified in this assemblage and it may be possible that this object was brought to the site from another location, perhaps even a traded item. No other modifications were observed.

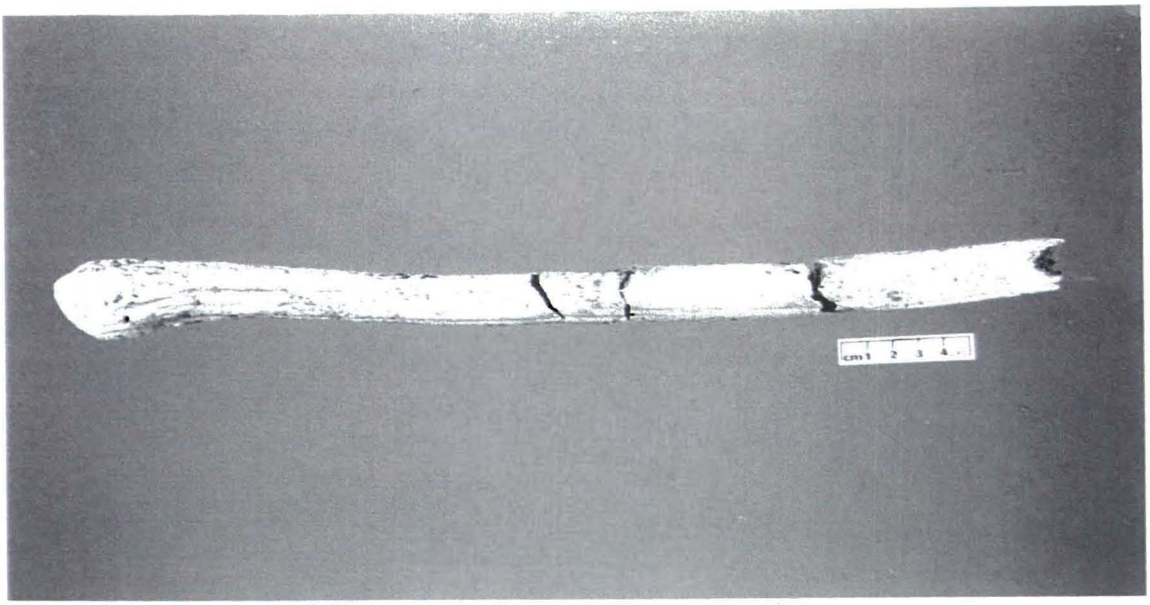

Plate 6.2 Caribou antler billet from the Lower Oxbow occupation.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 1; right distal tibia (15995).

Taxonomic description: See page 97.

Discussion: This snowshoe hare tibia was burned black which may suggest human intervention. No other cultural modifications were present. Taphonomic modifications were the same as that described for the bison specimen above.

Fish

Indeterminate Fish

Identified faunal remains: NISP = 1; indeterminate skull fragment.

Discussion: This specimen was too fragmented to determine species, size class, or element. It was identified as fish based on bone texture. There were no cultural or thermal alterations.

Miscellaneous Faunal Remains

Small Mammal (SC2)

Identified faunal remains: NISP = 6; vertebral fragments (16006), long bone shaft (20357)

Discussion: There were no cultural or thermal alterations on these specimens, although they were of similar colour to the rest of the assemblage.

Seasonality

There were no immature or foetal bison specimens recovered in this assemblage, nor were there any migrating or hibernating species. Therefore, seasonality cannot be determined from faunal indicators. The presence of fish remains, however, indicates that aquatic resources were available during occupation.

6.2.6 Mummy Cave Faunal Assemblage

The Mummy Cave assemblage is the largest in this excavation block with 10549 faunal specimens having a total weight of 8.3 kg. Unidentifiable specimens represent 97.4% of the assemblage likely due to the fragmentary nature of many of the faunal specimens. However, it is noteworthy to mention that by weight 68.8% of the assemblage is identifiable which can be attributed to the fact that many of these specimens were larger or near complete. Table 6.20 summarizes this information.

Table 6.20 Summary of the Mummy Cave faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	238	4.3	5464.0	5284	95.7	454.7	5522	5918.7
Burned	40	0.7	244.9	4988	99.2	2126.3	5028	2371.2
Total	**278**	**2.6**	**5708.9**	**10272**	**97.4**	**2581.0**	**10549**	**8289.9**

Seven taxa were identified in the Mummy Cave assemblage and there were six categories of specimens that could only be identified down to size class (Table 6.21).

Based on NISP the majority of the specimens identified to taxon were that of *Bison sp.* followed by *Lepus americanus*.

Table 6.21 Summary of the Mummy Cave faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	37	3
Indeterminate Cervidae		1	1
Large Canid (SC5)	*Canis sp.*	3	1
Medium Canid (SC4)	*Canis sp.*	1	1
Indeterminate Canid		1	-
Snowshoe hare	*Lepus americanus*	24	1
White-tailed jack rabbit	*Lepus townsendii*	4	1
Beaver	*Castor canandensis*	1	1
Northern pocket gopher	*Thomomys talpoides*	8	1
Miscellaneous			
Very Large Mammal (SC6)		138	
Small-Medium Mammal (SC3)		15	
Small Mammal (SC2)		10	
Micro-Mammal (SC1)		3	
Small-Medium Bird (SC3)		4	
Micro-Bird (SC1)		1	
Indeterminate Bird		13	
Identifiable to element group only		14	
Total		**278**	

Order Artiodactyla

Family Bovidae

Bison sp.

Identified faunal remains: NISP = 37; MNE and MNI are summarized in Table 6.22. For a list of the landmarks used in these calculations see Appendix I.

Taxonomic description: See page 93.

Discussion : There is a minimum of three bison represented in this assemblage based on the number of radial carpals present. Three of the specimens are burned black and all three of these are carpals found in units 85N/138E (all carpals in this unit were articulated) and 86N/134E. One radius was the only specimen that exhibited signs of

carnivore modification as it was crenulated. There were no cultural modifications in the form of butchering marks and taphonomic processes created light rootlet etching and weathering rated at a stage 2 on Behrensmeyer's (1978) weathering index. It is possible that many of the unidentifiable bones represent bison elements, however, these are too fragmented for identification and other large ungulates have been identified at this site.

Table 6.22 Summary of *Bison sp.* elements from the Mummy Cave occupation.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Cranium	2	2	2	0.5	25
Mandible	1	1	1	0.5	25
Forelimb					
Humerus	1	1	1	0.5	25
Radius	4	2	2	1	50
Ulna	1	1	1	0.5	25
Ulnar Carpal	1	1	1	0.5	25
Internal Carpal	2	2	2	1	50
Radial Carpal	4	3	4	2	100
Unciform Carpal	3	2	3	1.5	75
Fused 2/3 Carpal	3	2	3	1.5	75
Metacarpal	2	1	2	1	100
Hindlimb					
Tibia	2	2	2	**1.0**	**50**
Lateral Malleolus	1	1	1	**0.5**	**25**
Fused C/4 Tarsal	1	1	1	**0.5**	**25**
Fused 2/3 Tarsal	1	1	1	**0.5**	**25**
Metatarsal	1	1	1	**0.5**	**25**
Other Elements					
1st Phalanx	3	-	3	**0.375**	**18.75**
2nd Phalanx	1	-	1	**0.125**	**6.25**
3rd Phalanx	2	-	2	**0.25**	**12.5**
Total	**37**				

Family Cervidae

Indeterminate Cervidae

Identified faunal remains: NISP = 1; antler (19834).

Discussion: This specimen was likely used during the manufacturing of lithic tools at the site perhaps as a pressure flaker. This antler is the only specimen identified as a Cervidae in the assemblage and therefore it is likely that it was not brought to the site as a

food resource. It is possible that this specimen was brought to the site for the purpose of lithic tool manufacturing.

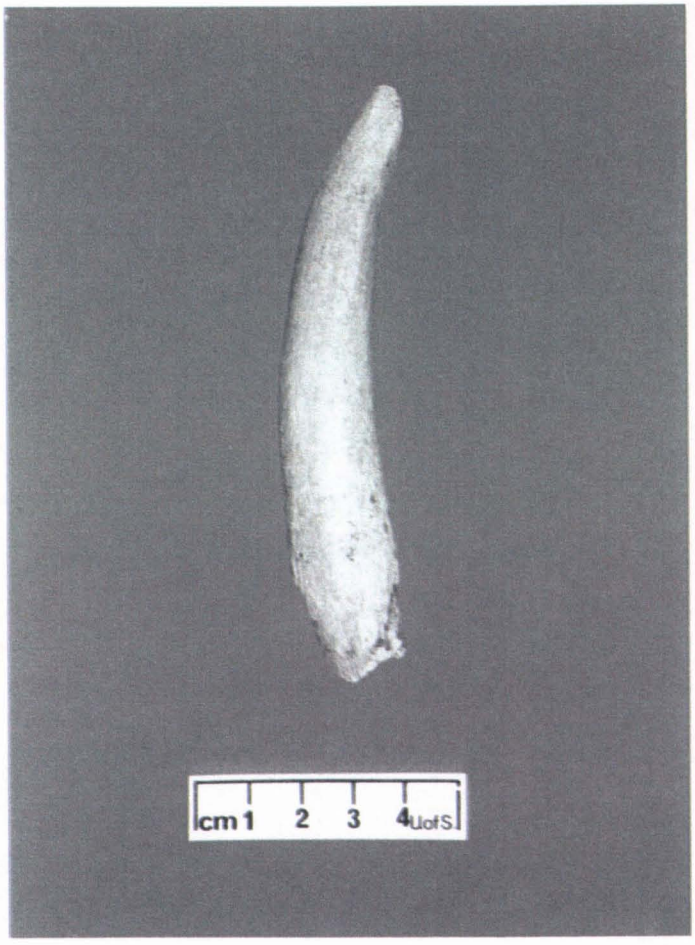

Plate 6.3 Antler tine pressure flaker from the Mummy Cave occupation, Central Block.

Order Carnivora

Family Canidae

***Canis sp.* (SC5)**

Identified faunal remains: NISP = 3; ulna (12228, 12229), left temporal (18234).

Discussion: The ulna was found at the west end of the excavation block and was broken into three pieces that can be articulated back together. This specimen was likely used as a bone pin or rod. There are many longitudinal striations spanning the entire length of the tool and it is extremely smooth (see Plate 6.4 for photo of the specimen).

This specimen will be discussed in greater detail in section 6.5.6. The temporal bone is the same size as the *Canis lupus* specimen in the comparative collection and may represent this species or a large domestic dog.

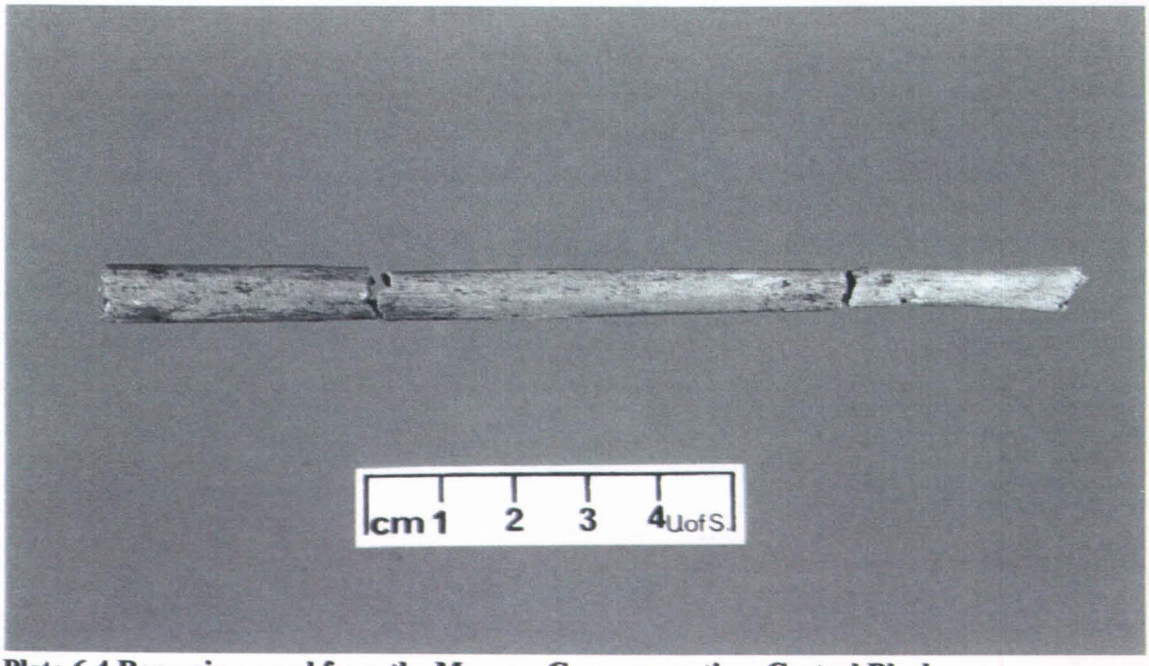

Plate 6.4 Bone pin or rod from the Mummy Cave occupation, Central Block.

Indeterminate *Canis sp.*

Identified faunal remains: NISP = 1; indeterminate tooth (17657).

Discussion: This specimen could be identified as a canid, however, it was too fragmented to determine species or size class. This specimen was found in the same unit as the temporal specimen described above and, therefore, may be of the same individual and size class

***Canis sp.* (SC4)**

Identified faunal remains: NISP = 1; lower second molar (16292).

Discussion: This specimen could not be identified to species but was of similar size to the *Canis latrans* (coyote) specimen in the comparative collection. No modifications were present.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 25; cervical vertebrae (18904), cervical vertebrae (18906), rib fragments (18908, 18909), indeterminate vertebral fragments (18905, 18907), left mandible (18636), tibia (11561), 1st phalanx (12866), 2nd phalanx (16864), left tibia-burned (16877), calcaneus (16878), 2nd phalanx-hind (16879), 2nd phalanx-hind (16880), 1st phalanx (16882), 1st phalanx (16883), 1st phalanx (16884), femur (16887), 3rd phalanx-burned (17375), right distal femur (13092).

Taxonomic description: See page 97.

Discussion: These specimens were identified as snowshoe hare based on morphology, size, and association. Specimens 18904 to 18909 were found together in unit 84N/138E. The majority of the remaining specimens were found in unit 84N/136E. Two of the specimens were burned black which may be an indication of human modification. No other modifications were present. Rootlet etching was light and weathering rated at stage 2 on Behrensmeyer's (1978) weather index.

Lepus townsendii

Identified faunal remains: NISP = 4; lumbar vertebrate (12394), 3rd phalanx (16899), 3rd phalanx-burned (17367), 3rd phalanx-burned (17370).

Taxonomic description: The white-tailed jack rabbit is a slender animal with long legs and ears. Its average weight is approximately 3.5 kg. This animal is predominantly nocturnal, solitary and is active all winter. Jack rabbits eat a variety of green forage in the summer and browse on twigs, buds, and bark in the winter. Their habitat includes pastures, cultivated fields, willow thickets, as well as short-grass sage brush plains. They seldom penetrate wooded areas except to seek refuge from a blizzard. The jack rabbit is found in the prairie portions of Saskatchewan, although their range has spread northward with the advance of agriculture (Banfield 1974).

Discussion: The phalanges were all found in unit 84N/136E and two of these were burned. No other modifications were observed and taphonomic effects were the same as those described for the snowshoe hare.

Order Rodentia

Family Castoridae

Castor canadensis

Identified faunal remains: NISP = 1; right mandible and incisor (16957).

Taxonomic description: See page 113.

Discussion: There were no thermal or cultural modifications present on this specimen, although it is presumed to be part of the cultural assemblage because it is of the same colour and has gone through the same degree of taphonomic modifications as the rest of the assemblage.

Family Geomyidae

Thomomys talpoides

Identified faunal remains: NISP = 8; left ulna (13089), left tibia (13090), lumbar vertebrate (13091), right innominate (13140), left innominate (ischium) (13105), sacrum (13106), indeterminate vertebrate (13107).

Taxonomic description: See page 114.

Discussion: These specimens were all found in unit 86N/135E. There were no thermal or cultural modifications present on the specimens and taphonomic modifications were the same as for the rest of the assemblage.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 138; Table 6.23 summarizes MNI and MNE.

Discussion: These specimens were too fragmented or were missing key identifiable attributes and therefore could only be identified to the level of size class. It is

likely that the majority of these are bison elements as this was the only identified large ungulate in the assemblage, however, other large ungulates have been identified in other assemblages at the site. Thirty-one of these specimens were burned, two exhibited signs of butchering in the form of cut marks, and four of the specimens were crenulated by carnivores. Rootlet etching was light and weathering rated at a stage 2 on Behrensmeyer's (1978) index. The majority of the specimens were broken longitudinally or were fragmented.

Table 6.23 Summary of Very Large Mammal elements from the Mummy Cave occupation.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Incisor	1	1	1	0.25	10
Forelimb					
Radius	2	1	1	0.5	20
Humerus	5	1	3	1.5	60
Ulna	2	1	1	0.5	20
Metacarpal	2	2	2	1.0	40
Hindlimb					
Femur	4	1	3	1.5	60
Innominate	1	1	1	1.0	40
Tibia	10	2	5	2.5	100
Fused C/4 Tarsal	1	1	1	0.5	20
Miscellaneous					
Indeterminate Axial	3	-	-		
Indeterminate Appendicular	3	-	-		
Indeterminate Tooth	72	-	-		
Indeterminate Carpal	2	-	-		
Indeterminate Phalanx	2	-	-		
Rib fragments	27	-	-		
Sesamoid	1	-	-		
Total	**138**				

Remaining Miscellaneous Faunal Remains

Identified faunal remains: NISP = 60; see Table 6.24.

Discussion: The majority of the small-medium mammal specimens were found in the same units as the snowshoe hare specimens and likely represent this species. The micro-mammal and micro-bird remains exhibited no signs of burning or cultural

modification and it is possible that these represent background fauna meaning naturally occurring bone. One of the indeterminate-sized bird specimens exhibited signs of digestion and is possibly part of an owl pellet. The specimens that were classified as 'identifiable to element group only' mainly consist of small-medium mammal and small mammal long bone fragments that were too fragmented to determine size class with accuracy.

Table 6.24 Summary of miscellaneous faunal specimens from the Mummy Cave occupation.

