An Enduring Story of an Iconic Animal: Archaeology and Bison as Support for Wanuskewin as a UNESCO World Heritage Site

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Abstract

Bison are a key to every aspect of Wanuskewin Heritage Park. This thesis undertakes a detailed faunal analysis of the remains from Wolf Willow, a multicomponent archaeological site in the Opimihaw Creek Valley. The results of this study show the Plains bison (*Bison bison bison*) to be the dominant animal in the assemblage. Large quantities of highly fragmented remains indicate area was a habitation space, taphonomic marks indicate the bison were used for food production and tool manufacture. More than any other animal, bison are what people used in their day-to-day life when occupying this space. From this information, the research expands to look at all other sites in the valley area, drawing the conclusion that bison are the most commonly present animal in all archaeology sites and habitation areas in the Opimihaw Creek Valley. They are pervasive in the past occupations. Investigation into other lines of evidence that depict and demonstrate the bison within the Park area is conducted, with Hoofprint Tradition rock art and the presence of bison iconography in archaeological sites.

Today, Plains bison have been returned to restored grassland fields at Wanuskewin. Their presence is for education, restoration, culture, and ceremony. They are a spiritual herd and give a visual for how their presence would have been felt in the past. The bison are a part of every aspect of the story of Wanuskewin. With the archaeological research done, specifically faunal analyses and the remains from Wolf Willow, bison are clearly important. Current efforts from Wanuskewin Heritage Park to become established as a UNESCO World Heritage site have ideas coming up about what makes this space truly special. The second part of this work discusses this, and how so easily every part of the story of Wanuskewin relates back to bison. They are what Wanuskewin is about, past and present, and give it its Outstanding Universal Value.

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Plain Language Summary

This work looks at all of the animal bones that have come from one specific archaeology site within the valley that Wanuskewin Heritage Park surrounds. These bones are modified from the activities of people that lived in this area beginning around 5,000 years ago. People most recently lived in this space, called the Wolf Willow site, approximately 250 years ago, just prior to contact with European settlers. What was learned when looking at this archaeological site and all of these bones that have come from it is that they almost all belong to bison. It's known that people would use the bison for food, clothing, shelter, and tools, and the way that people butchered the bison after hunting them can be seen on the bones. These signs and signatures tell of the activities people were doing and point to this space as being a place people lived. When this archaeology site is compared with all of the others in the Opimihaw Creek Valley, we see that they consistently all have bison as the most common animal bones found. This means that bison were the most frequently hunted animal on the prairies when people were living in this valley. Looking at the story of bison on these lands, from how there were millions of them up until the late 1700s to them almost disappearing in the late 1800s, we can see and appreciate how important they were in the lives of people indigenous to the prairies. And they still are, the bison have been absent from the land for a while, but they are still very important to stories and lifeways for Plains Indigenous peoples. Today, places like Wanuskewin are bringing bison back to the land in ways that are as close as possible to what it was like before agriculture changed the landscape. Based on all of this discussion on the importance of bison, specifically how it is seen at Wanuskewin, the way that bison can contribute to this place becoming Saskatchewan's first UNESCO World Heritage site is presented. The United Nations Educational Scientific and Cultural Organization (UNESCO) has a list of World Heritage sites, places that are important to all people on earth, past, present, and future. These sites tell the story of humanity, all the ways it looks in different parts of the world, and many of them are archaeology sites. Wanuskewin is not yet on this list of sites, but it could and should be, and the basis for it making it onto that list lies with the bison. They are so present in the archaeology, they are clearly important in the lives of people of the prairies in the past and present, they are what Wanuskewin is all about. World Heritage site designation for Wanuskewin can and should be based on the Plains bison, and that is what this thesis is all about.

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Chapter 1: Introduction

1.1 Introduction

Wanuskewin Heritage Park is a cultural centre on the Great Plains, showcasing past and present cultures, traditions, and lifeways of the Indigenous people from this area. Wanuskewin as a park began as an archaeological research project, there are 19 precontact archaeology sites spread throughout the Opimihaw Creek Valley. The oldest sites date to 6,000 years ago and the most recent are contact-era occupations. Within the northern extent of the valley is the Wolf Willow site, Borden Number FbNp-26, which is the focus of this work. It is the ninth site within the valley to undergo detailed excavation and research, it has had the most extensive excavation in the valley as work began in 2010 and concluded in 2020. The goal of this thesis is to undertake an examination of the faunal remains in order to provide a better understanding of the activities of past occupants, the importance of different animals, and how this site compares to others within the valley. Wolf Willow is separated into six cultural levels which are identified by the cultural materials present and depth below surface and defined by radiocarbon dates.