Size Class	NISP	Elements Present	# Burned	Other Modifications
3-Small-Medium Mammal	15	5-Indeterminate appendicular 1-Calcaneus fragment 1-Innominate fragment 2-Indeterminate phalanges 6-Rib fragments	1-phalanx	
2-Small Mammal	10	2-Indeterminate appendicular 1-Mandible 4-Indeterminate teeth 2-Rib fragments 1-Indeterminate vertebrate	2-tooth, rib	
1-Micro-Mammal	3	1-Mandible 1-Indeterminate tooth 1-rib blade	-	
3-Small-Medium Bird	4	2-Coracoid 2-Humerus	-	
1-Micro-Bird	1	1-long-bone shaft	-	
Indeterminate Bird Size	13	13-Indeterminate appendicular	-	Digestive holes
Identifiable to Element Group Only	14	10-Indeterminate appendicular 2-Indeterminate axial 2-Skull fragments	8	

Seasonality

Like the previously described assemblages at the Below Forks site there were no mandibles, maxilla, or teeth complete enough to conduct metric analysis on the bison specimens in an attempt to determine seasonality. There were four immature bison elements recovered from the Mummy Cave assemblage and no migrating or hibernating species. Also important to note is the likelihood that the bison represented here are one of the larger, extinct bison species and therefore comparison with the modern immature specimens in the comparative collection may not be totally accurate. However, without a comparative sample of the extinct species, comparing the specimens with the modern forms is the only method available. Because of these factors determining the seasonality by faunal indicators can only be speculative.

Immature bison elements

Three immature bison specimens were recovered in the Mummy Cave assemblage. One of these was a second phalanx that when compared to the comparative specimens was the same size as a one month old bison calf. The second was a first phalanx that was the same size as a ten month old calf and the third immature specimen was a distal tibia that was also the same size as a ten month old calf.

Discussion

A ten month old bison would be available from mid-February to mid-April and a one month old bison would be available from mid-May to mid-July. Because there is only a one month separation between these ranges it is likely the site was occupied somewhere from the late winter to early summer. Other types of paleoenvironmental research may be able to determine occupation seasonality with more accuracy than the faunal resources recovered from this occupation.

6.2.7 Below Mummy Cave Faunal Assembalge

There were 138 faunal specimens in this assemblage with a total weight of 0.8 kg. Only twelve (8.7%) of these specimens were identifiable with seven of these being burned. Table 6.25 summarizes this information.

Table 6.25 Summary of the Below Mummy Cave assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	5	3.8	53.2	126	96.1	27.0	131	80.2
Burned	7	100	1.1	0	0	0	7	8.1
Total	**12**	**8.6**	**54.3**	126	**91.3**	**27.0**	**138**	**81.3**

Only one taxon was identified in this assemblage, *Bison sp.*, and the remainder of the specimens were placed into three different size classes. The majority of the specimens could not be identified.

Table 6.26 Summary of the Below Mummy Cave assemblage faunal remains.

Common Name	Taxonomic Classification	NISP	MNI
Mammals Bison	*Bison sp.*	1	1
Miscellaneous Very Large Mammal (SC6) Small Mammal (SC2) Micro-Mammal (SC1)		 9 1 1	
Total		**12**	

Order Artiodactyla

Family Bovidae

Bison sp.

Identifiable faunal remains: NISP = 1; 1st phalanx (12115).

Taxonomic description: See page 93.

Discussion: This was the only specimen in the assemblage identified to bison. No cultural, thermal, carnivore, or rodent modifications were present. Taphonomic modifications include light rootlet etching and weathering rated at stage 2 on Behrensmeyer's (1978) weathering index.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 9; sesamoid (12114), indeterminate tooth fragments (13777, 13780, 13788, 20144, 20832), metapodial fragment (13788).

Discussion: There was no butchering marks or carnivore modification present on these specimens. Five of the indeterminate tooth fragments were burned and taphonomic modifications were the same as that described for bison.

Small Mammal (SC2)

Identified faunal remains: NISP = 1; indeterminate incisor (20150).

Discussion: This specimen was burned black and is the only specimen of this size class found in the assemblage.

Micro-Mammal (SC1)

Identified faunal remains: NISP = 1; long bone fragment (13787)

Discussion: This specimen was burned black and is the only specimen in this size class. It was not associated with any observed features.

Seasonality

There were no specimens present in this assemblage that were immature, migrating, or hibernating that could indicate the season of deposition.

6.3 Eastern Excavation Block

6.3.1 Upper Occupation Faunal Assemblage (unknown cultural affiliation)

There were 66 faunal specimens recovered from the Upper Occupation in the eastern block of excavation units with a total weight of 0.2 kg. Unidentifiable bone comprised 65.1% of the assemblage and only 13.6% of the assemblage was burned (Table 6.27 summarizes). The faunal remains were distributed at the eastern side of the excavation block while the lithic artifacts were located in the northwest corner (Kasstan 2004).

Table 6.27 Summary of the Upper Occupation faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	22	33.3	98.1	35	61.4	98.6	57	196.7
Burned	1	1.5	0.3	8	12.1	3.7	9	4.0
Total	**23**	**34.8**	**98.4**	**43**	**65.1**	**102.3**	**66**	**200.7**

There were five taxa identified in the Upper Occupation with the snowshoe hare having the highest NISP. Many of the specimens lacked identifiable characteristics and could only be identified to size class.

Table 6.28 Summary of the Upper Occupation faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	1	1
Medium Canid (SC4)	*Canis sp.*	1	1
Beaver	*Castor canadensis*	4	1
Snowshoe hare	*Lepus americanus*	8	2
Fish		2	

Miscellaneous Very Large Mammal (SC6) Small Mammal (SC2) Very Large/Large Mammal (SC6/5)		 4 2 1	
Total		**23**	

Table 6.28 (continued) Summary of the Upper Occupation faunal assemblage.

Order Artiodactyla

Family Bovidae

Bison bison

Identifiable faunal remains: NISP = 1; 3rd phalanx (4434).

Taxonomic description: See page 81.

Discussion: This specimen was the only size class six specimen with enough identifiable attributes to be identified to bison. There were no cultural, thermal, or carnivore modifications present and taphonomic modifications weathered this specimen to a stage 2 on Behrensmeyer's (1978) weathering index.

Order Carnivora

Family Canidae

***Canis sp.* (SC4)**

Identifiable faunal remains: NISP = 1; indeterminate vertebrae (3613)

Discussion: This specimen was identified as a medium canid based on size. It is approximately the same size as the *Canis latrans* specimens in the comparative collection, but the specimen was incomplete and therefore a positive identification could not be made. No cultural or thermal modifications were present and taphonomic modifications included light rootlet etching and weathering rated at a stage 2 on Behrensmeyer's (1978) weathering index.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identifiable faunal remains: NISP = 8; left mandible with teeth (5945), left humerus (5949), left scapula (5950), right scapula (5959), left humerus-burned (8158), frontals (skull) (8693), skull fragments (8739).

Taxonomic description: See page 97.

Discussion: The first four specimens listed were found in unit 89N/213E and are likely to represent one animal, the remaining specimens were located in adjoining units 90N/210E and 90N/211E. One specimen, a left humerus, was burned which may indicate human intervention. Taphonomic modifications were the same as described for previous taxa. Based on the number of left humeri present there is a minimum of two individuals present in this assemblage.

Order Rodentia

Family Castoridae

Castor canadensis

Identified faunal remains: NISP = 4; maxillary molar (7039), incisor (9359), left frontal (9367), left maxilla/teeth (9371).

Taxonomic description: See page 113.

Discussion: The majority of these specimens were found in unit 90N/212E. There were no cultural or thermal alterations present and taphonomic modifications were the same as described above. The colour of these specimens was consistent with the rest of the assemblage and therefore they are considered to be part of the cultural assemblage.

Fish

Indeterminate Fish

Identifiable faunal remains: NISP = 2; indeterminate specimen(5948).

Discussion: These specimens are identified as fish based on texture of the bone. They were too fragmented to identify to element or species. No thermal alterations were observed.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identified faunal remains: NISP = 4; rib blade (7047, 7050, 11090), rib neck (7049).

Discussion: Specimen #11090 was recovered from the cutbank at 96N/194E. This is not one of the east block units but will be considered in this section. This artifact is a bone tool that may have been used as a scraper or a flesher. The tool is thinned at the working end and as a result is sharp. The entire tool is smoothed and there are parallel striations running longitudinally down the tool. No other modifications are present on any of these specimens.

Small Mammal (SC2)

Identified faunal remains: NISP = 2; mandible fragment (5957), incisor (8734).

Discussion: These specimens were too fragmented to identify to species. They are the same colour as the rest of the assemblage, although they display no thermal or cultural alterations. Therefore, it is uncertain whether they are part of the cultural assemblage.

Indeterminate Very Large/Large Mammal (SC6/5)

Identified faunal remains: NISP = 1; indeterminate skull fragment (8745).

Discussion: This specimen was too fragmented to determine exact size class. No cultural or thermal alterations were present.

Seasonality

There were no immature bison specimens identified in this assemblage and therefore seasonality based on size identification was not possible. There were no migrating or hibernating species to give a seasonality of occupation. Therefore, seasonality could not be determined by faunal indicators.

6.3.2 Middle Occupation Faunal Assemblage (cultural affiliation unknown)

A total of 282 faunal specimens was recovered from the Middle Occupation in the eastern block of units. These specimens had a total weight of 0.5 kg. Identifiable bone comprised 81.8% of the assemblage based in weight, although based on frequency it comprised only 17.7%. This may suggest the faunal assemblage was not heavily fragmented. Burned bone comprised 45% of the assemblage and the majority (98.4%) of these were unidentifiable. Table 6.29 summarizes this information.

Table 6.29 Summary of the Middle Occupation faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	48	17.0	416.5	107	37.9	54.2	155	470.7
Burned	2	0.7	0.3	125	44.3	38.2	127	38.5
Total	**50**	**17.7**	**416.8**	**232**	**82.3**	**92.4**	**282**	**509.2**

There were four taxa identified in the Middle Occupation and three categories of specimens that could only be placed into a size class. Bison held the highest NISP per taxon and it is possible that many of the specimens placed in size class six are also bison, however, this could not be determined for certain. Table 6.30 summarizes the faunal remains.

Table 6.30 Summary of the Middle Occupation faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison bison*	16	1
Beaver	*Castor canadensis*	2	1
Snowshoe hare	*Lepus americanus*	2	1
Indeterminate Leporidae	*Lepus species*	1	1
Miscellaneous			
Very Large Mammal (SC6)		25	-
Small-Medium Mammal (SC3)		1	-
Small-Medium Bird (SC3)		1	-
Total		**48**	

Order Artiodactyla

Family Bovidae

Bison bison

Identified faunal remains: NISP = 16; indeterminate incisor (3650, 3651), indeterminate mandibular molar (3652), indeterminate tooth fragment (3653, 3662, 3663, 3664), left incisor (3657), indeterminate mandibular premolar (3658), right mandible (4524), left mandible (7102), 1st mandibular premolar (8285).

Taxonomic description: See page 81.

Discussion: The right mandible was found in unit 89N/211E and contained no teeth. This unit also contained part of a pit feature of burned bone and fire broken rock. The tooth fragments identified were found in adjoining unit 89N/210E and may belong to the same individual as the mandible. The left mandible was found a few metres to the east in unit 89N/214E. There was no cultural or thermal alterations present on these specimens. The teeth were extremely worn likely representing an older individual.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identifiable faunal remains: NISP = 2; right humerus (5107), right distal tibia-burned (8288).

Taxonomic description: See page 97.

Discussion: The humerus fragment was found near the burned bone pit in unit 89N/212E but did not display signs of burning. The tibia was burned black, although it was not found near the feature. No other cultural, carnivore, or rodent modifications were present. These specimens were weathered at stage 2 on Behrensmeyer's (1978) weathering index.

Lepus sp.

Identified faunal remains: NISP = 1; left ulna (2117).

Discussion: This specimen was classified as *Lepus sp.* based on size and could be *Lepus americanus* or *Lepus townsendii*, both species are available in the area. It is more likely to be *L. americanus* as this species was identified in a nearby unit. The ulna was found in unit 88N/213E. No cultural modifications were noted on this specimen.

Order Rodentia

Family Castoridae

Castor canadensis

Identified faunal remains: NISP = 2; left maxilla (1256), left incisor (10022).

Taxonomic description: See page 113.

Discussion: The maxilla was found in unit 88N/212E in association with the pit feature, although this specimen did not exhibit signs of burning. No other cultural modifications were noted. The specimens were the same colour as the rest of the assemblage and are assumed to be the result of cultural activity.

Miscellaneous Faunal Remains

Identified faunal remains: NISP = 25; see Table 6.31

Discussion: All of the specimens presented below were found in units containing the burned bone and fire broken rock pit feature or in adjoining units. Only the small-medium bird specimen was burned and this specimen was too fragmented to identify to species. The small-medium mammal is likely a snowshoe hare specimen as it was found in association with specimens identified to this species. No other modifications were present on these specimens other than taphonomic processes similar to that described for the rest of the assemblage.

Table 6.31 Summary of the Middle Occupation miscellaneous faunal remains by size class.

Size Class	NISP	Elements Present	# Burned	Other Modifications
6-Very Large Mammal	25	19-Indeterminate tooth fragments 1-Vertebral spinous process 2-Mandibular fragments 3-Rib blades		
3-Small-Medium Mammal	1	1-Vertebral spinous process		
3-Small-Medium Bird	1	1-Long bone fragment	1	

Seasonality

There were no bison mandibles or maxilla containing teeth recovered from this assemblage that would permit statistical age analysis nor were any immature bison specimens identified. Therefore, seasonality based on age of bison specimens cannot be determined. Unfortunately, there were no other faunal indicators identified that would aid in a seasonality estimate. Therefore, seasonality of the Middle Occupation of the eastern excavation block can not be determined.

Patterns of Faunal Specimen Distribution

The Middle Occupation faunal assemblage is very small and the majority of the faunal remains were located in or near a large pit of burned bone and fire broken rock. The centre of this pit was located in unit 88N/212E and extended into units 88N/211E, 89N/211E, and 89N/212E. Nearly all of the identifiable bone was located in association with this feature, although they were unburned. The unidentifiable bone fragments were located in or near this pit with the majority of these being burned. The identifiable specimens do not indicate any distribution patterns based on species or size class. The pit feature was the spatial focus of the assemblage.

6.3.3 Lower Occupation Faunal Assemblage (Mummy Cave)

There was a total of 26317 faunal specimens in the Lower Occupation weighing 3.33 kg. The majority (89.8%) of the assemblage was burned with more than 90% of the burned specimens being unidentifiable. Based on weight unidentifiable bone made up 65.7% of the assemblage. Based on frequency the assemblage was made up of more than 99% unidentifiable bone suggesting a high degree of fragmentation of the faunal remains. Table 6.32 summarizes this information.

Table 6.32 Summary of the Lower Occupation faunal remains based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight (g)	N	%N	Weight (g)	N	Weight (g)
Unburned	126	0.5	1121.8	2530	9.6	342.4	2656	**1464.2**
Burned	32	0.1	23.4	23629	89.8	1844.2	23661	**1867.6**
Total	**158**	**0.6**	**1145.2**	**26159**	**99.4**	**2186.6**	**26317**	**3331.8**

There were ten taxa identified in the Lower Occupation of the eastern excavation block and seven categories of faunal remains that could be identified to size class or element group only. A large canid species was the most abundant based on NISP,

although bison had the largest minimum number of individuals. Table 6.33 summarizes this information.

Table 6.33 Summary of the Lower Occupation faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison sp.*	17	2
Large Canid (SC5)	*Canis sp.*	29	1
Snowshoe hare	*Lepus americanus*	5	1
Beaver	*Castor canandensis*	2	1
Pocket gopher	Indeterminate Geomyidae	1	1
Ground squirrel	*Spermophilus species*	2	1
Deer mouse	*Peromyscus maniculatus*	2	1
Meadow vole	*Microtus pennsylvanicus*	2	1
Fish		17	
Catfish			
Invertebrates	Family Sphaeriidae		
Bivalve		13	
Miscellaneous			
Very Large Mammal (SC6)		29	
Medium Mammal (SC4)		1	
Small-Medium Mammal (SC3)		12	
Small Mammal (SC2)		13	
Micro-Mammal (SC1)		2	
Large Bird (SC4)		2	
Identifiable to Element Group Only		9	
Total		**158**	

Order Artiodactyla

Family Bovidae

Bison sp.

Identified faunal remains: NISP = 17; MNE is summarized in Table 6.34. For a list of the landmarks used in these calculations see Appendix I.

Taxonomic description: See page 93.

Discussion: There is a minimum of two bison represented in this assemblage based on the number of proximal tibia shafts identified. The only burned specimen was an indeterminate sesamoid. All hind limb elements, except for one tibia, were located in unit 90N/209E and could belong to the same individual. All of the bison specimens were located at the west side of the excavation block. Taphonomic modifications resulted in light rootlet etching and weathering of stage 2 on Behrensmeyer's (1978) weathering index. No cultural or carnivore modifications were observed.

Table 6.34 Summary of the Lower Occupation *Bison sp.* elements.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial Skeleton					
Incisor	2	1	2	0.5	50
Caudal Vertebrae	1	1	1	0.14	14
Petrous Temporal	1	1	1	0.5	50
Forelimb					
Radial Carpal	1	1	1	0.5	50
Hindlimb					
Tibia	2	2	2	1.0	100
Talus	1	1	1	0.5	50
Fused C/4 Tarsal	1	1	1	0.5	50
Lateral Malleolus	1	1	1	0.5	50
Other Elements					
2nd Phalanx	4	-	4	0.5	50
3rd Phalanx	2		2	0.25	25
Miscellaneous					
Sesamoid	1	-	-		
Total	**17**				

Order Carnivora

Family Canidae

Canis sp. (SC5)

Identified faunal remains: 29; indeterminate long bone shaft (3456, 3457, 3458, 3459, 3460, 3943), metapodial-burned (3937, 4011), metatarsal (3942), indeterminate vertebral fragment (3910-burned, 3955, 3957-burned, 3958-burned, 4229), left atlas (3954), caudal vertebrae (4243), 1st phalanx-burned (4183), 2nd phalanx-burned (4143),

left 4th metacarpal-burned (9261), skull fragments-burned (4227, 4228), frontal/orbital (4226), right and left mandibles, canine, 2nd , 3rd, 4th premolars, 1st, 2nd molars (4225), incisor (4055), right ulna (4796), left calcaneus (4805), left proximal femur (4806).

Discussion: These specimens represent one individual that could be either *Canis lupus* or a large domestic dog. When compared to the specimens in the comparative collection they were slightly smaller than the adult male *C. lupus* specimen. All of these specimens were found in unit 89N/210E at the extreme western end of the excavation block. Many of the distal limb elements and the axial elements were burned black. Cut marks were evident on the anterior shaft of the ulna. These factors suggest that this canid was butchered. The teeth were extremely worn and suggest that this was an older individual. See Plates 6.5 and 6.6 for photos of specimens.

Plate 6.5 *Canis sp.* specimens from the Lower Occupation, Eastern Block.

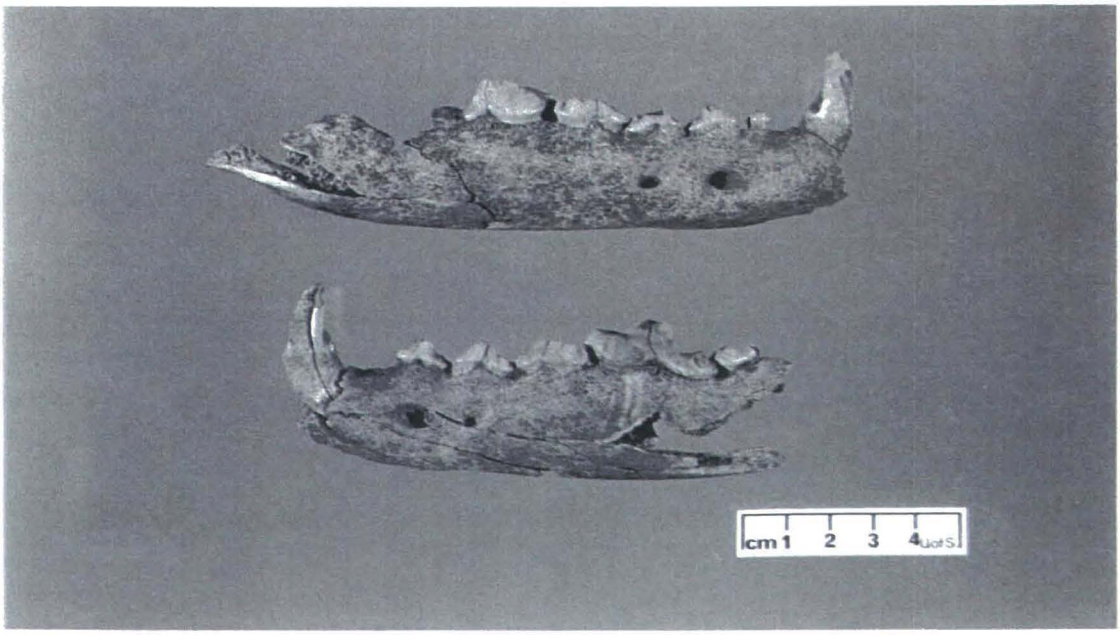

Plate 6.6 *Canis sp.* mandibles from the Lower Occupation, Eastern Block.

Order Lagomorpha

Family Leporidae

Lepus americanus

Identified faunal remains: NISP = 5; right distal tibia (342), right distal humerus (5750), left distal humerus (9840), indeterminate vertebrate-burned (9797), right scapula-burned (10500).

Taxonomic description: See page 97.

Discussion: There is one individual represented by these specimens. The majority of the specimens were found along the edge of a large concentration of burned bone in the northeastern area of the block in units 89N/212E and 90N/212E. Two of these specimens were burned which may suggest human intervention. No other cultural or carnivore modifications were present. All the specimens were lightly rootlet etched.

Order Rodentia

Family Castoridae

Castor canadensis

Identified faunal remains: NISP = 2; incisor (6605, 6705).

Taxonomic description: See page 113.

Discussion: These incisors were identified as beaver based on size. Both specimens were found in unit 89N/213E at the edge of a large cluster of burned faunal remains. These specimens did not display signs of thermal or cultural modifications but are assumed to be part of the cultural assemblage based on association with other artifacts.

Family Geomyidae

Indeterminate Geomyidae

Identified faunal remains: NISP =1; mandible and incisor (4328)

Discussion: This specimen was missing identifiable attributes such as teeth to identify it to species. It was identified as a pocket gopher based on size and morphology of the mandible. The specimen was located in unit 89N/213E and was not near any feature. It is likely that this specimen is part of the background fauna.

Family Sciuridae

Spermophilus sp.

Identified faunal remains: NISP = 2; distal tibia (1117), indeterminate vertebrae-burned (1018), left distal humerus (3284).

Discussion: There were not enough identifiable attributes present to identify these specimens to species, although size suggests they represent *S. richardsonii* which is a common species in the Forks area. The specimens were found in unit 88N/211E, except for the humerus which was found in unit 89N/209E. The vertebral fragment was burned which may indicate human intervention. No feature was identified near the specimens, and no other cultural modifications were observed.

Family Muridae

Peromyscus maniculatus

Identified faunal remains: NISP =2; left and right mandibles (7325).

Taxonomic description: The deer mouse has one of the widest distributions of all North American mammals. They are found in almost all habitats except wet areas. They do not hibernate during the winter, but drop their body temperature considerably and huddle together. They excavate trails underneath the snow in the winter to move about and forage. These mice are a particularly important source of food for predators.

Discussion: Both of these specimens were found in unit 89N/214E at the edge of a large burned bone feature. There were no cultural or thermal modifications present on the specimens.

Microtus pennsylvanicus

Identified faunal remains: NISP =2; left mandible (5397), right mandible (5911).

Taxonomic description: The meadow vole's preferred habitats are wet meadows but they will live in grasslands and forest edges that have enough vegetation for cover. These animals do not hibernate but build tunnels under the snow to move about and forage. In the summer they tend to build above ground nests to raise their young.

Discussion: These specimens were found in unit 89N/212E again at the edge of a burned bone feature. There were no cultural or thermal alterations present on either specimen.

Fish

Family Ictaluridae

Identified faunal remains: NISP = 4; pectoral spine (5696, 5746, 7793, 9870).

Discussion: These specimens were identified to catfish based on the presence of and the morphology of the pectoral spines. All of these specimens were burned which may indicate human modification. These catfish specimens were located in unit 89N/212E, 90N/212E, 90N/209E. Catfish are not presently found in the Saskatchewan

Small Fish (minnow size)

Identified faunal remains: NISP = 1; vertebral centrum (6497).

Discussion: This small specimen was located in unit 89N/213E and could only be identified to a size class. When compared to the specimens in the comparative collection it was similar in size to those of minnows or darter fish.

Indeterminate Fish

Identified faunal remains: NISP = 11; vertebral centrum (1019-burned, 1118-burned, 1659-burned, 5697-burned, 6292-burned, 7794), mandible fragment (1095, 1478, 3304), indeterminate section (5775).

Discussion: These specimens were too fragmented to be identified to size class or species, but were identified as fish based on bone texture and shape of the centrum. Most of the vertebral fragments were burned suggesting human modification. The specimens were located in units in the centre of the excavation block. No features were noted here.

Invertebrates

Phylum Mollusca

Class Bivalvia

Family Sphaeriidae

Identified faunal remains: NISP = 13; shell fragments.

Discussion: The shell specimens were fragments of various sizes of a bivalve. The species of the shells cannot be identified for certain but may be of the genus *Psidium*. This identification is based on the find of other *Psidium* specimens at the site (Jennifer Murray personal communication 2005).

River system nor are they commonly found in the North or South Saskatchewan rivers. They are, however, present in the Red Deer River and the Qu'Appelle River, both of which connect to the South Saskatchewan (Walker personal communication 2005). Therefore, there is a connecting drainage source between the current location of the catfish and the site area. More research into past drainage systems will aid in the interpretation of these specimens at the site. Catfish tend to be present in warm, oxygen depleted waters (Piper *et al.* 1982). Their presence at the Below Forks site is important as a paleoenvironmental indicator to the effect that the changing climate may have had on the river systems during this time period. See Plate 6.7.

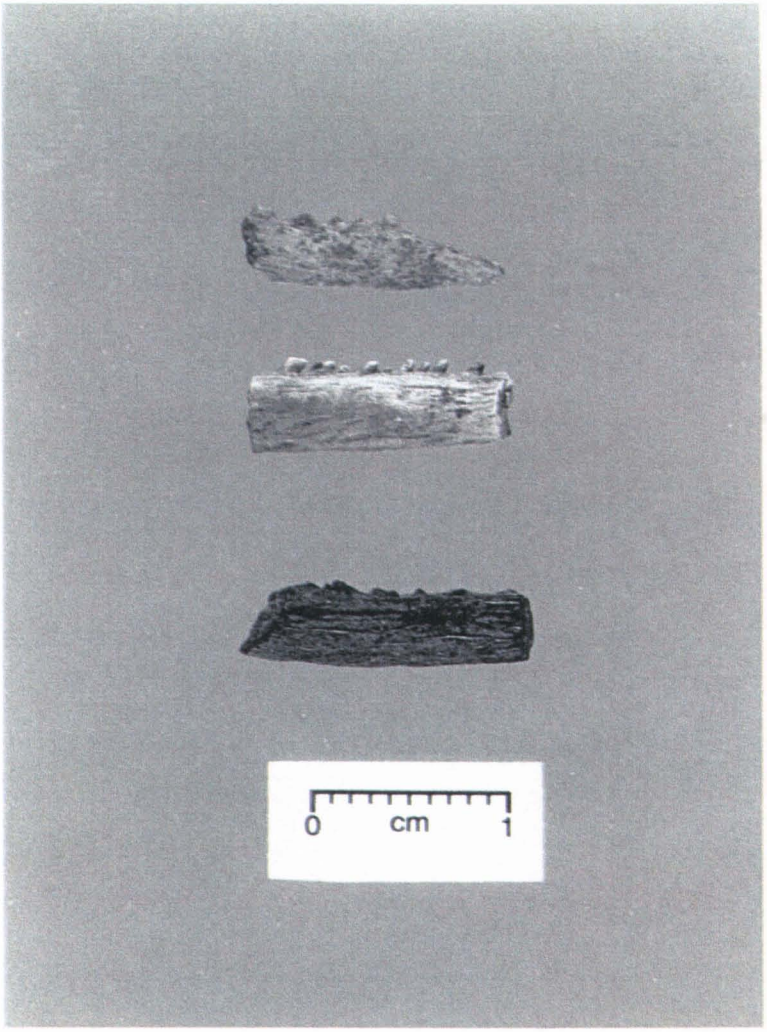

Plate 6.7 Catfish pectoral spines from the Lower Occupation, Eastern Block.

Miscellaneous Faunal Remains

Identified faunal remains: NISP = 68; see Table 6.35 for summary.

Discussion: The very large mammal specimens were distributed across the entirety of the excavation block and may represent bison as this was the only ungulate identified in this assemblage, although this cannot be determined as other ungulates are present at the site. The incisors placed in the small-medium mammal category are approximately the same size as a porcupine (*Erethizon dorsatum*) and may represent this species, although more identifiable attributes would be needed to say for certain. The small mammal and micro-mammal specimens are that of indeterminant rodents and may represent a species already identified in this assemblage. The specimens that were identified to element group only could have been placed in two or more size classes (small-medium or small mammal). The majority of the specimens were located on the edge of the burned bone feature, although only eight of these were burned (See Kasstan (2004) for location of the feature).

Table 6.35 Summary of the Lower Occupation miscellaneous specimens based on size class.

Size Class	NISP	Elements Present	# Burned	Other Modifications
6-Very Large Mammal	29	6-Indeterminate tooth fragments 14-Longbone fragments 1-Mandibular fragments 1-Skull fragment 4-Rib blades 2-Metapodial Shaft 1-Scapula blade		
4-Medium Mammal	1	1-Rib	1	
3-Small-Medium Mammal	12	4-Indeterminate vertebrae 2- Tibia shaft 4-Incisors 1-Indeterminate appendicular 1-Phalanx	3	

2-Small Mammal	13	1-atlas 5-Indeterminate molars 4-Incisors 1-Mandible 1-Calcaneus 1-Indeterminate appendicular		
1-Micro-Mammal	2	1-Vertebral fragment 1-Indeterminate molar		
4-Large Bird	2	2-Long bone fragment		
Identifiable to element group only	9	5-Indeterminate appendicular 1-Indeterminate axial 3-Rib fragments	4	

Table 6.35 (continued) Summary of the Lower Occupation miscellaneous specimens based on size class.

Seasonality

There were very few identifiable faunal specimens in this assemblage and therefore there were very few specimens identified to bison. There were no mandibles, maxillae, or identifiable teeth present that would enable a statistical age determination nor were any immature specimens identified. Likewise there were no hibernating or migrating species that could indicate a seasonality. The presence of fish remains indicates that this was a warmer season where aquatic resources would have been available (spring, summer, or fall).

6.4 The 1980 Excavation Block

The two 1980 excavation units were located more than thirty metres to the west of the central excavation block. This distance combined with the complex stratigraphy at the site made it nearly impossible to correlate the stratigraphy between the excavation blocks. Therefore, the Mummy Cave occupation in the 1980 block was correlated to the Mummy Cave occupation in the rest of the site by a radiocarbon date of 5845 ± 140 (S-2245) rcybp, a date within the appropriate time range. This occupation was also noted as having a similar artifact density as the Mummy Cave occupation in other areas. For the scope of this thesis only the Mummy Cave occupation and an occupation below this were analysed in the 1980 block of units. There were relatively few artifacts located above this and with

only two units opened it was difficult to determine affiliation with the rest of the site occupations.

6.4.1 The Mummy Cave Occupation (1980 block) Faunal Assemblage

There were 60 faunal remains uncovered in the Mummy Cave occupation in the 1980 excavation block with a total weight of 0.6 kg. In comparing this area of the Mummy Cave occupation to the rest of the site there was a higher number of identifiable bone, numbering more than 41%. Forty-four percent of identifiable bone was burned. Table 6.36 summarizes this information.

Table 6.36 Summary of the Mummy Cave occupation (1980 block) faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	14	73.7	616.9	5	26.3	9.0	19	625.9
Burned	11	26.8	29.1	30	73.2	20.1	41	46.9
Total	**25**	**41.7**	**682.0**	**35**	**58.4**	**29.1**	**60**	**711.1**

The only identifiable taxon in this assemblage was *Bison sp.* This is likely due to the small sample size. Two categories of size class were needed to organize specimens that could not be identified to level of taxon. Table 6.37 summarizes.

Table 6.37 Summary of the Mummy Cave occupation (1980 block) faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals Bison	*Bison sp.*	6	2
Miscellaneous Very Large Mammal (SC6) Small-Medium Mammal (SC3)		 18 1	
Total		25	

Order Artiodactyla

Family Bovidae

Bison sp.

Identifiable faunal remains: NISP = 6; MNE is summarized in Table 6.38.

Taxonomic description: See page 93.

Discussion: There is a minimum of two individuals present in this assemblage based on the number of left fused 2/3 tarsals present. These specimens were all recovered from unit 89N/100E. There were no cultural, thermal, or carnivore modifications observed on any of the specimens. All specimens were lightly rootlet etched and weathered at stage 2 on Behrensmeyer's (1978) weathering index.

Table 6.38 Summary of the Mummy Cave (1980 block) *Bison sp.* elements.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Forelimb					
Scapula	1	1	1	0.5	50
Hindlimb					
Fused 2/3 Tarsal	2	2	2	1.0	100
Lateral Malleolus	2	1	2	1.0	100
Other Elements					
1st Phalanx	1	-	1	0.125	12.5
Total	**6**				

Miscellaneous Faunal Remains

Identified faunal remains: NISP = 19; See Table 6.39.

Discussion: The very large mammal specimens were found in unit 89N/100E and may be that of bison as they were found in association with other bison specimens. This is only speculation, however, as they could be derived from other ungulates common in the area. Eleven of these more fragmented specimens were burned. The small-medium mammal specimen was found in unit 90N/100E and did not exhibit any signs of cultural modification.

Table 6.39 Summary of Mummy Cave occupation (1980 block) miscellaneous faunal remains.

Size Class	NISP	Elements Present	# Burned	Other Modifications
6-Very Large Mammal	18	2-Indeterminate tooth fragments 12-Long bone fragments 4-Rib blades	11	Crenulated-1 long bone shaft.
3-Small-Medium Mammal	1	1-Femoral head and neck		

Seasonality

There were no bison elements or hibernating or migrating species identified in the Mummy Cave Occupation (1980 Block) that could warrant a seasonality estimate. Therefore, seasonality cannot be determined in this area of the site by means of faunal remains.

6.4.2 Below Mummy Cave (1980 block) Faunal Assemblage (cultural affiliation unknown).

There was a total of 1314 faunal specimens recovered from this occupation weighing approximately 1.4 kg. The majority (92.5%) of the faunal remains, based on frequency, were unidentifiable and 88% of these were burned. Based on weight, 72.5% of the assemblage was identifiable indicating the relatively complete nature of the identifiable elements. Table 6.40 summarizes.

Table 6.40 Summary of the Below Mummy Cave occupation (1980 block) faunal assemblage based on burning.

	Identified			Unidentified			Total	
	N	%N	Weight(g)	N	%N	Weight (g)	N	Weight(g)
Unburned	46	24.1	954.7	145	75.9	114.3	191	1069
Burned	52	4.6	68.2	1071	95.4	273.4	1123	341.6
Total	**98**	**7.4**	**1022.9**	**1216**	**92.5**	**387.7**	**1314**	**1410.6**

There was only one taxa identified in this assemblage and that was *Bison sp.* The remainder of the identifiable specimens could be placed into size class only. Two categories of size class were needed in this assemblage. Table 6.41 summarizes.

Table 6.41 Summary of the Below Mummy Cave occupation (1980 block) faunal assemblage.

Common Name	Taxonomic Classification	NISP	MNI
Mammals			
Bison	*Bison sp.*	7	1
Miscellaneous			
Very Large Mammal (SC6)		90	
Small Mammal (SC2)		1	
Total		**98**	

Order Artiodactyla

Family Bovidae

Bison sp.

Identified faunal remains: NISP = 7; see Table 6.42 for MNE.

Taxonomic description: See page 93.

Discussion: A minimum of one individual is represented in this assemblage based on the elements identified. There were no thermal, cultural or carnivore modifications present on these specimens. All of the specimens experienced light rootlet etching and weathering rating at stage 2 on Behrensmeyer's (1978) weathering index.

Table 6.42 Summary of the Below Mummy Cave (1980 block) *Bison sp.* elements.

	NISP	MNI (Side)	Total MNE	Total MAU	% MAU
Axial					
Cranium (petrous temporal)	2	1	2	1.0	100
Upper 3rd Molar	1	1	1	0.5	50
Forelimb					
Humerus	1	1	1	0.5	50
Fused 2/3 carpal	1	1	1	0.5	50
Radius	1	1	1	0.5	50

Other Elements 1st Phalanx	1	1	1	0.125	12.5
Total	7				

Table 6.42 (continued) Summary of the Below Mummy Cave (1980 block) *Bison sp.* elements.

Miscellaneous Faunal Remains

Very Large Mammal (SC6)

Identifiable faunal remains: NISP = 90; right occipital (20862), indeterminate skull (20863, 208655, 21800, 21803-burned, 21826-burned), indeterminate tooth (20866-burned, 21780, 21786-burned, 21787, 21788, 21799, 21808, 21809), indeterminate appendicular (21855-burned, 21859-burned, 21865-burned, 21866-burned, 21867-burned, 21875-burned, 21876, 21877, 21884, 21888, 21889, 21890, 21891, 21894, 21900, 21921, 21926), metapodial (21861, 21863), right ulna (21911, 21916), tibia shaft (21922-burned, 21923-burned).

Discussion: These specimens did not have enough identifiable attributes to identify them to taxa, however, based on size it could be determined they were of a large ungulate. Fifty-two of the specimens were burned and one long bone shaft was crenulated by carnivore modification. No cultural modifications were present.