This is written alongside a thesis prepared by Bailey Pelletier, whose work focuses on the cultural remains of the site. Both theses include the materials from the 2015 through 2020 excavations. Previous theses by Maria Mampe (2015) and Devon Stumborg (2016) focused on both cultural and faunal materials from the site for excavation years 2010-2011 and 2012-2014 respectively. Eryn Coward (2022) analyzed the macrobotanical remains from Wolf Willow in her thesis while Kathryn Burdeyney (2019) examined phytoliths.

While the faunal analysis is the foundation for this thesis, other chapters discuss the Plains bison history and decimation and their persistence and conservation in North America. The bison remains from all excavated sites at Wanuskewin are examined to establish the proportion of bison remains recovered compared to other species. Bison are the most commonly found animal remains in Opimihaw Creek Valley, and their presence is examined as a whole and within the broader picture of bison history and significance on the Great Plains. Petroglyph rock art that has been more recently found at Wanuskewin demonstrates cognitive recognition and possibly the spiritual significance of the bison, a tangible manifestation of their overall importance. Using this information, a proposal for including Wanuskewin Heritage Park on the

United Nations Educational, Scientific, Cultural Organization (UNESCO) World Heritage List is made. The argument for the basis of the statement of Outstanding Universal Value being made on the basis of bison and their presence and significance in the valley is made. Designation as a World Heritage Site is contingent upon establishing a statement of Outstanding Universal Value which forms the final part of this thesis.

1.2 Thesis Objectives

This thesis uses faunal analysis to address several objectives with a driving question of: Can bison form the basis for a statement of Outstanding Universal Value for Wanuskewin Heritage Park. The objectives and organization of the thesis is summarized by:

1. Analyze and describe the faunal remains found within the Wolf Willow site to determine:
    a. the number of each taxon present in every level,
    b. the relative abundance of each species,
    c. taphonomic changes present on the remains and activities that would result in such changes, and
    d. reconstruction of the bison cranium found within the site.
2. Quantify the faunal analysis of the Wolf Willow site through comparison with other archaeological sites at Wanuskewin.
3. Determine whether bison can form the basis of a statement of Outstanding Universal Value
4. Propose Wanuskewin as a UNESCO World Heritage Site on the basis of the continued presence of bison in the area.

This work will add to the extensive research that has already been conducted on the archaeological heritage at Wanuskewin but will provide a different perspective. The significance and the importance of the site area will be conveyed in a manner that can be appreciated and understood on a global scale. Outstanding Universal Value is an important construct yet is very difficult to comprehend and convey as relating significance to all of humanity is not an easy task. However, at Wanuskewin, the predominance of bison remains at the Wolf Willow site serves as the basis for this statement on Outstanding Universal Value and make this justification possible.

1.3 Thesis Organization

Chapter 2 will provide an overview and description of the site area and the resources present including geological, geographical, climatic, and biological elements. Chapter 3 details the methods used to conduct the research from the fieldwork to the laboratory as well as the general cultural chronology which provides a framework for interpreting the occupation levels excavated. Chapter 4 presents an extensive faunal analysis of all cultural levels (1, 2a, 2b, 3, 4, and 5), as well as the taphonomic features found within the faunal assemblage and an interpretation of the site as a whole. Chapter 5 discusses the importance of the Plains bison through its prevalence in the archaeological sites within the Opimihaw Creek Valley, the history of the demise of the bison and its subsequent resurgence, as well as bison-focused and iconographic pieces represented at the Wolf Willow site. Finally, Chapter 6 discusses UNESCO, World Heritage Site designation and how Wanuskewin can achieve this on the basis of the bison story. Chapter 7 will conclude the thesis with a summary of the information presented and propose potential areas of future research.