Small Mammal (SC2)

Identified faunal remains: NISP = 1; proximal right femur (21784).

Discussion: Only one specimen was identified to this size class and not enough identifiable attributes were present to identify to species. No cultural or thermal alterations were observed.

Seasonality

There were no faunal indicators in this assemblage that could indicate seasonality of occupation. Therefore, seasonality could not be determined for the Below Mummy Cave Occupation in this area of the site.

The faunal remains from this assemblage and all of the following assemblages at the site rated a 2 on Behrensmeyer's (1978) weathering index. This indicates a short exposure of the specimens on the ground surface as they were covered relatively quickly after deposition by sediment as a result of river flooding. This is a persistent feature through all of the site's assemblages and explains how the occupations became so deeply buried in the river terrace.

6.5.2 Upper Occupation 2

The Upper Occupation 2 in the central block contained only three identified taxa, these being bison (MNI=1), snowshoe hare (MNI=1), and an indeterminate fish specimen. The majority of the specimens recovered were unidentifiable and burned, although no hearth feature was uncovered. Like the Upper Occupation 1 this assemblage also experienced sediment mixing due to bioturbation, but not to the same extent.

With only 220 faunal remains uncovered in this assemblage distributional patterning could not be determined and therefore no activity areas were identified. The burned, fragmented, and highly distributed and disarticulated nature of the faunal assemblage could suggest that this assemblage is like the previous, being a campsite or a multiple activity site, although this is uncertain due to the small assemblage with a lack of features. Seasonality of this occupation could not be determined by the faunal remains.

6.5.3 Paleosol 19 Assemblage

The paleosol 19 assemblage is another small assemblage containing only two identified taxa; the snowshoe hare and the sharp-tailed grouse. There were also very large mammal, small mammal, and small-medium bird remains recovered, although they could not be placed within a taxon. Like the previous assemblage paleosol 19 contained a very small number of faunal remains (443) and the majority were unidentifiable. Over half of the assemblage exhibited signs of burning, although no hearth feature was encountered.

The distribution of artifacts did not indicate patterning of any sort to indicate activity areas. Again, like the previous assemblage, the highly fragmented, burned, and

6.5 Discussion and Summary of the Central Excavation Block and the 1980 Excavation Block Occupation Layers

6.5.1 Upper Occupation 1

There were eight different taxa identified in the Upper Occupation 1 assemblage of the Central Block. These included bison (MNI=1), deer (MNI=1), snowshoe hare (MNI=3), beaver (MNI=1), northern pocket gopher (MNI=1), woodchuck (MNI=1), a member of the genus *Anas* (Aves) (MNI=1), and an indeterminate fish specimen. The majority of the assemblage was unidentifiable to taxon and was burned. It is uncertain how many occupational events are represented in this assemblage as sediment mixing was heavy due to rodent activity and plant root growth.

The distribution of faunal remains was not patterned in any way as to produce discernable activity areas. This lack of patterning could be due to the fact that there were too few faunal remains recovered here to create concentrations of bone. Individual taxa or faunal size class groups were not found to be concentrated in specific areas, but were rather found dispersed throughout the excavation block. The only exception to this were the snowshoe hare specimens located in unit 84N/137E. Here a nearly complete individual was found with no indication of burning or butchering. There were no features found in this occupation, although the large percentage (67.4%) of burned bone suggests that at least one hearth was located nearby.

The nature of the Upper Occupation 1 is difficult to determine due to the small number of artifacts represented. However, it is likely that this assemblage represents a campsite or a multiple activity site. This is indicated by the highly fragmentary nature of the faunal remains, the large percentage of burned specimens, the highly dispersed and disarticulated nature of the taxa, and by the large diversity of taxa but relatively few bones from each found within the site (Sivertson 1980). Lithic artifacts indicate that stone tool manufacturing was taking place. Seasonality of the Upper Occupation 1 was presumed to be late winter/early spring based on the remains of an immature bison and the presence of the (hibernating) woodchuck.

dispersed nature of the faunal remains could indicate this was a campsite or multiple activity site, although the assemblage is too small to say for certain. Lithic debitage recovered from the assemblage indicates that stone tool manufacturing took place during this occupation.

It is interesting to note that bison or very large mammal of any sort was not the main species being used for subsistence during this occupation. Snowshoe hare dominated the faunal assemblage along with a variety of other birds and small mammals. These species, and the low number of faunal remains, may indicate a small group of people occupying the site for only a short time period.

6.5.4 Upper Oxbow Assemblage

Bison (MNI=1), snowshoe hare (MNI=2), and the northern pocket gopher (MNI=1) were the identifiable taxa found in the Upper Oxbow Assemblage along with small mammal, bird, and fish remains that could not be identified to taxon. By the number of faunal remains alone more than 94% of the assemblage was unidentifiable, although by weight more than 80% of the assemblage was identifiable. This is due to the fact that the identifiable specimens were relatively complete elements while the remainder of the faunal assemblage was highly fragmented.

There were no features located in this occupation layer, although the large number of burned bone indicates that there was likely a hearth feature nearby. No real activity areas were identified by the distribution of faunal remains, however, the majority of identifiable bone was located in the north west area of the excavation block. Also, all of the burned bison specimens were found in unit 88N/135E.

Bison and snowshoe hare are almost equally represented in the assemblage, however, the high number of specimens placed in the very large mammal size class indicates that very large mammals (perhaps bison) were the main source of subsistence. Although no butchering marks were observed, burning of several of the snowshoe hare and pocket gopher specimens indicates that these specimens were used as a secondary source of subsistence. Gopher remains are often interpreted as intrusive species in a faunal

assemblage because of their burrowing behaviour, however, they were likely important elements in prehistoric diets (Shaffer 1992; Stahl 1982). Several fish vertebrae recovered also were burned indicating their consumption.

The large amounts of Swan River Chert debitage and the recovery of an ear of an Oxbow projectile point indicate that the main activity during this occupation was the production of stone tools. Several cut marks and chopping marks on the bison specimens, along with the heavily fragmented and burned nature of the faunal remains, indicate that processing activities were also taking place at the site. The large number of bison distal limb elements indicate that the animals were likely killed elsewhere and the meat bearing portions were brought back to the site. The low numbers of very large mammal specimens along with the many fragmented specimens indicate that these were likely terminal processing activities, which could include marrow extraction and grease production. Bone marrow extraction could also explain the lack of bison elements rich in marrow being identified in the assemblage, perhaps these elements were too fragmented to be identified. This is only speculation as the sample size is extremely small (MNI=1 bison) and %MAU statistical analysis requires a larger number of specimens.

Based on the observations above, the higher ratio of stone debitage to faunal remains, and a highly dispersed nature of the artifacts, this occupation can be identified as a camp or multiple activity site with stone tool production as the main activity. Seasonality of the occupation could not be determined from bison remains or hibernating animals, although the presence of fish indicates that aquatic resources were available at the time of occupation.

6.5.5 Lower Oxbow Assemblage

The Lower Oxbow Assemblage was only identified at the eastern edge of the central excavation block in paleosol 21a. Because of the small area excavated the number of faunal remains uncovered in this assemblage is extremely small (285). Only nine specimens were identifiable and these were bison (MNI=1), caribou (MNI=1), snowshoe

hare (MNI=1), and indeterminate small mammal and fish remains. Burned bone comprised 44% of the assemblage.

This occupation contained a higher frequency of lithic debitage than faunal remains, and again it is probable that stone tool manufacturing was the main activity taking place with the processing and probable consumption of a low number of mammals and fish being a secondary activity. Because of the low number of faunal remains uncovered and the fact that this assemblage was only identified in four units, no artifact distribution was identified which could indicate a pattern of site activity.

Of special interest in this assemblage was the discovery of a caribou antler that may have been used as a billet for percussion flaking (Meyer 2003). The size of this antler is suitable for such a task and the burrs have been smoothed. Impact scars, however, are not present on the antler and if this specimen was used for such a task it was likely brief. Antler billets are used in the production of stone tools as soft hammers and are particularly useful in thinning, flattening, and shaping stone. This is because the soft nature of the antler compresses slightly and the force is spread out more slowly and evenly. This is essential for producing large tools with thin straight edges (Whittaker 1994). The present day range of woodland caribou is to the north of the Below Forks site within the Northern Boreal Ecoregion, extending only slightly into the Southern Boreal Ecoregion (Banfield 1974). If the climate of the area during the time of the Oxbow Complex was becoming cooler and wetter (conditions similar to that seen today) than the preceding Altithermal, then it is likely that the caribou's range was similar to that seen at present. Nevertheless, it is likely that caribou were not found in the area during the deposition of this assemblage (4790 ± 70 rcybp (TO-10085)) and that this antler was brought to the site possibly as a trade item. This theory is also supported by the fact that there were no other faunal remains identified as caribou in the assemblage, suggesting that they were not procured as part of the food supply.

From the low number of bone identified in the assemblage it appears that small mammals were a main source of subsistence. This is only speculative, however, as only nine specimens were identifiable. Burning of the snowshoe hare remains suggests this

animal was procured as a food resource. Seasonality of the site occupation could not be determined from foetal bison remains or the presence of hibernating species, although the presence of fish remains indicates that aquatic resources were available.

6.5.6 Mummy Cave Assemblage

Central Excavation Block

The Mummy Cave Assemblage is the most dense, most extensive occupation at the site. Faunal remains identified here include bison (MNI=3), large canid (MNI=1), medium canid (MNI=1), snowshoe hare (MNI=1), white-tailed jack rabbit (MNI=1), beaver (MNI=1), norther pocket gopher (MNI=1) and a large number of indeterminate mammals ranging from very large size class to micro-mammal size class, and small-medium-sized and micro-sized bird specimens. Like the Upper Oxbow Assemblage, the majority of bone by frequency was unidentifiable, however, by weight the majority was identifiable indicating the relatively complete nature of the identifiable specimens. Just under half (47.7%) of this assemblage was burned. No hearth features were identified, although it is presumed by the presence of burned bone and fire-broken rock (FBR) that one was located nearby.

The Mummy Cave occupation in the central excavation block had a dense layer of lithic debitage, faunal remains, and FBR. The majority of the assemblage was made up of debitage indicating that the main activity during this occupation was stone tool manufacturing. This is also supported by the recovery of an antler tine pressure flaker and an anvil. When looking at the distribution of artifacts, there are no clear patterns of distribution that would indicate activity areas, however, the majority of the artifacts were located in the western to north western section of the excavation block. The artifact types (lithic and faunal) were not separated nor was burned and unburned bone, burned bone fragments being found alongside unburned fragments. This lack of separation and patterning could indicate that the area may have been used as a refuse disposal area and that specific activities leading to the production of these artifacts were occurring elsewhere (Meyer personal communication 2005). Hide preparation may also have been an activity occurring at the site as two end scrapers and a side scraper were found in this assemblage.

It is also possible, however, that these were the final products being made during tool production. From the evidence described above it seems that the Mummy Cave occupation in the central excavation block was a campsite with a variety of activities taking place within its confines.

The faunal remains in this assemblage indicate that bison were the main source of subsistence during this occupation. The bison specimens recovered from this assemblage were larger than those in the comparative collection and it is likely that they represent one of the extinct bison species known to be present at the time of occupation, *B. occidentalis or B. antiquus*. The majority of the elements identified were limb elements and most of these were distal portions. It was once suggested by White (1952: 224) that the lower limbs did not contain usable meat and therefore would have been chopped off at the kill site to reduce carrying loads. Perkins and Daly (1968 c.f. Lyman 1994:224) later proposed the schlepp effect which indicated that the feet made convenient handles for dragging limbs and hides back to camp. As well, they contained valuable sinews. Other statistical indices have been created using MAU to determine food utilization versus bone density and subsequent survivorship of bone due to taphonomic forces (Behrensmeyer 1975; Haynes 1980 c.f. Lyman 1994). With only thirty-seven specimens identified as bison these statistical tests could not be applied to this assemblage. The preservation at the Below Forks site was excellent and it is therefore unlikely that taphonomic forces had a significant effect on bone preservation. Also, since the site is clearly not a kill site White's theory would not apply to this assemblage. Therefore, the most likely reason that distal limb elements appear in the site is that they were brought to the site with the meat and marrow bearing portions of the bison limbs. There were also a large number of smaller mammal remains identified at the site; particularly abundant were snowshoe hare specimens. Several of these specimens were burned which may indicate human modification and their importance as a secondary source of subsistence.

Canis sp. specimens were also identified in this assemblage representing both *Canis lupus* (wolf) and *Canis latrans* (coyote) sized animals. It is also possible, however, that these specimens could represent a domestic dog, although the small sample size does not

provide enough detail to make this judgement. One very important specimen recovered at the west end of the excavation block was a bone pin or rod that was made from a *Canis sp.* (size class 5) ulna shaft. This pin/rod was broken into three pieces of which two could be refitted (see Plate 6.4). The pin/rod is extremely smooth and there are longitudinal striations spanning its entire length. Jefferies (1997) conducted a study on Middle Archaic bone pins found in mid-Holocene sites along the Middle Mississippi and Lower Ohio Rivers and their tributaries. He noted a similarity in pin morphology and decoration and suggested that the pins were used to transmit information to other groups as well as provide a way for group members to identify themselves and other groups as part of a social network in a larger regional group. Jefferies (1997:465-466) believes that the pins may be associated with people's attempts to adapt to the changes in the social and physical environment caused by the mid-Holocene climatic change, which caused decreased group mobility and the emergence of more restricted local territories. The bone pins analysed in Jefferies' study were made from deer metapodials and showed minimal evidence of use wear indicating they did not come into contact with resistant materials. Many of these pins were noted to display an overall polish attributed to sanding during production. Some of the specimens were noted to have longitudinal striae also produced during production (Jefferies 1997:471). The description of pin production from this latter study exhibits similarity to the pin discovered at Below Forks particularly in reference to smoothing and longitudinal striae. Jefferies describes these pins as likely being used as hair pins, pendants, or clothing pins. It is not being suggested here that the Below Forks pin/rod is part of an exchange network from the Southern Midwestern United States, but perhaps this pin held a similar use function and was prepared in a similar manner. Identifying this pin/rod as part of an exchange network would require the discovery of more pins of similar style and antiquity to be found on the Northern Plains.

Another bone tool was identified in the central block Mummy Cave Assemblage. This was an antler tine pressure flaker made from the antler of an indeterminate Cervid. Pressure flaking involves using an antler or bone tool to remove flakes from the edge of a tool by pressing it against the stone instead of striking it. This method is usually used for

the final retouch on tools (Whittaker 1994:33). The antler tine recovered from this assemblage exhibits signs of being used in this fashion. The end has been rounded and facets are present on the end made by pressing it against the stone. The handle portion of the antler has also shows polish, likely where the hand would grip it.

Seasonality of site occupation was estimated from three immature bison specimens to fall within a late winter to early summer occupation. Further paleoenvironmental research may be able to pinpoint the time period more closely.

1980 Excavation Block

In the two units excavated in this block 60 faunal remains were recovered along with a larger amount of lithic debitage. Because of the small area uncovered no spacial patterning could be inferred. From the artifacts identified, however, it can be presumed that stone tool manufacturing was occurring along with the processing and assumed consumption of bison (MNI=1) and a small-medium sized mammal. There were no features identified in this assemblage and seasonality could not be inferred.

6.5.7 Below Mummy Cave Assemblage

Central Excavation Block

It is unclear whether this assemblage in the central block is cultural as there were very few faunal remains (138), the faunal remains did not exhibit any signs of butchering, and there were very few lithic artifacts. Several of the identified specimens did, however, exhibit signs of burning which may suggest human intervention. Bison (MNI=1), small mammal and micro-mammal (may be intrusive) were identified in this assemblage. Seasonality could not be inferred from the faunal remains identified nor could the nature of the site activities due to the small assemblage size.

1980 Excavation Block

The Below Mummy Cave occupation in the 1980 excavation block was relatively dense with 1314 faunal remains recovered along with a large amount of lithic debitage.

Cultural affiliation is unknown, although the assemblage is below the presumed Mummy Cave occupation dating to 5845 ± 140 rcybp (S-2245) and is therefore presumed older than this. No features were encountered and the area excavated was too small to determine activity areas. Again, from the lithic artifacts recovered it is presumed stone tool manufacturing was occurring along with the procurement and probable consumption of bison (MNI=1) and an indeterminate small mammal. No faunal indicators could be identified that would infer the season of occupation.

6.6 Discussion and Summary of the Eastern Excavation Block

6.6.1 Upper Occupation Assemblage

The Upper Occupation in the eastern block contained a small faunal assemblage (66 specimens) with 23 of these being identifiable. The majority of the assemblage was unburned and no hearth features were observed. From the contour density plots created by Kasstan (2004) for this occupation it would appear that lithic debitage and FBR were situated in the northwestern corner of the excavation block in what Kasstan identified as a lithic reduction station. The faunal remains occurred separately in the eastern area of the block. The faunal remains identified included bison (MNI=1), medium sized canid (*Canis latrans* sized) (MNI=1), beaver (MNI=1), and snowshoe hare (MNI=2). There were no butchering marks identified on any of the faunal remains, although one snowshoe hare specimen was burned indicating human intervention. The burned, fragmented bone found in the assemblage indicates that there was likely terminal processing of faunal remains occurring at the site.

The faunal remains identified show a heavy reliance on small mammals as a source of dietary subsistence. By number of identifiable faunal remains it would appear that small mammals were the primary source of subsistence, although the heavily fragmented unidentifiable bone may represent very large mammals making the primary source that of bison or other large ungulates. Either way both small and large mammals were important sources of subsistence.

One bone tool was identified in this assemblage, this being a scraper or flesher made from a rib blade of an indeterminate large ungulate. This specimen was thinned at the working edge and was smoothed on the portion that would have been held in the hand.

The artifacts identified in this occupation indicate that this was likely a campsite or multiple activity site in which there was a scatter of campsite materials that were loosely separated. Lithics were on one side of the area and faunal remains were on the other. There were no faunal remains identified in this assemblage that could indicate a season of occupation.

6.6.2 Middle Occupation Assemblage

The Middle Occupation in the eastern block contains a small number of faunal remains (282) that were mainly concentrated in or near a large pit feature that was filled with unidentifiable burned bone and FBR. The centre of this pit feature was located in unit 88N/212E. Identifiable bone was not found within the pit but was situated in adjoining units. Only two of the fifty identifiable bones were burned. Taxa identified in this assemblage included bison (MNI=1), beaver (MNI=1), snowshoe hare (MNI=1), indeterminant very large to small-medium sized mammals, and a small-medium sized bird specimen. Based on NISP bison and indeterminate very large mammals were the most highly represented and therefore are likely the primary source of subsistence. Small mammals and birds, however, would have been extremely important as a secondary source of subsistence as they too are well represented in this assemblage.

From the density contour plots created by Kasstan (2004) it appears that lithic debitage, FBR, and cores are scattered throughout the northern portion of the excavation block, while faunal remains are concentrated around the pit feature. This feature is not a hearth as there was no soil oxidization. Perhaps it was a refuse pile where hearth debris was being dumped. Nevertheless, this occupation again represents a campsite or a multiple activity site where both stone tool manufacturing and the processing of faunal remains was occurring. The seasonality of occupation could not be determined from the faunal materials recovered in this assemblage.

6.6.3 Lower Occupation Assemblage (Mummy Cave)

The faunal assemblage in the Lower Occupation was the largest identified at the Below Forks site with 2617 faunal specimens. The majority of these faunal remains were unidentifiable and burned. More than 99% of the assemblage was unidentifiable indicating the highly fragmented nature of the assemblage. Taxa identified included bison (MNI=2), large (*Canis lupus*) sized Canid (MNI=1), snowshoe hare (MNI=1), beaver (MNI=1), pocket gopher (MNI=1), ground squirrel (MNI=1), deer mouse (MNI=1), meadow vole (MNI=1), catfish (MNI=1), bivalve, an indeterminate large bird, and a variety of indeterminate mammals ranging from very large to micro-sized.

Bison are the most highly represented taxa in the assemblage and it is possible, based on bone thickness, that many of the highly fragmented specimens also represent bison or another very large mammal. Therefore, bison are the primary source of subsistence during this occupation. Medium to small mammals, birds, and fish are also very well represented in this assemblage and are considered to be an important secondary subsistence source.

Of extreme importance in this faunal assemblage was the recovery of cranial, vertebral, and limb elements of a large canid species. When compared to the comparative collection these specimens were slightly smaller than the male *Canis lupus* specimen and may represent that species or a larger domestic form. All of the specimens were found in unit 89N/210E and are likely representative of one older (based on tooth wear) individual. Many of the distal limb and vertebral elements were burned black and cut marks were evident on the anterior shaft of the right ulna, suggesting the animal was butchered. Smaller mammals were also recovered (such as the snowshoe hare) and a *Spermophilus sp.* specimen was burned indicating human intervention and likely consumption.

Because of the large number of faunal remains and the even larger number of lithic artifacts recovered from this assemblage spatial patterning is more complex than in the other assemblages. Kasstan's (2004) contour density plots indicate an artifact scatter across the entire excavation block with density increasing toward the northeast corner.

There is a correspondence between the location of burned bone and a knapping feature in the northeastern corner. FBR is distributed widely across the area and Kasstan (2004:128) suggests this may be the result of a cleaned out hearth feature. The most dense concentration of FBR is also in association with the burned bone concentration. No hearth feature was found, but the significant amount of FBR and burned bone suggests a hearth was nearby.

It is possible that the Mummy Cave occupation in the central block correlates with the Mummy Cave occupation in the eastern block. The main activities are the same and the species identified in each are also similar.

Chapter Seven

Mummy Cave and Oxbow Subsistence Strategies on the Northern Plains

7.1 Introduction

Archaeological sites attributed to the Mummy Cave Series are poorly known on the Northern Plains. However, continued site discovery and research over the past several decades have succeeded in adding information to a time period once thought to have coincided with widespread abandonment of the Plains by both humans and bison (Mulloy 1958). Chapter two of this thesis outlined the history of research into this time period and the changing perspectives of human adaptation to the Altithermal environment. It is important, however, to note here that current evidence supports a continuous occupation of the Northern Plains during the Altithermal with the majority of sites being centred around reliable sources of water such as the Saskatchewan and Missouri river drainages. The northern, eastern, and western borders of the Northern Plains may have also served as refuge areas during the most severe droughts, although occasional migrations back to the short grass plains were possible (Walker 1992).

The Mummy Cave Series roughly corresponds to the Altithermal climatic period and settlement strategies at the time appear to have been to place settlements on alluvial terraces of river valleys or near stable sources of water. Habitation sites discovered to date are generally sparse, with a limited extent, and usually single component. It is likely that population mobility was reduced due to environmental conditions and subsequently so was trade and intergroup interactions. Subsistence practices at the time indicate that bison were the primary food resource, although the large scale bison hunts seen in previous and subsequent time periods were not employed. Rather, it appears that small scale hunting of a few animals was the norm, along with a heavier reliance on secondary food sources such as smaller mammals, birds, and possibly plant resources. Bone grease extraction also was an important innovation during this time period (Walker 1992).

The Oxbow Complex succeeds the Mummy Cave Series corresponding at the end of the Altithermal when the climate was becoming cooler and moister. On the Northern Plains, the Oxbow Complex is believed to have developed *in situ* from the Gowen component of the Mummy Cave Series (Walker 1992). Oxbow sites are considerably more common than those of the Mummy Cave Series and this may be a result of the shifting climate. Another reason, however, for the higher frequency of Oxbow sites may be an increased recognition of these sites by archaeologists as the projectile point styles are less variable than that seen for the Mummy Cave Series. Also, geological forces during the mid-Holocene may have resulted in Mummy Cave aged sites being more deeply buried in river terraces and therefore locating these sites is made more difficult. Regardless, the frequency of Oxbow sites is higher than those found for Mummy Cave, but still not as abundant as sites dating to later time periods. Oxbow subsistence strategies are remarkably similar to those of the Mummy Cave Series. Sites are generally located next to stable sources of water, especially in river valleys, and small scale bison hunting was practiced as opposed to large scale mass kills. Interestingly, no kill site has been discovered that can be attributed to the Oxbow Complex. Trade during the Oxbow time period increases from that seen during the Mummy Cave Series. The first evidence of long distance trade in nonlithic materials appears in the form of copper artifacts from the Lake Superior area (Dyck 1980).

The Below Forks site and the St. Louis site both contain Mummy Cave and Oxbow components. The faunal remains from these components were analysed for this thesis in an attempt to increase the knowledge pertaining to subsistence strategies during this time period. This chapter will compare the faunal assemblages from the Below Forks site and the St. Louis site to the faunal assemblages from the Gowen sites (FaNq-25, FaNq-32), the Cory site (FaNq-75), the Norby site (FbNp-56), the Oxbow Dam site (DhMn-1), the Long Creek site (DgMr-1), and the Harder site (FbNs-1). These sites were chosen for comparison because they contain Mummy Cave and/or Oxbow components, they contain a sufficient number of faunal specimens, they are in relatively close geographical proximity, they have good or sufficient preservation, and they have all

been reasonably well documented. The comparisons will be used to interpret Mummy Cave and Oxbow subsistence strategies and to determine if the Below Forks site and St. Louis site reflect similar or different strategies.

7.2 Site Summaries

7.2.1 The Gowen Sites (FaNq-25, FaNq-32)

The Gowen sites are located on a major terrace of the South Saskatchewan River known as the Saskatoon Terrace which is located within the limits of the city of Saskatoon. The present location of the river is approximately 800 metres to the east. Two separate sites were excavated here, Gowen 1 (FaNq-25) and Gowen 2 (FaNq-32), these being located approximately 70 metres apart. Gowen 1 was excavated in the fall of 1977 and Gowen 2 was exposed by heavy equipment in the fall of 1980 and then by controlled excavations in the spring of 1981. Radiocarbon dates from the sites were averaged to produce a date of 5870 ± 48 rcybp, placing the site within the Early Middle Prehistoric Period (see Appendix III for radiocarbon date references). One occupation was encountered at these sites and the projectile points recovered were used to define the Gowen component of the Mummy Cave Series (Walker 1992).

Faunal remains from Gowen 1 indicate that bison were heavily utilized, although a variety of other species were also present (Table 7.1 summarizes the faunal remains). The most notable feature of this faunal assemblage is its fragmented condition. Almost every recovered element of all species was broken while the bone was fresh. Carpal and tarsal bones were recovered intact while phalanges were split and the medullary cavity was scoured out. The bone fragmentation and the recovery of anvil stones indicate the intensive processing which involved the extraction of bone marrow. This fragmentary nature of the faunal remains made seasonality determination difficult, but immature bison specimens and floral remains indicated a late summer or autumn occupation. The variety of both faunal and lithic artifacts recovered from the site indicated that this was a camp site or a special purpose site where a number of activities were occurring. The high number of bison limb elements and the low number of axial skeleton elements recovered

indicate that the animals were killed elsewhere and transported back to the site (Walker 1992).

Table 7.1 Summary of Gowen 1 faunal assemblage (from Walker 1992).

Common Name	Taxon	NISP	MNI
Bison	*Bison bison* (or extinct form)	114	9
Pronghorn	*Antilocapra americana*	6	1
Gray wolf	*Canis lupus*	10	1
Medium size canid	*Canis sp.*	101	2
Northern pocket gopher	*Thomomys talpoides*	1	1
American crow	*Corvus brachyrhynchos*	1	1

Bone tools or modified bone at the Gowen 1 site includes a bone tube of unknown use made from a pronghorn metapodial, flaked bone, bone awls fashioned from long bone fragments, as well as avian long bones with deep transverse grooves. These incisions are consistent with the production of bone beads (Walker 1992:66-70).

Features at Gowen 1 include a series of pits and hearths associated with burned bone fragments. These are common features at a site where processing of bone is occurring. Artifact distribution indicates a concentration of unburned bone and possibly three concentrations of burned bone (Walker 1992:110).

The faunal assemblage from the Gowen 2 site is similar to that described for the Gowen 1 site with bone being heavily processed for maximum extraction of bone marrow. Bison were the main focus of subsistence with a variety of other species also being processed (Table 7.2 summarizes the faunal assemblage). The variety of both faunal and lithic artifacts recovered again indicates that this was a campsite or a site where multiple activities were taking place. Seasonality of the Gowen 2 site could not be precisely determined.

Table 7.2 Summary of Gowen 2 faunal assemblage (from Walker 1992).

Common Name	Taxon	NISP	MNI
Bison	*Bison bison*	217	14
Gray wolf	*Canis lupus*	12	1
Coyote	*Canis latrans*	2	1
Red fox or swift fox	*Vulpes sp.*	1	1
Medium size canid	*Canis sp.*	149	2
Least chipmunk	*Eutamias minimus*	1	1
Northern pocket gopher	*Thomomys talpoides*	1	1
Deer mouse	*Peromyscus maniculatus*	1	1
Muskrat	*Ondatra zibethicus*	1	1

Bone tools recovered from Gowen 2 were consistent with those found at Gowen 1. Five specimens were classified as awls or perforators made from bison limb fragments and the 4th metacarpal of an indeterminate canid. Two specimens were considered to be lithic knapping tools, while another bone splinter was heavily stained with red ochre pigment and may have been used in preparation of this pigment or in its application. A variety of other tools show polish and notching that are likely the result of use as a tool of sorts (Walker 1992:94-95).

Features identified in the Gowen 2 excavations included not only the pit and hearth features seen in Gowen 1, but also ash lenses, bone spill piles, stained areas, a concentration of lithic debris, and postholes (Walker 1992:115-119).

7.2.2 The Cory Site (FaNq-75)

The Cory site is located on the Saskatoon Terrace along the South Saskatchewan River within the limits of the city of Saskatoon. The stratigraphic position, artifact content, and condition of the bone are reminiscent of the Gowen sites which are located to the northeast of the Cory site (Walker and Amundson *et al.* 2002). This site was

excavated in the fall of 2001 as part of a cultural resource management (CRM) study conducted by Stantec Consulting Ltd. Heavy equipment removed the upper portion of the site and the remaining levels were excavated by hand. Four layers containing artifacts were encountered. Layer II was identified as Mummy Cave based on the recovery of two Gowen type projectile points and a conventional radiocarbon date of 5910 ± 60 BP (Beta-168248). Layer I was attributed to the Oxbow Complex based on the recovery of the base of an Oxbow point (Walker and Amundson *et al.* 2002). Layers A and B were removed with the heavy equipment and are also considered to be Oxbow based on the recovery of Oxbow projectile points, however, these assemblages were extremely small and so will not be considered here.

The Mummy Cave Occupation contained a variety of faunal and lithic artifacts consistent with campsite material. Faunal remains indicated that bison were the main focus for subsistence with bird and deer also being utilized (see Table 7.3). Highly fragmented burned and calcined bone were recovered suggesting processing activities were occurring, although no hearth features were encountered. The thickness if the fragmented bone indicates they were from a very large mammal. Seasonality was not determined for the occupation (Walker and Amundson *et al.* 2002).

Table 7.3 Summary of Cory site Mummy Cave faunal assemblage (from Walker and Amundson *et al.* 2002).

Common Name	Taxon	NISP	MNI
Bison	*Bison bison*	2	?
Mule deer	*Odocoileus hemionus*	1	1
Bird (Aves)	-	6	?

The Oxbow assemblage at the Cory site was similar in nature to that observed in the Mummy Cave layer. The variety of faunal and lithic artifacts are indicative of a campsite or multiple activity site and the fragmented and burned bone indicates that faunal remains were being processed here. No features were encountered in this

occupation. Bison are the main subsistence focus with bird and ground squirrel also being utilized (see Table 7.4). Seasonality was not determined for this assemblage (Walker and Amundson *et al.* 2002).

Table 7.4 Summary of Cory site Oxbow faunal assemblage (from Walker and Amundson *et al.* 2002)

Common Name	Taxon	NISP	MNI
Bison	*Bison bison*	24	1
Bird (Aves)	-	8	1
Ground Squirrel	*Spermophilus sp.*	3	?

7.2.3 The Norby Site (FbNp-56)

The Norby site is located along the South Saskatchewan River on the Saskatoon Terrace within the limits of the city of Saskatoon. This site was excavated intensively during the summer of 1989 and was determined to be a bison kill site. Three radiocarbon dates clustered around 5800 BP placing the site within the Early Middle Prehistoric Period. The recovery of six early side-notched projectile points, two of which were identified as Gowen varieties also affirm this antiquity and place the site components within the Mummy Cave Series. Preservation of the faunal remains was poor indicating a long exposure of the bone to taphonomic forces. Sufficient preservation was, however, present to conduct a detail faunal analysis and to preserve more fragile small mammal remains (Zurburg 1991).

The Norby site was determined to be a mass kill site of approximately 26 bison. This was determined by Zurburg (1991) conducting a detailed analysis of element distribution and frequency. This analysis implied that only primary butchering occurred at the site. Partially complete skeletons and articulated butchering units in addition to the lack of hearths and boiling pits indicated that meat may have been stripped from the carcasses and transported elsewhere for further processing. The complete nature of the elements also suggested that marrow extraction and grease production were not

occurring. The aging and sexing investigations of the Norby site material suggest that this herd consisted of adult males all above the age of four years and that the kill event took place in January or February. It was also speculated from this study that the bison specimens were significantly larger than modern bison and likely represent *Bison occidentalis* (Zurburg 1991).

The strategy involved in killing these animals is not completely understood. Zurburg (1991) offers two hypotheses. The first is that because this was a winter kill it is possible that a snow drift was utilized or modified as a trap. The second hypothesis, which she believes is more probable due to the warmer, drier climate of the time, is that a small group of bison was taken as they approached the open water of the river.

Almost the entire faunal assemblage at the Norby site was identified as bison except for two left hare metatarsals and two complete canid mandibles. Small rodent bones were also recovered during the excavations, but these were considered to be intrusive and were not identified in Zurburg's (1991) faunal analysis (see Table 7.5). Zurburg (1991) attempted to determine the species of the canid remains by measuring the mandibles and comparing the results with other studies. From this she determined that the mandibles were likely from a wild canid, possibly *Canis lupus*. The teeth on these mandibles were extremely worn and indicate that this wolf was likely a considerable age at the time of death. There were no features or bone tools reported from the site, although stone tools were relatively abundant.

Table 7.5 Summary of Norby site faunal assemblage (from Zurburg 1991).

Common Name	Taxon	NISP	MNI
Bison	*Bison bison occidentalis*	2970	26
Gray wolf	*Canis lupus*	2	1
Hares	*Lepus sp.*	2	2

7.2.4 The Harder Site (FbNs-1)

The Harder site is an Oxbow Complex campsite located in the Dunfermline Sand Hills west of Saskatoon. This is an exceptionally well documented site, first reported on in Dyck's (1977) publication pertaining to the original investigations at the site. The faunal remains were later reexamined by Morlan (1994) and several changes to the interpretation of the faunal assemblage were made along with the addition of new radiocarbon dates. What is remarkable about the Harder site is that it is located approximately 20 kilometres from the nearest source of fresh water. Dyck (1977) and Morlan (1994) both determined that the Harder site was occupied during the winter and that the most likely source of water was from snow.

The original radiocarbon dates from Dyck's (1977) investigation were obtained based on comminuted bone fragments and were obtained prior to revisions in lab protocols designed to reduce potential contaminants. Later samples provided by Morlan (1993) gave three uncalibrated radiocarbon dates ranging from 3420 ± 140 to 4410 ± 150 rcybp (S-3452, S-3453, S-3444)(see Appendix III for radiocarbon dates). The youngest date is similar to the original dates from Dyck's (1977) study. After Morlan's dates were calibrated it was clear that there was a time span of 1200 calender years between these dates. Morlan's explanation for this was that the site was either occupied twice with a millennium hiatus, or the ground water discharge-recharge system in area may have differentially chemically altered the bone. Regardless of radiocarbon date discrepancies the Harder site is affirmed to be affiliated with the Oxbow Complex based on the recovery of several Oxbow projectile points.

The Harder site is a winter campsite within which a variety of activities were taking place. Fire broken rock, rock and bone filled pits, comminuted and burned bone, and bone spill piles were identified at the site and were interpreted as discarded batches of boiled bone from grease extraction. However, no boiling pits were found at the site (Dyck 1977:179-180). Morlan (1993:773) indicates these features may have been the result of marrow recovery, meat boiling, and soup making. Morlan (1994) notes that the bison bone from the site exhibited combinations of fresh bone and dry bone fracture

patterns. He attributes this to the freezing winter conditions when limbs would have frozen and subsequently been warmed in dwellings before consumption or processing.

Dyck (1977:55-56) suggests that the bison were procured by communal hunting possibly using a pound. In Morlan's (1994) reanalysis of the site materials he reveals that the bison profile was dominated by prime age bison with almost equal representation of bulls and cows. He suggests that rather than use of a pound, the Harder site was provisioned by communal hunting of nursery herds and by hunting solitary bulls and cows or small bull herds.

Canid remains, likely dog or wolf, were found in abundance at the site and Morlan (1994) speculates that canid robes may have been used for camouflage during bison stalking. He suggests that cranial and foot bones may have been left in the skins to give it a more lifelike appearance and to keep the robe in place. Evidence from a pathology on one canid radius recovered from the site also indicates that large dogs may have been used in pulling heavy loads. Dwelling floors and lithic work stations were also found at the Harder site, adding support for the identification of the site as a campsite. A variety of stone tools, typical of hunting weaponry and hide processing, were recovered in addition to many bone tools including a worked antler tine (Dyck 1977).