Chapter 2: Biogeophysical Setting of the Opimihaw Creek Valley

2.1 History of the Study Area

The Opimihaw Creek valley, formerly known as the Tipperary Creek valley, is a tributary of the South Saskatchewan River and is recognized as an important and unique archaeological resource area on the Northern Plains. The land where Wanuskewin now lies was homesteaded in 1902 by the Penner family and sold to the Vitkowski family in the 1930s (Walker 1983). Like the majority of the grasslands, the area surrounding the valley was turned into productive agricultural fields and the valley became pastureland beginning in 1935 and continuing for the better part of the 20th century. However, the archaeological significance of the area was unknown. Walker (1983) notes the first recognized visit to the area was in 1932 by members of the Saskatoon Archaeological Society which coincided with the discovery of the medicine wheel. In both 1946 and 1952, Thad C. Hecker of the North Dakota State Historical Society conducted test excavations at two separate locations in the valley. Later in 1962, Thomas F. Kehoe, then with the Saskatchewan Museum of Natural History in Regina, did a series of test excavations at the medicine wheel site and returned to examine the medicine wheel in 1977 to see if it presented any astronomical alignments; none were found. In 1965, Professor Zenon Pohorecky took a group of students from the University of Saskatchewan out to conduct test excavations at one location in the valley. These events, over the course of nearly 50 years, led to the documentation of an area rich in archaeological resources, the extent of which was not yet fully understood (Walker 1983).

Rancher Mike Vitkowski, a friend of archaeologist Dr. Ernie Walker, owned the land that would become Wanuskewin Heritage Park until he to retired in 1980. From time spent with Dr. Walker in the valley on his property, Vitkowski came to understood the importance of the resources held within the land. The ideal sale of land would be to some level of government in an effort ensure that it could be developed for protection and preservation into the future. The City of Saskatoon and the Government of Saskatchewan together with the newly created Meewasin Valley Authority (MVA) purchased the land for development into a Heritage Park to protect it. The MVA was established to protect and preserve the South Saskatchewan River valley within the limits of the City of Saskatoon, and a Toronto architect, Raymond Moriyama, was commissioned to design the 100-year master plan for the MVA (Walker 1983). Moriyama (1979)

indicated an urgent need to protect the area from the rapidly encroaching city. The resources of the Opimihaw Creek Valley were incorporated into this master plan and a full assessment of the area was commissioned in April of 1982. Dr. Walker, through the then-called Anthropology and Archaeology Department at the University of Saskatchewan, surveyed and conducted test excavations in the Opimihaw Creek valley in 1982 and 1983. This survey identified 19 precontact and two historic archaeology (Figure 2.1). The sale of the land to the City of Saskatoon and Government of Saskatchewan was finalized in the mid-1980s and establishment of a Heritage Park to protect the space as recommended by both Walker (1983) and Moriyama (1979) began shortly thereafter.

The Province of Saskatchewan designated the land a Provincial Heritage Property in 1984. Following a royal visit from Queen Elizabeth II in 1987, the park area was recognized as a National Historic Site by the Federal Government (Walker 1988). Wanuskewin Heritage Park officially opened to the public with a visitor center on June 27, 1992, and has since welcomed visitors from around the world. This entire endeavour would not have proceeded without the participation of Elders from local First Nations communities. Since its inception, Wanuskewin has actively involved local Indigenous groups and has been operated primarily by Indigenous peoples at all levels of operation. The name for the valley “Opimihaw” comes from the traditional name for one of the founding park Elders, the late Senator Hilliard McNab, translated from nehiyawewin (Plains Cree) as “One Who Flies”.

2.2 Geologic Formation

The Saskatoon area, including the Opimihaw Creek Valley, is composed of glaciolacustrine and glaciofluvial sediments overlying the glacial till of the Battleford Formation, a part of the Saskatoon Group (Christensen 1968). The sediments overlying the glacial till formed through a sequence of glacial events that began 15,000 years ago which are outlined in the following section. At its greatest extent during the Last Glacial Maximum (LGM) between 22,000 and 19,000 years ago, the Laurentide Ice Sheet covered the northern half of North America southward through Montana and North Dakota. After thousands of years and many cycles of advance and retreat, the Wisconsin Glaciation began its final recession, and the Laurentide Ice Sheet began its retreat around 15,00 years ago. By 12,000 years ago much of the Saskatoon area was ice free (Christensen 1992; Simpson 1999:87).

Figure 2.1: Map of Precontact Archaeology Sites in the Opimihaw Creek Valley. Adapted from Google Earth. Red Star Indicates the Wolf Willow Site.

Glacial Lake Saskatchewan (also called Glacial Lake Saskatoon) followed the terminus of the Laurentide Ice Sheet in its retreat acting as a collection basin for the glacial meltwater and runoff. The spillways along the terminus of the glacier flowed northeast along its edge, forming the beginning of the Saskatchewan River system. As the ice sheet retreated to the northeast, it dammed the ice margin channels and the spillways preventing flow and causing an accumulation of water (Christensen 1992; Skwara 1988). The banks of the overflowed spillways created Glacial Lake Saskatchewan. Approximately 12,000 years ago the area that is now houses the Opimihaw Creek Valley would have been covered by this glacial lake with the Laurentide ice sheet sitting just to the north. As this area was covered predominantly in stagnant water, sediments settled out and formed the glaciolacustrine layer that forms the Battleford Formation. Given the location of this till, it is clear that the lake sat well above where the present-day river is as its sediments are seen in the uplands between the North and South Saskatchewan Rivers and across much of south-central Saskatchewan (Christensen 1979, 1992).

The Laurentide Ice Sheet continued its northward retreat removing the ice dams and thus enabling water to flow. The water that had been contained in Glacial Lake Saskatchewan flowed in wide riverbeds into Glacial Lake Agassiz (Skwara 1988). This meltwater discharge created the meandering and braided South Saskatchewan River system; a system that flowed high above where it lies today with many tributary channels. The Laurentide Ice Sheet continued to retreat which led to a decreased input of water into the river with the main influx then coming from Rocky Mountain glacial meltwater. As made apparent by the glaciolacustrine and glaciofluvial sediments on the uplands between the North and South Saskatchewan Rivers, it is known that the rivers incised deep into their beds and presently flow well below their former levels (Christensen 1979). This decreased flow marks the transition to the fluvial stage of the evolution of formation processes in the area and the formation of the Opimihaw Creek within the former river valley. As a result of this decreased flow, the tributary channels were altered. This glaciofluvial activity shaped many of the Saskatoon area landforms known today, but the postglacial river itself would have been much larger and higher than present (Christensen 1979; Walker 1992).

Over thousands of years, these processes formed the Opimihaw Creek and its valley within what is formally known as the Saskatchewan Rivers Plain physiographic region (Walker 1988). A valley 30 meters deep at the mouth of the creek, the Opimihaw Creek Valley provides

many life forms with a sheltered area to live and is a microcosm of the South Saskatchewan River Valley (Moriyama 1979).

2.3 Biophysical Setting

Located two kilometers north of Saskatoon, Saskatchewan, Wanuskewin covers nearly 900 acres of the SW, NW ¼ Section 36 and SW, SE, NE ¼ Section 35, Township 37, Range 5, West of the 3rd Meridian. The park is located at 52° 13' North Latitude and 106° 35' West Longitude (Figure 2.2). The Opimihaw Creek Valley is located on the border between two ecoregions, the Aspen Parkland to the north and the Mixedgrass Prairie to the south (Fung