The faunal assemblage from the Harder site is dominated by bison, although a variety of smaller species were recovered. Dyck (1977:49) notes their presence in the faunal assemblage but indicates that they may not be part of the cultural assemblage. Table 7.6 summarizes the faunal remains from the Harder site.

Table 7.6 Summary of Harder site faunal assemblage (from Morlan 1993).

Common Name	Taxon	NISP
Indeterminate bird	-	1
Snowshoe hare	*Lepus americanus*	2
Wolf, dog, or coyote	*Canis sp.*	58
Red fox	*Vulpes vulpes*	4
Swift fox	*Vulpes velox*	1

Fisher	*Martes pennanti*	1
Badger	*Taxidea taxus*	1
Deer	*Cervidae*	1
Moose	*Alces alces*	1
Bison	*Bison bison*	1152

Table 7.6 (continued) Summary of Harder site faunal assemblage (from Morlan 1993).

7.2.5 The Oxbow Dam Site (DhMn-1)

The Oxbow Dam site is located along the east bank of the Souris River approximately 1.6 kilometres south of the town of Oxbow, Saskatchewan. This site was described briefly in chapter two of this thesis and some of this information will be reiterated here. The Oxbow Dam site was originally excavated by Nero and McCorquodale in 1956 through the Saskatchewan Museum of Natural History. This became an extremely important site as it became the type site for the Oxbow Complex. Later research and the discovery of other Oxbow sites, indicated that this site may not represent the time period it defines. Artifacts from the original excavation are somewhat atypical of Oxbow artifacts and the original radiocarbon date of 5200 ± 130 rcybp (S-44) (calibrated to 6289 [5947] 5655 BP) was outside the time range for the Oxbow Complex. Later researchers also suggested that this site may be transitional between the Mummy Cave Series and the Oxbow Complex. These discrepancies fuelled the reanalysis of the site by Green (1998) where he reexamined the artifacts and continued excavations at the site. A new calibrated radiocarbon date of 4513 [4277] 3994 BP (S-3648:cal) was reported for the site and the new data indicated that the site was likely a later expression of the Oxbow Complex and not a transitional site (see Appendix III for radiocarbon dates).

The summary of the faunal assemblage provided here will follow Green's (1998) reanalysis. Here Green analysed the site by the 1956 stratigraphic levels and the cultural levels he observed during his own excavations. For ease of presentation this thesis keeps these separate as well. Green's excavations documented seven stratigraphic levels of

which levels six and seven were attributed to the Oxbow Complex based on Oxbow projectile points and radiocarbon dates respectively. These will be the levels summarized here.

Level six of Green's excavations appear to represent a campsite where tools and weapons were being repaired and produced and bone was being processed for grease and marrow extraction. Bison were the main focus of subsistence, although other species were also heavily relied upon. Of particular interest are the burned and butchered remains of a western painted turtle and the high number of canid remains of which at least one was determined to likely be a domestic dog. Table 7.7 summarizes the identified faunal remains.

Table 7.7 Summary of Oxbow Dam Level Six faunal assemblage.

Common Name	Taxon	NISP	MNI
Bison	*Bison bison*	112	3
Pronghorn	*Antilocapridae americana*	1	1
Large canid, medium canid, small canid	*Canis sp*	113	2,1,1
Richardson's ground squirrel	*Spermophilus richardsoni*	1	1
Vole	*Arvicoline*	-	-
Frog	*Anura*	1	1
Rabbit (cottontail)	*Sylvilagus sp.*	1	1
Western painted turtle	*Chrysemys picta belli*	8	1
Snake	*Thamnophis sp.*	-	-

Level seven of Green's (1998) excavations do not show obvious signs of butchering and very few lithic artifacts were encountered. Limb elements identified were not associated with axial elements suggesting to Green (1998:156) that they were transported to the site from elsewhere. Bison (NISP=24, MNI=2) and Richardson's

ground squirrel (NISP=1, MNI=1) were the only species identified. The nature of this occupation was not identified by Green, although it appears to be a campsite or multiple activity site.

The most remarkable artifact recovered in the course of the 1956 excavations was a fragment of an ochre-stained shell gorget pendant. This pendant appears to have been made from a locally available fresh water clam. During Green's (1998) reanalysis of the 1956 excavated artifacts he reclassified the provenience of the faunal assemblage. This did not change the interpretation of the faunal assemblage. Green's reanalysis determined that bison were the main food resource but other species were also heavily relied upon. These secondary species included a large number of canid remains as well as clams. A frog skeleton was also recovered but was considered intrusive. Very little burned bone was recovered from the original excavations as compared to Green's excavations. Green (1998:199) suggests that this may reflect the nature of collection techniques in the 1950s. A hearth was encountered in the original excavations and was reported in the museum records to be covered with bison bone fragments (Green 1998:199). Bison long bones present in the assemblage have articular ends removed in a fashion consistent with marrow and grease extraction. Table 7.8 summarizes the faunal assemblage from the original excavations as reprovenienced.

Table 7.8 Summary of Oxbow Dam reanalysed 1956 faunal assemblage.

Common Name	Taxon	NISP	MNI
Bison	*Bison bison*	-	3
Gray Wolf	*Canis lupus*	6	1
Medium Canid (Coyote, Dog)	*Canis sp.*	-	1
Small Canid (Red Fox)	*Canis sp.*	-	1
Frog	*Ranidae*	-	1
Clam	*Unionidae*	-	1

7.2.6 The Long Creek Site (DgMr-1)

One year after excavations were conducted at the Oxbow Dam site, a large scale salvage excavation took place on Long Creek (Wettlaufer and Mayer-Oakes 1960), in southeastern Saskatchewan that became known as the Long Creek site. This is a multi-component site spanning the past 5000 years. A reanalysis of the site materials was conducted in 2002 (Bryant 2002) and changes were made to site interpretations and to the culture sequence of the stratigraphy. The results of the reanalysis will be followed here.

Level 7 was identified as an Oxbow assemblage based on the recovery of Oxbow projectile points. Faunal remains in this level were sparse with *Bison bison* (NISP= 33, MNI=2) being the only species identified. A variety of activities occurred at the site as evidenced by the lithic and faunal remains uncovered. The lithic artifacts from level 7 and the knapping feature reveal that flintknapping was taking place along with the processing of bison remains. Endscrapers may indicate that hide working was also occurring (Bryant 2002:183). This level will not be included in Table 8.11 as only one species was identified

Bryant (2002) determined in her reanalysis that level 8 of the Long Creek site likely represents a late Mummy Cave/early Oxbow transitional component based on a Mummy Cave Series projectile point and a new radiocarbon date of 4960 ± 70 rcybp (Beta-168212) calibrate to 5900-5590 BP. Abundant artifact concentrations in this level revealed that multiple occupations were represented with evidence suggesting it was a campsite where several activities were taking place, including tool manufacturing, faunal procurement, and hide working. A posthole feature indicates a possible tanning station (Bryant 2002:206). This assemblage will be placed in the Oxbow assemblages chart as it is transitional.

The faunal assemblage revealed that bison were the most heavily relied upon source of subsistence with canid and scurid species also being important. The identification of three invertebrate species also indicates that these were utilized as a food resource. At least ten hearth features were encountered with burned bone, postholes

(tanning station), and flake concentrations being located nearby. Bone tools were also recovered in the forms of scrapers and flakers for knapping. Table 7.9 summarizes this faunal assemblage.

Table 7.9 Summary of Long Creek site Level 8 faunal assemblage.

Common Name	Taxon	NISP	MNI
Bison	*Bison bison*	-	4
Medium Canid	*Canis sp.*	-	2
Ground Squirrel	*Spermophilus sp.*	-	-
Fat Mucket Clam	*Lampsilis siliquoidea*	-	-
White Heelspitter Clam	*Lasmigona complanata*	-	-
The Common Floater	*Anodonto grandis*	-	-
Snail	*Sphaerium sulcatum*	-	-
Snail	*Succinea ovalis*	-	-

Level 9 at Long Creek was a sparse occupation of stone tools, debitage, and a minimal amount of faunal remains. There was one hearth feature identified and a bison scapula and incisor were associated. These were the only faunal remains recovered from the layer. Bryant (2002) attributes this occupation to the Mummy Cave Series. This assemblage will not be used for comparison as it is extremely small.

7.3 Site Comparisons

7.3.1 The Mummy Cave Assemblages

The St. Louis, Below Forks, Gowen, Cory, Norby, and Long Creek sites all contain components attributed to the Mummy Cave Series. These sites are similar in that they are all located in riverine environments where water would have been available during the warmer and/or drier Altithermal climatic period in which they were occupied. Each of these sites is also located in or near present day transitional zones between two

ecozones, these being the Moist Mixed Grassland to Parkland and the Boreal Transition (Below Forks) ecozones. The location of these sites within transitional ecozones could have provided access to a variety of species from neighbouring ecosystems. However, paleoenvironmental evidence indicates that the open grasslands may have expanded as much as 70 kilometres farther north than their present day limit during the Altithermal (Ritchie 1976, 1978). This would place all of these sites within a grassland type environment. If a grassland type environment was present at the time these sites were occupied then one would expect to see a reliance on grassland adapted species. The species identified at these sites are all historically found in present day grassland environments as well as in the adjacent parkland. The majority of these species can also be found in the Boreal Forest or at least into the forest edge. Pronghorns are the one exception. They are generally grassland adapted species, although they can move as far north as the parkland at times (Meyer and Russell 2004:221). Bison were the main focus of subsistence at all of these sites, which may also suggest a grassland environment as bison are grasslands-adapted species, however, bison are known to occupy the parklands at times as well as the forest edge. It is interesting to note the lack of species found mainly in the Boreal Forest in these assemblages, such as moose and elk or smaller species such as the red squirrel, especially at the Below Forks site where these species are found today.

The location of these sites in river valleys may have also played a crucial role in determining the species available for food resources. If the theory that river valleys were oases during the Altithermal is correct (Walker 1992), then the species present in river valleys may have been more numerous and diverse than the species found out of the valleys on the open plains. It is therefore difficult to determine the precise nature of the environment and the species available for subsistence during the time these sites were occupied based solely on faunal remains. Other paleoenvironmental studies, such as pollen studies, may be able to shed more light in the future.

Upon reviewing the faunal assemblages from the sites discussed above several general similarities became apparent. All of these sites, except the Norby site, were

campsites or multiple activity sites where a relatively wide variety of species was being utilized. Furthermore, all of these campsites were occupied during the warmer months of the year (spring to autumn) when occupants would have had access to a greater diversity of species. It is also assumed, although not explored for this thesis, that plant resources would have been relied upon as a food resource.

The Norby site differs in these respects as it is a kill site with a winter seasonality. Regardless, this site is still extremely important for comparison as it indicates procurement strategies of the species that was most heavily relied upon at all sites. It is interesting to note that this kill event took place in a riverine environment, the same setting as the rest of the sites, indicating the importance of this environment in all seasons and for a number of purposes.

The faunal assemblages for each site were compared in Table 7.10 and the results were used to make the following generalizations regarding Mummy Cave Series subsistence strategies.

Table 7.10 Comparison of faunal assemblages from Mummy Cave levels at the St. Louis, Below Forks, Gowen, Cory, and Norby sites.

Common Name	Taxon	St. Louis Layer IV		Below Forks				Gowen 1		Gowen 2		Cory		Norby	
		NISP	MNI	Mummy Cave Central Block		Mummy Cave Eastern Block		NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI
				NISP	MNI	NISP	MNI								
Bison	*Bison sp.*	129	2	37	3	17	2	114	9	217	14	2	-	2970	26
Pronghorn	*Antilocapra americana*	-	-	-	-	-	-	6	1	-	-	-	-	-	-
Deer	*Odocoileus sp.*	-	-	-	-	-	-	-	-	-	-	1	1	-	-
Indeterminate cervid	*Cervidae*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gray wolf	*Canis lupus*	-	-	-	-	-	-	10	1	12	1	-	-	2	1
Coyote	*Canis latrans*	-	-	-	-	-	-	-	-	2	1	-	-	-	-

Large canid (SC5)	*Canis sp.*	71	2	3	1	29	1	-	-	-	-	-	-	-	-
Medium canid (SC4)	*Canis sp.*	-	-	1	1	-	-	101	2	149	2	-	-	-	-
Indeterminate fox	*Vulpes sp.*	-	-	-	-	-	-	-	-	1	1	-	-	-	-
White-tailed jack rabbit	*Lepus townsendii*	-	-	4	1	-	-	-	-	-	-	-	-	-	-
Snowshoe hare	*Lepus americanus*	1	1	24	1	5	1	-	-	-	-	-	-	-	-
Hares	*Lepus sp.*	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Beaver	*Castor canadensis*	-	-	1	1	2	1	-	-	-	-	-	-	-	-
Least chipmunk	*Eutamius minimus*	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Northern pocket gopher	*Thomomys talpoides*	-	-	8	1	-	-	1	1	1	1	-	-	-	-
Gopher	*Geomyidae*	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Ground Squirrel	*Spermophil u-s sp.*	-	-	-	-	2	1	-	-	-	-	-	-	-	-
Muskrat	*Microtus pennsylvanicus*	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Deer Mouse	*Peromyscus maniculatus*	-	-	-	-	2	1	-	-	1	1	-	-	-	-
Meadow Vole	*Microtus pennsylvanicus*	-	-	-	-	2	1	-	-	-	-	-	-	-	-
Vole	*Mictrotus sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
American Crow	*Corvus brachyrhynchos*	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Sharp-Tailed Grouse	*Tympanuchus phasianellus*	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Bird	*Aves*			5	-	2	-	-	-	-	-	1	-	-	-
Catfish				-	-	17	-	-	-	-	-	-	-	-	-
Fish	-	2		-	-	✓	-	-	-	-	-	-	-	-	-
Clam	*Mollusca*	-	-	-	-	13	-	-	-	-	-	-	-	-	-

Table 7.10 (continued) Comparison of faunal assemblages from Mummy Cave levels at the St. Louis, Below Forks, Gowen, Cory, and Norby sites.

1. Primary subsistence source- *Bison sp.* elements were the most numerous in all of these sites. The specimens recovered appear to be significantly larger than modern day forms and likely represent an extinct form, *B. antiquus* or *B. occidentalis.* Further statistical analysis is required at most sites, however, to determine which form is present. Regardless of species, the method of processing the bison limb elements seems to be consistent at each site. A high degree of fragmentation and burning of the fragments suggest that the marrow was being extracted and that the bones were being boiled for grease extraction. Further support for these processing procedures was evidenced at the Gowen sites by the presence of a number of hearth features associated with the bone debris. Hearth features were not encountered at the Below Forks site or the Cory site, although the large amount of burned and fragmented bone found at each site indicates hearths were located nearby. The St. Louis site assemblage does not contain the same high frequency of burned, fragmented bone and therefore processing activities are not as clear. This may also be due to the small sample size recovered from the hand excavations at this site. It is assumed that the fragmented specimens are bison based on thickness and density of these bones, and the fact that bison were the only large artiodactyls identified in these assemblages.

The inclusion of the Norby site in this comparison is important in reaffirming the notion that bison were the main food resource, although the method of procuring them was done on a smaller scale than seen in earlier and later periods. The Norby site indicates a relatively small number (MNI=26) of bison were killed and meat bearing portions were removed and likely transported elsewhere for further processing. This lends support for the idea that the limb elements found in the campsites were transported portions brought from elsewhere.

2. Secondary subsistence sources- Canid remains were present at every site, except for the Cory site. The large number of elements identified as canid at these sites indicates that canid species, wild or domestic, were abundant and were used as a food source. Canid remains from the Below Forks site show evidence of burning and cut marks.

Canids would be present scavenging at a site where faunal processing was occurring and their presence in the assemblages may represent animals that were killed to protect the food resources.

Leporids were relied upon heavily at Below Forks and were also identified at the St. Louis and Norby sites. A number of these specimens from the Below Forks site were charred, indicating their use as a food resource.

3. Small mammals and birds- A variety of small mammals were found in these sites and charring may suggest their use as a food resource. These mammals include northern pocket gopher, least chipmunk, muskrat, and ground squirrels. A variety of mice and voles were identified at Below Forks and Gowen 2 and lack of charring evidence may suggest they were intrusive. Bird remains were identified at the Below Forks, St. Louis, and Cory sites. Charring evidence from the Below Forks site indicates their use as a food resource. The majority of these bird remains were medium-large size birds and sharp-tailed grouse could be identified at St. Louis. American crow was identified at Gowen 1 and was identified as part of the cultural assemblage.

4. Fish and other aquatic resources- The only sites in this comparison where fish were identified were at the St. Louis and Below Forks sites. The fish remains at Below Forks could be identified as catfish, a species not known to be in the area historically. Clam specimens recovered from Below Forks may also suggest their harvest from the nearby river. This was the only site where clams were encountered unless the transitional layer (Mummy Cave to Oxbow) from the Long Creek site is considered.

7.3.2 The Oxbow Assemblages

The St. Louis, Below Forks, Harder, Oxbow Dam, and Long Creek sites all contain components that can be attributed to the Oxbow Complex through radiocarbon dates and/or associated projectile points. St. Louis, Below Forks, and Long Creek sites all contain Oxbow assemblages that are underlain by Mummy Cave assemblages. At the

Long Creek site level 8 was considered to be transitional between the two periods and may further reaffirm the notion of the Oxbow Complex developing *in situ* from the Mummy Cave Series on the Northern Plains. The other sites where both periods are present add strength to this argument as well as representing a continuum of habitation.

The geographical location of these sites is similar to the location of the Mummy Cave sites described above. All of the Oxbow sites, except the Harder site, are located in riverine environments where water was stable. The Harder site was a winter campsite and Dyck (1977) proposed that snow was used for water. Several hypotheses can be made for the placement of the Oxbow sites. If Oxbow did develop out of the Mummy Cave Series, then it is possible that the practice of placing camps near stable sources of water was a continued behaviour from their predecessors. What Mummy Cave peoples did out of environmental necessity the Oxbow people continued even if the environment did not demand it. Also, the Harder site provides a small amount of evidence that perhaps people were beginning to venture away from these stable areas in certain instances. Also supporting this notion is the fact that Oxbow projectile points are found in surface sites in a wide variety of locations, away from stable sources of water. A larger sample of sites dating to this transitional period is required before more inferences can be made.

Paleoenvironmental evidence (Lemmen and Vance 1999) indicates that the extreme Altithermal conditions seen during the Mummy Cave Series were in the process of subsiding by the time the Oxbow Complex began to appear. Therefore, environmental conditions were likely more similar to those observed at present day and the ecological regions where the sites are located at present are assumed to be relatively unchanged since the time of occupation. With that said, the Oxbow sites listed above are found within several ecological regions. The Long Creek, Oxbow Dam, and Harder sites are located within the Grassland Ecoregion but are extremely close to the Parkland Ecoregion border. This location may have provided access to species not restricted to the grasslands. An example of this situation is the presence of moose in the Harder site assemblage. Moose are typical of the southern Boreal Forest edge and the Parkland.