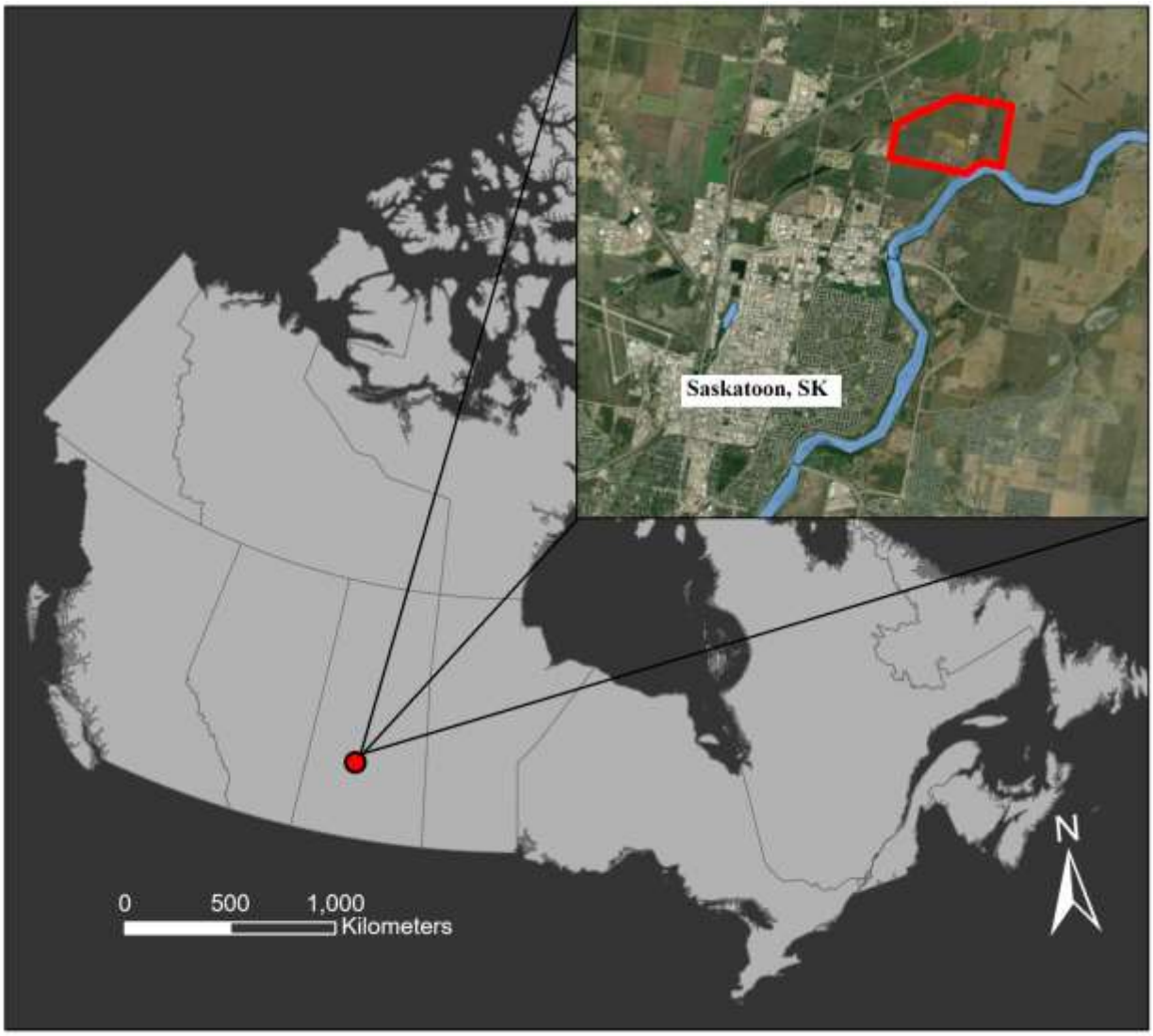

Figure 2.2: Map of Wanuskewin Location Near Saskatoon, Saskatchewan Canada. Wanuskewin Heritage Park Boundary Delineated in Red in Inset Map

1999:133). Aspen Parkland is the transitional ecotone, a blending of two distinct ecosystems between the Boreal Forest and the Mixed grasslands characterized by aspen stands mixed amongst prairie grasses. The Aspen Parkland ecotone covers approximately 13% of the province and cuts diagonally through from west central Saskatchewan to the southeast corner. The Mixedgrass Prairie is an ecoregion characterized by mid and short grasses with shrubs interspersed throughout (Shorthouse 2010). The prairie covers approximately 25% of Saskatchewan in the southern part of the province including much of the populated areas (Thorpe 1999:136). Both C3 and C4 grasses are present throughout the region (Yansa 2007:114).

The Opimihaw Creek Valley falls within the buffer zone between these two ecoregions. With the transition from Parkland to Prairie, a decrease in tree cover is noted and trees are generally limited to the periphery of bodies of water including the Opimihaw Creek (Fung 1999:162). There is still notable tree cover within the Opimihaw Creek Valley as a result of it being a riparian area and is an aspect of why the environment is different than the surrounding area. Mampe (2015) defines the region as an ecological island based on these principles where a unique diversity of resources exists within a small and defined area.

2.4 Paleoenvironment

The retreat of the Laurentide Ice Sheet from the Northern Plains marked the end of the Wisconsin Glaciation. The Saskatoon area was ice-free beginning 12,000-11,600 years before present (BP). This was followed by a spruce dominated boreal forest cover for much of Saskatchewan. The forest followed the ice sheet in its retreat gradually moving northeast. On the basis of data from a central Saskatchewan lake core, Wolfe et al. (2006) concluded this occurred 15,600-13,000 cal. radiocarbon years BP for the south and central parts of Saskatchewan. This marks a cooler and moister climate as is typical of forested regions (Thorpe 1999). Grassland cover began to overtake the forested areas between 13,000 BP and 10,200 BP turning the region into parkland and subsequently into grasslands. The grasslands covering the southern and central parts of Saskatchewan had reached their maximum northern extent by 9,000 BP (Wolfe et al. 2006).

A period of hot and dry climate, known as the Hypsithermal (or the Altithermal), persisted on the Plains for approximately 3,000 years between 8,000 BP and 5,000 BP. The dates for this period vary by region of the Plains. The Hypsithermal is known to be a period of time

from which relatively few archaeological sites date (Frison 2001; Oetelaar 2011; Walker 1992). A line of thinking was that the Plains were abandoned during this period due to an inhospitable environment, a way to explain the general absence of sites and cultural materials from this time period (Forbis 1992; Mulloy 1958). However, further studies have proven this improbable. Current conclusions drawn point to that while there were many periods of drought, there were also several periods with cooler and moister conditions making the Plains habitable for at least a portion of this time (Oetelaar 2011; Walker 1992). Likely, different adaptive strategies were employed by people in different regions of the Great Plains (Dyck and Morlan 2001; Meltzer 1991, 1999; Sheehan 1994; Vehik 2001). Population growth also likely resulted from the ameliorated climate with the end of the Hypsithermal. Refuge to the periphery of the Plains and areas with more water likely occurred during the most severe instances of drought (Walker 1992). River valleys, such as the South Saskatchewan, would have likely been habitable refuge areas (Frison et al. 1976; Sheehan 1994, 2002). This timing coincides with an increase in occupations in the Saskatoon area starting more than 6,000 years ago (Walker 1992). Due to the hot and dry climate, the Hypsithermal period would have reduced the amount of water coming into the Saskatchewan River system, increasing erosional sequences in turn affecting the Opimihaw Creek Valley drainage; the downcutting made for deeper valleys and more defined water flow channels (Oetelaar 2004; Walker 1992). This climatic shift aligns with the fluvial sequence of events in the area. The reduced flow created the small Opimihaw Creek which meanders through the large former river valley, thus creating perfect sheltered areas for human occupation (Rutherford 2004; Stumborg 2016).

Beginning around 5,000 BP much of Saskatchewan began to cool and conditions became much more moist, marking the end of the Hypsithermal (Forbis 1992). This change marks the transition from the dry, postglacial period towards a climate similar to that of today. Fluctuations have occurred, but largely the climate has been consistent with contemporary conditions for the better part of human occupation in the area (Wolfe et al. 2006). Exceptions to this stable and consistent climate lie in the Medieval Warming Period and the Little Ice Age. Both were global phenomena from which impacts are observed in the adaptive responses of nearly every cultural group living during this time. The Medieval Warming Period occurred from 1950-650 BP and is marked by a general increase in global surface temperatures. This Medieval Warming Period resulted in changing sea levels and temperatures and instigated a global adaptive response of

increased agrarian practices (Foster 2012). This time period is also associated with a distinct cultural fluorescence; it is at this time that on the Great Plains the invention and adoption of the bow and arrow hunting method, tipi habitation structures, and pottery are all known to have occurred as well as increased hunting capacity (Walker 2016).

Immediately following this warming period was the Little Ice Age, from 650 to 200 BP, with some areas impacted as recently as the year 1890. This period of climatic cooling led to cold, short seasons (Nicholson 2011:159; Nicholson et al. 2006). The Little Ice Age resulted in colder temperatures and longer winters, and it is recorded that some years the seasons were so cold there was no summer (Walker 2016). No specific adaptations to these prolonged climatic shifts can be clearly observed or studied within the Opimihaw Creek Valley, apart from the presence of the artifacts associated with the Medieval Warming Period inventions of the arrowhead projectile points, pottery, and tipi rings. Still both the Medieval Warming Period and Little Ice Age are important in interpretation of the habitation frequencies and practices observed within the study area.