The St. Louis site is located in the Parkland Ecoregion near the border of the Parkland-Boreal Forest Transitional Ecodistrict. Therefore, species adapted to the southern edge of the Boreal Forest and the grasslands to the south would have been available as food resources. There is no evidence of any Boreal Forest species being utilized by the Oxbow occupants at the St. Louis site. The excavation methods in Layer I may have distorted the faunal assemblage as heavy equipment was used in removing this layer. Bison and a large canid were the only species identified here. Both species are present in the parklands. The Below Forks site is located within the Parkland-Boreal Forest Transition Zone (Zoltai 1975) and therefore a wide variety of parkland and Boreal Forest adapted species could be utilized. This is reflected by the presence of caribou (although this was likely an item brought to the site from elsewhere), the low number of bison specimens, and the heavy reliance on snowshoe hare. There were, however, no moose or elk specimens recovered from this site, both of these species being abundant in the area presently.

Table 7.11 summarizes the faunal assemblage from the Oxbow components in the sites described above. From this comparison several general similarities were noted. All of these sites represent campsite locations where a variety of species were being utilized, except perhaps the St. Louis site. Seasonality of site occupation could not be determined for St. Louis or Below Forks. The Harder site was a winter occupation and it is assumed that the Oxbow Dam and Long Creek sites were warm season occupations as aquatic resources were utilized. Therefore, seasonality could not be a considerable factor in this comparison. The comparison of these sites was successful in determining some similarities in subsistence strategies, and these are summarized below. It is important to note how similar the Oxbow subsistence strategies are to those of the Mummy Cave Series described above.

Table 7.11 Comparison of faunal assemblages from Oxbow or Mummy Cave/Oxbow transitional levels from the St. Louis, Below Forks, Harder, Oxbow Dam, and Long Creek sites.

Common Name	Taxon	St. Louis Layer I		Below Forks				Harder		Oxbow Dam				Long Creek	
										Green		1956			
		NISP	MNI	Upper Oxbow		Lower Oxbow		NISP	MNI	NISP	MNI	NISP	MNI	NISP	MNI
				NISP	MNI	NISP	MNI								
Bison	*Bison bison*	343	5	18	1	1	1	1152	-	112	3	-	3	-	4
Caribou	*Rangifer tarandus*	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Moose	*Alces alces*	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Pronghorn	*Antilocapra americana*	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Deer	*Odocoileus sp.*	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Gray wolf	*Canis lupus*	-	-	-	-	-	-	-	-	-	-	6	1	-	-
Coyote	*Canis latrans*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red fox	*Vulpes vulpes*	-	-	-	-	-	-	4	-	-	-	-	-	-	-
Swift fox	*Vulpes velox*	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Large canid (SC5)	*Canis sp.*	5	1	-	-	-	-	-	-	-	2	-	-	-	-
Medium canid (SC4)	*Canis sp.*	-	-	-	-	-	-	-	-	-	1	-	1	-	2
Small canid (SC3)	*Canis sp.*	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Indeterminate canid	*Canis sp.*	-	-	-	-	-	-	58	-	113	-	-	-	-	-
White-tailed jack rabbit	*Lepus townsendii*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snowshoe hare	*Lepus americanus*	-	-	20	1	1	1	2	-	-	-	-	-	-	-
Hare	*Lepus sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cottontail	*Sylvilagus sp.*	-	-	-	-	-	-	-	-	1	1	-	-	-	-

Fisher	*Martes pennanti*	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Badger	*Taxidea taxus*	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Northern pocket gopher	*Thomomys talpoides*	-	-	5	1	-	-	-	-	-	-	-	-	-	-
Richardson-'s ground squirrel	*Spermophilus richarsonii*	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Ground squirrel	*Spermophilus sp.*	-	-	-	-	-	-	-	-	-	-	-	-	✓	-
Vole	*Mictrotus sp.*	-	-	-	-	-	-	-	-	✓	-	-	-	-	-
Bird	*Aves*	-	-	1	1	-	-	1	-	-	-	-	-	-	-
Western painted turtle	*Chrysemys picta belli*	-	-	-	-	-	-	-	-	8	1	-	-	-	-
Snake	*Thamnophis sp.*	-	-	-	-	-	-	-	-	✓	-	-	-	-	-
Frog	*Ranidae*	-	-	-	-	-	-	-	-	1	1	-	1	-	-
Fish		-	-	4	-	1	-	-	-	-	-	-	-	-	-
Clam	*Unionidae*	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Fat mucket clam	*Lampsilis siliquoidea*	-	-	-	-	-	-	-	-	-	-	-	-	✓	-
White heelspitter clam	*Lasmigona complanata*	-	-	-	-	-	-	-	-	-	-	-	-	✓	-
The common floater	*Anodonto grandis*	-	-	-	-	-	-	-	-	-	-	-	-	✓	-
Snail	*Sphaerium sulcatum*	-	-	-	-	-	-	-	-	-	-	-	-	✓	-
Snail	*Succinea ovalis*	-	-	-	-	-	-	-	-	-	-	-	-	✓	-

Table 7.11 (continued) Comparison of faunal assemblages from Oxbow or Mummy Cave/Oxbow transitional levels from the St. Louis, Below Forks, Harder, Oxbow Dam, Long Creek sites.

1. Primary subsistence source - Bison were the main focus of subsistence in all of these sites. Heavy fragmentation and burning of the bones likely indicate marrow extraction

and grease production were occurring at sites such as Harder, Oxbow Dam, Below Forks, and perhaps Long Creek. A large amount of burned, fragmented bone was not recovered from the St. Louis site suggesting that grease production was not occurring here on a large scale. The nature of this site appears to be a processing site. The removal of articular ends of long bones may suggest marrow extraction was occurring.

As stated above, an Oxbow kill site has not been recovered on the Northern Plains and therefore little is known about procurement strategies. Evidence from the Harder site suggests that small groups of bison were being killed and transported back to camp several times over a season. This is similar to that noted for the Mummy Cave sites and may suggest that small scale hunting was still the norm into the Oxbow Complex. Morlan (1994) suggests that the presence on canid cranial and distal limb elements in the Harder site assemblage may indicate canid robes were used in stalking the bison during a kill.

2. Secondary sources of subsistence- Canid remains are the next most numerous being found in all sites except Below Forks. Processing evidence from the Oxbow Dam assemblage suggests these were likely used as a food resource. There is also evidence from the Harder site and the Gray Burial site (Millar 1981a) that the Oxbow Complex people had a relationship with domestic canids. These animals pulled heavy loads and were associated with human internments. Hares were also relied upon heavily at the Below Forks site and they were recovered from the Oxbow Dam site as well. These secondary sources are similar to the secondary sources identified for the Mummy Cave Series, although the numbers of these species are lower in the Oxbow assemblages suggesting perhaps they were not relied upon as heavily.

3. Small mammals and birds - Small mammals such as ground squirrels and mustelids were recovered in extremely small numbers in every site except the St. Louis site. Their remains may suggest they were utilized as a food resource, although they may be background fauna in many instances. Very small mammals such as voles were recovered

from the Oxbow Dam site only. These species were also found in the Mummy Cave assemblages although in greater number.

Bird remains were identified at Below Forks and the Harder site. Their frequency is consistent with what was seen in the Mummy Cave sites, suggesting birds were only a small part of the diet.

4. Reptiles, fish, and other aquatic resources- Fish remains were recovered from the Below Forks site in both the Oxbow and the Mummy Cave levels suggesting their continued use at this site. Other aquatic resources were recovered from the Long Creek site and the Oxbow Dam site. These included frogs, clams, snails, and the butchered remains of a western-painted turtle from the Oxbow Dam site. The number and variety of these species suggest that the river resources were relied upon substantially at these sites as a supplement to a diet mainly focussed on larger mammals. The few aquatic resources recovered from the Harder site is logical due to the lack of a stable water source and the winter occupation.

7.4 Discussion and Summary

The faunal assemblages from the above sites indicate that the peoples of the Mummy Cave Series were somewhat generalists who utilized a wide variety of the faunal resources available. While a number of resources were being utilized, bison remained the main source of subsistence, although the number of bison recovered in the sites indicates smaller scale hunts than previously seen (Walker 1992). The bison that were utilized were heavily processed indicating intensive marrow extraction and grease production. This intensity was evidently an attempt to retrieve the maximum amount of food energy from the faunal resources. Evidence for this is provided at the Gowen sites where Walker (1992) reports the splitting of phalanges to retrieve marrow. The above sites also indicate that canid and leporid species were heavily relied upon as were a variety of small mammal and bird species.

The site assemblage comparisons indicate that the widest diversity of species utilized in a site comes from the Below Forks site. It is unlikely that this is attributable to preservation as all of the sites, except the Norby site, had excellent preservation. It is possible that the Below Forks site was located far enough north that a slightly more boreal forest reliant subsistence practice was occurring. Bison still dominated, as is typical for a grassland adapted strategy, although they were present in lower numbers than was seen in the sites to the south. Paleoenvironmental information to date (Roskowski 2004) indicates that the environment at the site has remained stable over the last 6000 years, although the stability may be unique to the river valley area as other evidence (Ritchie 1976, 1978) indicates a grassland expansion into the area. Perhaps the occupants of the site during the Mummy Cave Series were able to utilize a wider variety of species than occupants of the more southerly sites as the Boreal Forest transitional zone would have been in closer proximity. Further paleoenvironmental studies will have to be conducted to determine more precisely the environmental conditions during this time.

The analysis of the Oxbow components reveals a subsistence strategy that is remarkably similar to that of the previous Mummy Cave Series, even though the environment appears to have been changing. The similarity in subsistence strategies and site locations helps to reaffirm the notion of the Oxbow Complex emerging from the Mummy Cave Series on the Northern Plains. The Oxbow subsistence practices focussed primarily upon bison. With no kill site having been found to date it is speculated that procurement involved small scale hunts of nursery herds or solitary bulls (Morlan 1994). Marrow extraction and bone grease production were evident in several of these sites with fragmented and burned bone being associated with several hearth features. Posthole features found at the Long Creek site are possible evidence that hide processing or meat drying activities were occurring in campsite locales along with knapping of stone tools as evidenced by the lithic debitage recovered from most of the sites.

Canids were an important resource for Oxbow people not only as a food resource but also to aid in transporting heavy loads. Evidence of their importance also comes from the Gray Burial site where canids were interred with humans (Millar 1981a).

In comparing several Northern Plains Mummy Cave and Oxbow sites to the Below Forks site and the St. Louis site several similarities and differences could be seen. All of these sites, except Harder, were located in riverine environments next to stable sources of water, all of the sites were located in or near transitional ecological zones where resources from several environments could be utilized, subsistence practices remained constant from site to site and throughout time with bison dominating followed by canid, leporids, and a variety of other small mammal, bird, and aquatic resources. Small scale hunting practices remained constant as did the processing of bison elements. Marrow extraction and bone grease recovery were likely to have been an important activity in most of the sites. The intensity of the processing may have decreased through time as the Gowen sites show evidence of the heaviest processing. The Below Forks site differs slightly from the other sites in that it contains the widest variety of species and the lowest number of bison remains. This may be because this site was closer to the Boreal Forest during the Altithermal and it's location along the forest edge during the period of the Oxbow Complex. St. Louis differed slightly from these sites as well in regard to the low diversity of species observed there. The excavation procedures for the layers analysed here may be a reason as heavy equipment was used to excavate the majority of the site area. There were no hearth features observed at either Below Forks or St. Louis, although burned bone indicates they were nearby. This comparison shows that although the environment became cooler and wetter following the Altithermal period, subsistence strategies remained relatively unchanged from the Mummy Cave Series to the Oxbow Complex. A diverse subsistence base taking a low number of animals at a time was a successful adaption made by Mummy Cave peoples facing Altithermal climatic conditions, and this was carried on by succeeding Oxbow Complex people.

Chapter Eight

Summary and Conclusions

The St. Louis site (FfNk-7) and the Below Forks site (FhNg-25) were chosen for study for this thesis because they are both well stratified, multi-component sites containing Mummy Cave Series and Oxbow Complex assemblages. These time periods, especially the Mummy Cave Series, are poorly known on the Northern Plains and the additional information provided by these sites will make significant contributions to the understanding of subsistence practices during these periods. The placement of these sites within the South Saskatchewan and Saskatchewan River valleys respectively would have made a high diversity of faunal resources available to the site's inhabitants during the times of occupation. This diversity of resources may have been an important factor in site placement as the Altithermal climatic period was at it's height during the Mummy Cave Series time period and was in the process of ameliorating during Oxbow Complex times. The placement of sites near stable water sources appears to have been a common practice during the warmer and/or drier Altithermal and seems to be a practice continued by Oxbow Complex peoples. This is evidenced by the continued discovery of Mummy Cave and Oxbow sites in these locations over the past several decades.

The faunal remains recovered from the Below Forks site and those recovered from the upper four layers of the St. Louis site were analysed in detail for this thesis. The goals of this analysis were to determine aspects of the subsistence practices used by the Mummy Cave Series and Oxbow Complex occupants of these sites, to determine site activities and the nature of the occupations, to determine seasonality of the occupations, and to determine how these sites fit in with other sites of close geographical proximity that date to these time periods.

The results of the faunal analysis revealed that bison were the main faunal resource relied upon at both sites in both the Mummy Cave and Oxbow assemblages. The bison recovered from the Mummy Cave occupations were larger than modern forms and likely represent either *Bison antiquus* or *Bison occidentalis*. Further analysis is needed to determine which species was present. Although bison specimens were the most numerous, the minimum number of individuals (MNI) recovered were small indicating that small scale hunting was likely practiced where hunters were taking only a few animals at a time and transporting butchering units back to these sites. The majority of the elements recovered were fragmented and at the Below Forks site they were also burned indicating that marrow and possibly grease production (at Below Forks) were an important activity. Canids and leporids were also found in both sites and at the Below Forks site both canid and leporid were relied upon heavily as food resources as many of these specimens were charred.

When these assemblages were compared to other sites of similar antiquity, it was determined that the diversity of faunal resources was the greatest at the Below Forks site. In addition to bison, canid, and leporids, a variety of small mammal, bird, and fish also were used as food resources. The close proximity of the Boreal Forest, even during the Altithermal, may be one explanation for this diversity as access to both grassland and forest adapted species may have provided a wide range of resources to draw from. Further paleoenvironmental research will be extremely important in determining the nature of the local environment at the time and may shed more light on what resources were available.

Determining the subsistence practices at the St. Louis site for both time periods was more difficult as the majority of the layers analysed were excavated with heavy machinery and it is likely that if the remains of smaller species were present they would have been missed during this process. The hand excavations that were conducted revealed, however, that the Mummy Cave occupation did utilize snowshoe hare, sharp-tailed grouse and fish in addition to bison and canids.

Evidence from the occupations at the Below Forks site revealed that these were likely campsites or multiple activity sites where the main activity was knapping local lithic materials with the processing of faunal resources being a secondary or subsequent activity. The activities at the St. Louis site were more difficult to interpret but it appears that the Oxbow occupation was a processing or butchering site as bison elements were more complete and campsite debris was not present. The Mummy Cave occupation here likely is a campsite as lithic artifacts were recovered, a variety of species were present, and the majority of the faunal remains were fragmented.

Determination of seasonality was difficult as few immature bison elements were identified and teeth and mandibles were not recovered in sufficient numbers to conduct metric analyses. From what was available it was proposed that the Mummy Cave occupation at the St. Louis site was a late winter/early spring occupation, the Mummy Cave occupation in the central excavation block at the Below Forks site occurred during late winter to early summer, and the Mummy Cave component in the eastern block as well as the Oxbow occupations at this site could only be determined to have been occupied during a warm season when aquatic resources would have been available.

The most important contribution of this thesis is the addition of new information regarding subsistence practices utilized during the Mummy Cave Series and Oxbow Complex. Continued discovery and analysis of assemblages of this antiquity will be pertinent in further understanding human responses to the conditions of the Altithermal climatic period and the responses to the amelioration of these conditions.

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Appendix I

Calculations of MNI, MNE, MAU, and % MAU by Landmarks

Table AI-1. Example of Landmarks Used to Calculate MNI, MNE, MAU, and %MAU (for *Bison sp.*) Using the Upper Oxbow and Mummy Cave Faunal Assemblages of the Below Forks Site (FhNg-25).

*Note: Landmark tables are not provided for other assemblages or species as the low artifact numbers and space constraints do not warrant their inclusion.