2.5 Modern Climate

Given the Köppen Classification for decadal fluctuations, Wanuskewin falls within the Dfb climate which is characterized by a humid continental climate with long cold winters and warm summers (Lundqvist 1999:118). It is a semiarid environment given a general lack of precipitation. The majority of the precipitation occurs during the summer months with just 30% of the annual total coming during the long winters in the form of snowfall. The annual amount of precipitation is highly variable, ranging over 200mm annually. Droughts are frequent occurrences throughout the prairie portion of the province (Fung 1999:96, Lundqvist 1999:118).

2.6 Fauna

A wide array of fauna have lived in the Opimihaw Creek Valley since its formation, this section discusses the animals that have been found within the Valley itself. The section on Fauna Before Contact discusses those that no longer live in the valley area but persist in other regions of the Great Plains or in North America. The section on modern fauna includes the animals that are present today in the Opimihaw Creek Valley and across the Northern Plains. Wanuskewin Heritage Park is currently conducting species counts to determine animals and plants present in

the valley today. All taxonomic classifications were taken from the Animal Diversity Web to ensure consistency and accuracy in the naming of each (Animal Diversity Web 2023)

2.6.1 Fauna Before Contact

Prior to European contact there was much greater faunal species diversity than is found today. Plains bison (*Bison bison*) roamed the area in large numbers for millennia and were found with other artiodactyls including elk (*Cervus canadensis*), pronghorn (*Antilocapra americana*), and mule deer (*Odocoileus hemionus*). Carnivorous animals that inhabited the area long ago include Plains varieties of the wolf (*Canis lupus*) and the grizzly bear (*Ursus arctos*), as well as the swift fox (*Vulpes velox*) and the wolverine (*Gulo gulo*). The reintroduction of the swift fox has occurred in the southern part of Saskatchewan with success (Nature Conservancy Canada 2023). While all still in existence today, the mule deer is the only one that persists naturally in the Opimihaw Creek Valley. The others have all faced local extirpation or complete extinction due to homesteading, development for agriculture as well as habitat availability and overhunting of the animal or its food source (Wapple 1999:142).

2.6.2 Modern Fauna

Certain animals have continued to thrive on the Great Plains, some more so now than before due to the absence of niche and resource competition with competitor species extirpated or having gone extinct. To some degree, nearly all animals typical of the grassland ecosystem exist within the Opimihaw Creek Valley today (Stumborg 2015). Whitetail deer (*Odocoileus virginianus*) are presently the dominant artiodactyl. Carnivorous animals present today include the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*) as well as several members of the weasel family such as the striped skunk (*Mephitis mephitis*) and the American badger (*Taxidea taxus*). Cougars (*Puma concolor*) are still present in low numbers in the area as the South Saskatchewan River valley is a major corridor for them, but they are rarely spotted in the Opimihaw Creek Valley (Burt and Grossenheider 1976; Wapple 1999:142).

Several species of rodents live in the area including Richardson's ground squirrel (*Spermophilus richarsonii*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), and northern pocket gopher (*Thomomys talpoides*) among many others. These aforementioned rodents are of special note due to their burrowing activities; their habitats often disturb archaeological sites and thus their remains are frequently found within site faunal assemblages as

intrusive specimens. The American beaver (*Castor canadensis*) is present in large, stable populations and impacts the ecosystem through gnawing on trees and constructing dams which creates local creek overflow.

The white-tailed jackrabbit (Lepus townsendii campanius) and the snowshoe hare (Lepus americanus) represent lagomorphs. These leporids were present in the paleoenvironment much like they are today and were an important animal for subsistence (Kornfeld and Larson 2008; Walker 1986). Being much smaller animals, they were less impacted by homesteading and the development of agriculture as they adapted to living in cultivated lands and refuge areas with populations remaining relatively stable (Wapple 1999:142).