	Upper Oxbow Occupation						Mummy Cave Occupation					
Element	MNE	R	L	Axial	MAU	%MAU	MNE	R	L	Axial	MAU	%MAU
Cranium												
Frontal	0	0	0	0	0	0	0	0	0	0	0	0
Horn Core	0	0	0	0	0	0	0	0	0	0	0	0
Parietal	0	0	0	0	0	0	0	0	0	0	0	0
Occipital	0	0	0	0	0	0	0	0	0	0	0	0
Occipital condyle	0	0	0	0	0	0	0	0	0	0	0	0
Petrous temporal	1		1		0.5	100	0	0	0	0	0	0
Zygomatic temporal	0	0	0	0	0	0	0	0	0	0	0	0
Tympanic remporal	0	0	0	0	0	0	0	0	0	0	0	0
External auditory meadus	0	0	0	0	0	0	0	0	0	0	0	0
Zygomatic	0	0	0	0	0	0	0	0	0	0	0	0
Nasal	0	0	0	0	0	0	0	0	0	0	0	0
Sphenoid	0	0	0	0	0	0	0	0	0	0	0	0
Ethmoid	0	0	0	0	0	0	0	0	0	0	0	0
Premaxilla	0	0	0	0	0	0	0	0	0	0	0	0
Maxilla	0	0	0	0	0	0	0	0	0	0	0	0
1st premolar	1		1		0.5	100	0	0	0	0	0	0
2nd premolar	0	0	0	0	0	0	0	0	0	0	0	0
3rd premolar	0	0	0	0	0	0	0	0	0	0	0	0
1st/2nd molar indet	0	0	0	0	0	0	2	2			0.5	25
3rd molar	0	0	0	0	0	0	0	0	0	0	0	0
Mandible												
Articular condyle	0	0	0	0	0	0	0	0	0	0	0	0
Coronoid process	0	0	0	0	0	0	0	0	0	0	0	0
Mandibular foramen	0	0	0	0	0	0	0	0	0	0	0	0
Lower border	0	0	0	0	0	0	0	0	0	0	0	0
Diastema	0	0	0	0	0	0	0	0	0	0	0	0
Mandibular symphysis	0	0	0	0	0	0	0	0	0	0	0	0
Mental foramen	0	0	0	0	0	0	0	0	0	0	0	0
Incisor/canine	0	0	0	0	0	0	0	0	0	0	0	0

1st premolar	0	0	0	0	0	0	0	0	0	0	0	0
2nd premolar	0	0	0	0	0	0	0	0	0	0	0	0
3rd premolar	0	0	0	0	0	0	0	0	0	0	0	0
1st molar	0	0	0	0	0	0	0	0	0	0	0	0
2nd molar	0	0	0	0	0	0	0	0	0	0	0	0
1st/2nd molar indent	0	0	0	0	0	0	0	0	0	0	0	0
3rd molar	0	0	0	0	0	0	1		1		0.5	25
Hyoid	0	0	0	0	0	0	0	0	0	0	0	0
Atlas												
Prezygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Postzygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Neural arch	0	0	0	0	0	0	0	0	0	0	0	0
Dorsal Tubercle	0	0	0	0	0	0	0	0	0	0	0	0
Ventral arch	0	0	0	0	0	0	0	0	0	0	0	0
Axis												
Prezygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Postzygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Neural arch	0	0	0	0	0	0	0	0	0	0	0	0
Neural spine	0	0	0	0	0	0	0	0	0	0	0	0
Transverse process	0	0	0	0	0	0	0	0	0	0	0	0
Centrum	0	0	0	0	0	0	0	0	0	0	0	0
Odontoid process	0	0	0	0	0	0	0	0	0	0	0	0
Cervical												
Neural arch	0	0	0	0	0	0	0	0	0	0	0	0
Neural spine	0	0	0	0	0	0	0	0	0	0	0	0
Transverse process	0	0	0	0	0	0	0	0	0	0	0	0
Centrum	0	0	0	0	0	0	0	0	0	0	0	0
Thoracic												
Prezygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Postzygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Neural arch	0	0	0	0	0	0	0	0	0	0	0	0
Neural spine	0	0	0	0	0	0	0	0	0	0	0	0
Transverse process	0	0	0	0	0	0	0	0	0	0	0	0
Centrum	0	0	0	0	0	0	0	0	0	0	0	0

Lumbar												
Prezygopophyses	0	0	0	0	0	0	0	0	0	0	0	0
Postzygopophyses	1			1	0.07	14	0	0	0	0	0	0
Neural arch	1			1	0.17	34	0	0	0	0	0	0
Neural spine	0	0	0	0	0	0	0	0	0	0	0	0
Transverse process	0	0	0	0	0	0	0	0	0	0	0	0
Centrum	0	0	0	0	0	0	0	0	0	0	0	0
Sacrum	0	0	0	0	0	0	0	0	0	0	0	0
Caudal	0	0	0	0	0	0	0	0	0	0	0	0
Scapula												
Glenoid	1		1		0.5	100	0	0	0	0	0	0
Coracoid	1		1		0.5	100	0	0	0	0	0	0
Neck	1		1		0.5	100	0	0	0	0	0	0
Acromion	1		1		0.5	100	0	0	0	0	0	0
Acromial spine	0	0	0	0	0	0	0	0	0	0	0	0
Supraspinous fossa	0	0	0	0	0	0	0	0	0	0	0	0
Infraspinous fossa	0	0	0	0	0	0	0	0	0	0	0	0
anterior border	1		1		0.5	100	0	0	0	0	0	0
posterior border	1		1		0.5	100	0	0	0	0	0	0
Humerus												
Head	0	0	0	0	0	0	0	0	0	0	0	0
Lateral tuberosity	0	0	0	0	0	0	0	0	0	0	0	0
Medial tuberosity	0	0	0	0	0	0	0	0	0	0	0	0
Proximal shaft	0	0	0	0	0	0	0	0	0	0	0	0
Deltoid tuberosity	0	0	0	0	0	0	0	0	0	0	0	0
Teres major tuberosity	0	0	0	0	0	0	0	0	0	0	0	0
Teres minor tuberosity	0	0	0	0	0	0	0	0	0	0	0	0
Posterior Lateral. Foramen	0	0	0	0	0	0	0	0	0	0	0	0
Olecranon fossa	0	0	0	0	0	0	0	0	0	0	0	0
Radial fossa	0	0	0	0	0	0	0	0	0	0	0	0
Medial epicondyle	0	0	0	0	0	0	0	0	0	0	0	0
Lateral epycondyle	0	0	0	0	0	0	0	0	0	0	0	0
Trochlea	0	0	0	0	0	0	0	0	0	0	0	0
Capitulum	0	0	0	0	0	0	0	0	0	0	0	0

Distal shaft	0	0	0	0	0	0	1		1		0.5	25
Radius												
Lateral glenoid cavity	0	0	0	0	0	0	1		1		0.5	25
Medial glenoid cavity	0	0	0	0	0	0	2		2		1	50
Lateral tuberosity	0	0	0	0	0	0	2		2		1	50
Posterior lateral foramen	0	0	0	0	0	0	2		2		1	50
Proximal posterior shaft	0	0	0	0	0	0	2		2		1	50
Proximal anterior shaft	0	0	0	0	0	0	2		2		1	50
Distal posterior shaft	0	0	0	0	0	0	2		2		1	50
Distal anterior shaft	0	0	0	0	0	0	2		2		1	50
Radial carpal facet	0	0	0	0	0	0	2		2		1	50
Internal carpal facet	0	0	0	0	0	0	2		2		1	50
Ulna												
Olecranon	0	0	0	0	0	0	0	0	0	0	0	0
Anconeal process	0	0	0	0	0	0	1		1		0.5	25
Semilunar notch	0	0	0	0	0	0	1		1		0.5	25
Coronoid process	0	0	0	0	0	0	0	0	0	0	0	0
Shaft	0	0	0	0	0	0	1		1		0.5	25
Styloid process	0	0	0	0	0	0	0	0	0	0	0	0
Radial carpal	0	0	0	0	0	0	4	1	3		2	100
Internal carpal	0	0	0	0	0	0	2		2		1	50
											0.5	25
Ulnar carpal	0	0	0	0	0	0	1		1			
Unciform carpal	0	0	0	0	0	0	3	1	2		1.5	75
Fused 2/3 carpal	1		1		0.5	100	3	1	2		1.5	75
Accessory carpal	0	0	0	0	0	0	0	0	0	0	0	0
Metacarpal												
Carpal 2/3 facet	1		1		0.5	100	2	1	1		1	50
Unciform facet	1		1		0.5	100	2	1	1		1	50
Proximal anterior foramen	1		1		0.5	100	1		1		0.5	25
Proximal posterior foramen	1		1		0.5	100	1		1		0.5	25

Proximal anterior shaft	1		1		0.5	100	1		1		0.5	25
Proximal posterior shaft	1		1		0.5	100	1		1		0.5	25
Distal anterior foramen	0	0	0	0	0	0	1		1		0.5	25
Distal posterior foramen	0	0	0	0	0	0	1		1		0.5	25
Distal anterior shaft	0	0	0	0	0	0	1		1		0.5	25
Distal posterior shaft	0	0	0	0	0	0	1		1		0.501	25
Medial condyle	0	0	0	0	0	0	1		1		0.501	25
Lateral condyle	0	0	0	0	0	0	1		1		0.501	25
5th Metacarpal	0	0	0	0	0	0	0	0	0	0	0	0
Prox. Lat. Sesamoid	0	0	0	0	0	0	0	0	0	0	0	0
Dist. Inf. Sesamoid	0	0	0	0	0	0	0	0	0	0	0	0
1st phalanx												
Proximal phalanx	4				0.5	100	2				0.25	12.5
Distal phalanx	4				0.5	100	3				0.375	18.75
2nd phalanx												
Proximal phalanx	1				0.125	25	1				0.125	6.25
Distal phalanx	1				0.125	25	1				0.125	6.25
3rd phalanx												
Proximal phalanx	0	0	0	0	0	0	2				0.25	12.5
Distal phalanx	0	0	0	0	0	0	1				0.125	6.25
Innominate												
Ilium blade	0	0	0	0	0	0	0	0	0	0	0	0
Ilium body	0	0	0	0	0	0	0	0	0	0	0	0
Sacral tuber	0	0	0	0	0	0	0	0	0	0	0	0
Ilium acetabulum	0	0	0	0	0	0	0	0	0	0	0	0
Ischium blade	0	0	0	0	0	0	0	0	0	0	0	0
Ischium body	0	0	0	0	0	0	0	0	0	0	0	0
Coxal tuber	0	0	0	0	0	0	0	0	0	0	0	0
Ischium acetabulum	0	0	0	0	0	0	0	0	0	0	0	0
Pubis body	0	0	0	0	0	0	0	0	0	0	0	0
Pubic symphysis	0	0	0	0	0	0	0	0	0	0	0	0
Pubis acetabulum	0	0	0	0	0	0	0	0	0	0	0	0

Femur												
Head	0	0	0	0	0	0	0	0	0	0	0	0
Neck	0	0	0	0	0	0	0	0	0	0	0	0
Greater trochanter	0	0	0	0	0	0	0	0	0	0	0	0
Lesser trochanter	0	0	0	0	0	0	0	0	0	0	0	0
Proximal shaft	0	0	0	0	0	0	0	0	0	0	0	0
Post. Med. Foramen	0	0	0	0	0	0	0	0	0	0	0	0
Supercondyloid fossa	0	0	0	0	0	0	0	0	0	0	0	0
Trochlea	0	0	0	0	0	0	0	0	0	0	0	0
Medial condyle	1	1			0.5	100	0	0	0	0	0	0
Lateral condyle	0	0	0	0	0	0	0	0	0	0	0	0
Medial epicondyle	0	0	0	0	0	0	0	0	0	0	0	0
Lateral epicondyle	0	0	0	0	0	0	0	0	0	0	0	0
Distal shaft	0	0	0	0	0	0	0	0	0	0	0	0
Patella	0	0	0	0	0	0	0	0	0	0	0	0
Tibia												
Medial condyle	0	0	0	0	0	0	0	0	0	0	0	0
Lateral condyle	0	0	0	0	0	0	0	0	0	0	0	0
Tibial tuberosity	0	0	0	0	0	0	0	0	0	0	0	0
Anterior crest	0	0	0	0	0	0	0	0	0	0	0	0
Posterior lateral foramen	0	0	0	0	0	0	0	0	0	0	0	0
Proximal anterior shaft	0	0	0	0	0	0	0	0	0	0	0	0
Proximal prosterior shaft	0	0	0	0	0	0	0	0	0	0	0	0
Distal anterior shaft	0	0	0	0	0	0	2		2		1	50
Distal posterior shaft	0	0	0	0	0	0	2		2		1	50
Medial groove	0	0	0	0	0	0	2		2		1	50
Lateral groove	0	0	0	0	0	0	2		2		1	50
Medial malleolus	0	0	0	0	0	0	2		2		1	50
Lateral malleolus	0	0	0	0	0	0	1		1		0.5	25
Fused C/4 Tarsal	1		1		0.5	100	2		2		1	50
Fused 2/3 Tarsal	1				0.5	100	1		1		0.5	25
Talus												

Proximal condyles	0	0	0	0	0	0	0	0	0	0	0	0
Distal condyles	0	0	0	0	0	0	0	0	0	0	0	0
Calcaneus												
Sustentaculum	0	0	0	0	0	0	0	0	0	0	0	0
Tuber calis	0	0	0	0	0	0	0	0	0	0	0	0
Proximal epiphysis	0	0	0	0	0	0	0	0	0	0	0	0
Metatarsal												
Tarsal C/4 facet	0	0	0	0	0	0	1		1		0.5	25
Tarsal 2/3 facet	0	0	0	0	0	0	1		1		0.5	25
Proximal anterior foramen	0	0	0	0	0	0	1		1		0.5	25
Proximal posterior foramen	0	0	0	0	0	0	1		1		0.5	25
Proximal anterior shaft	0	0	0	0	0	0	1		1		0.5	25
Proximal posterior shaft	0	0	0	0	0	0	1		1		0.5	25
Distal anterior foramen	1				0.5	100	1		1		0.5	25
Distal posterior foramen	1				0.5	100	1		1		0.501	25
Distal anterior shaft	1				0.5	100	1		1		0.501	25
Distal posterior shaft	1				0.5	100	1		1		0.501	25
Medial condyle	1				0.5	100	1		1		0.501	25
Lateral condyle	1				0.5	100	1		1		0.501	25
2nd metatarsal	0	0	0	0	0	0	0	0	0	0	0	0
5th metatarsal	0	0	0	0	0	0	0	0	0	0	0	0

Appendix II

Berhensmeyer's (1978) Weathering Index

Weathering Stages in Large Mammals (after Behrensmeyer 1978)		
Weathering Stage	**Description**	**Range in years since death**
0	greasy, no cracking or flaking, perhaps with skin or ligament/soft tissue attached (marrow edible, bone still moist)	0-1
1	cracking parallel to fibre structure (longitudinal); articular surfaces perhaps with mosaic cracking of covering tissue and bone (split lines begin to form, low moisture, marrow sours and is inedible)	0-3
2	flaking of outer surface (exfoliation), cracks are present, crack edge is angular (marrow decays, split lines well developed)	2-6
3	roughly homogeneously altered compact bone resulting in fibrous texture; weathering penetrates 1-1.5 mm maximum; crack edges are rounded	4-15
4	coarsely fibrous and rough surface; splinters of bone loose on surface, with weathering penetrating inner cavities; open cracks	6-15
5	bone falling apart *in situ*, large splinters present, bon material very fragile	6-15

Figure AII-1. Weathering index for large mammals (after Behrensmeyer 1978).

Appendix III

Radiocarbon Dates

Table AIII-1 Radiocarbon dates, cultural affiliation, lab number, and source.

Radiocarbon Dates Referred to in this Thesis				
Site Name	Cultural Affiliation	Lab Number	Normalized Radiocarbon Date (rcybp)	Source
Below Forks	Mummy Cave	TO-9354	6100 ± 140	Meyer 2003
Below Forks	Mummy Cave	TO-9355	6010 ± 80	Meyer 2003
Boss Hill	Mummy Cave	S-1251	7955 ± 130	Doll 1982
Boss Hill	Mummy Cave	S-1371	7750 ± 105	Doll 1982
Boss Hill	Mummy Cave	S-1250	6150 ± 95	Doll 1982
Cory	Mummy Cave	Beta-168248	5910 ± 69	Amundson *et al.* 2002
Gowen 1	Mummy Cave	S-1457	6230 ± 110	Walker 1992
Gowen 1	Mummy Cave	S-1488	6150 ± 260	Walker 1992
Gowen 1	Mummy Cave	S-2036 A	5160 ± 150	Walker 1992
Gowen 1	Mummy Cave	S-1526	4810 ± 130	Walker 1992
Gowen 2	Mummy Cave	S-1971	6160 ± 160	Walker 1992
Gowen 2	Mummy Cave	S-1970	6000 ± 130	Walker 1992
Gowen 2	Mummy Cave	S-2036B	5990 ± 170	Walker 1992
Gowen 2	Mummy Cave	S-2037	5670 ± 110	Walker 1992
Head-Smashed-In	Mummy Cave	RL-334	5740 ± 100	Reeves 1978
Head-Smashed-In	Mummy Cave	GSC-803	5490 ± 300	Reeves 1978
Head-Smashed-In	Mummy Cave	RL-333	5160 ± 150	Reeves 1978
Long Creek	Oxbow/Mummy Cave	4960 ± 70	4960 ± 70	Bryant 2002
Mona Lisa	Mummy Cave	GX-6395 A	5715 ± 150	Brumley and Rushworth 1983 c.f Kasstan 2004

Radiocarbon Dates Referred to in this Thesis				
Mona Lisa	Mummy Cave	GX-6394 A	5390 ± 170	Brumley and Rushworth 1983 c.f Kasstan 2004
Mummy Cave	Mummy Cave	I-1588	7630 ± 170	Frison 1991
Mummy Cave	Mummy Cave	I-1587	7140 ± 170	Frison 1991
Norby	Mummy Cave	S-3006	5965 ± 265	Zurburg 1991
Norby	Mummy Cave	S-3205	5820 ± 110	Zurburg 1991
Norby	Mummy Cave	S-3206	5640 ± 120	Zurburg 1991
Sun River	Mummy Cave	Beta-5533	5960 ± 210	Greiser *et al.* 1985
St. Louis	possible Mummy Cave	Beta-173611	6220 ± 70	Amundson *et al.* 2005
Amisk	Oxbow	S-2536	4140 ± 211	Amundson 1986
Below Forks	Oxbow	TO-10196	4750 ± 90	Meyer 2003
Below Forks	Oxbow	TO-10085	4790 ± 70	Meyer 2003
Gray	Oxbow	S-1450	3540 ± 121	Morlan 1993
Gray	Oxbow	S-706	3610 ± 211	Morlan 1993
Gray	Oxbow	S-693	3675 ± 311	Morlan 1993
Gray	Oxbow	S-707	3875 ± 196	Morlan 1993
Gray	Oxbow	S-646	3880 ± 116	Morlan 1993
Gray	Oxbow	GX-3373	4465 ± 250	Morlan 1993
Gray	Oxbow	RDDL-515	4420 ± 190	Morlan 1993
Gray	Oxbow	RDDL-512	4510 ± 140	Morlan 1993
Gray	Oxbow	RDDL-514	4600 ± 130	Morlan 1993
Gray	Oxbow	RDDL-513	4600 ± 170	Morlan 1993
Gray	Oxbow	SFU-295	4875 ± 176	Morlan 1993
Gray	Oxbow	S-619	5080 ± 181	Morlan 1993
Gray	Oxbow	S-647	5225 ± 406	Morlan 1993
Gray	Oxbow	SFU-294	5275 ± 176	Morlan 1993

Radiocarbon Dates Referred to in this Thesis				
Gray	Oxbow	S-1449	3040 ± 101	Morlan 1993
Gray	possible Mummy Cave	SFU-296	5445 ± 176	Morlan 1993
Gray	possible Mummy Cave	SFU-297	5745 ± 336	Morlan 1993
Greenwater Lake	Oxbow	S-1447	4515 ± 121	Walker 1981
Harder	Oxbow	S-490	3485 ± 136	Dyck 1977
Harder	Oxbow	S-668	3550 ± 121	Dyck 1977
Harder	Oxbow	S-3453	3570 ± 140	Morlan 1993
Harder	Oxbow	S-3452	4335 ± 90	Morlan 1993
Harder	Oxbow	S-3444	4515 ± 150	Morlan 1993
Oxbow Dam	Oxbow	S-44	5100 ± 210 uncalibrated	Nero and McCorquodale 1958 c.f. Green 1998
Oxbow Dam	Oxbow	S-44	5350 ± 250 uncalibrated	Nero and McCorquodale 1958 c.f. Green 1998
Oxbow Dam	Oxbow	S-44	5200 ± 130 uncalibrated	Nero and McCorquodale 1958 c.f. Green 1998
Oxbow Dam	Oxbow	S-3648	33870 ± 80	Green 1998
St. Brieux	Oxbow	S-520	5110 ± 91	Walker 1981
St. Louis	possible Oxbow	Beta-173608	4590 ± 60	Amundson *et al.* 2005

*See Walker (1992) and Kastan (2004) for more Mummy Series radiocarbon dates.
*See Green (1998) for more Oxbow Complex Radiocarbon dates.