Very limited numbers of fishes, amphibians and reptiles are also present in the Opimihaw Creek Valley. The northern leopard frog (*Lithobates pipiens*) and the tiger salamander (*Ambystoma tigrinum*) represent the amphibians but are rarely seen. Due to the cold climate and being cold blooded animals, they hibernate through the winter months. The common garter snake (*Thamnophis sirtalis*) lives in the valley and hibernates through the winter as well and is the only reptile found in the region. Fishes include the yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), sauger (*Sander canadensis*), northern pike (*Esox lucius*), and lake sturgeon (*Acipenser fulvescens*). While these species of fish would have been present in the past, they do not currently inhabit the Opimihaw Creek but are found in the adjacent South Saskatchewan River (Wapple 1999:142).

More than 140 species of birds live in the Opimihaw Creek Valley today, some of which inhabit the valley year-round while others migrate. Migratory birds of note include Canada goose (*Branta canadensis*), great blue heron (*Ardea herodias*), red-winged blackbird (*Agelaius phoeniceus*), red-tailed hawk (*Buteo jamaicensis*), mallard duck (*Anas platyrhynchos*), yellow warbler (*Dendroica petechia*), and American pelican (*Pelecanus erythrorhynchos*). Birds that inhabit the area year-round include but are not limited to the black-billed magpie (*Pica hudsonia*), bald eagle (*Haliaeetus leucocephalus*), great horned owl (*Bubo virginianus*), great gray owl (*Strix nebulosa*), and sharp-tailed grouse (*Tympanuchus phasianellus*) (Smith 1999:145; Smith et al. 2017). It is known that some of these birds inhabited the valley in the past given their presence in the archaeological record at the Dog Child site (Pletz 2010).

2.7 Flora

A large variety of plant species inhabit the Opimihaw Creek Valley area. Due to the many different environments within a small area, this species diversity is amplified in comparison to other similar areas on the Plains. Plants can be organized by the local environment they inhabit: the grassland prairie uplands, the transitional valley slopes, and the valley floor floodplain (Walker 1983). Nearly all of these plants would have been an important part of the lives and diets of the people that occupied the valley for millennia.

The uplands around the Opimihaw Creek Valley are covered primarily in native grasses with dense shrubbery interspersed. Native prairie grass species include the dominant western porcupine grass (*Stipa curtiseta*) and northern wheatgrass (*Agropyron dasystachyum*) while needle and thread grass (*Stipa comata*), western wheatgrass (*Agropyron smithii*), and green needle grass (*Stipa viridula*) are also present but to a lesser degree (Thorpe 1999). June grass (*Koeleria macrantha*) and blue grama grass (*Bouteloua gracilis*) are very common short grass species in the mixed grass prairie region and also found in the area. Interspersed among these grasses are wolf willow (*Elaeagnus commutata*), Western snowberry (*Symphoricarpos occidentalis*), and rose species (*Rosa spp.*) shrubs. Pasture sage (*Artemisia frigida*) is found close to the ground and in the greatest abundance of the herbs while sedges including low sedge (*Carex eleocharis*), sun-loving sedge (*Carex pennsylvanica*)) and thread-leaved sedge (*Carez filifolia*) are found as well. Prairie crocuses (A*nemone patens*) appear on uplands and valley slopes (Thorpe 1999:138). Back from the valley's edge, adjacent fields were cultivated and used as productive crop field for more than 100 years. Present day efforts are underway to restore the fields to native grass species with the goal to eventually return them to their natural mixedgrass prairie state.

The valley slopes act as a transitional area between the grassland uplands and the floodplain of the valley basin and take on an environment closely resembling that of the Aspen Parkland ecoregion. Stands of trembling aspen trees (*Populus tremuloides*) are spread throughout and into the floodplain with the shrubbery typical at the base of the aspen trees present as ground vegetation. These shrubs include Saskatoon berry (*Amelanchier alnifolia*), chokecherry (*Prunus virginiana*), hawthorn (*Crataegus chrysocarpa*), and Wood's rose (*Rosa woodsia*) among others. Creeping juniper (*Juniperus horizontalis*) and red raspberries (*Rubus strigosus*) are found across

the valley slopes. The increased moisture in the soil compared to the uplands is the main reason for this difference in flora. Fescue grasses are found commonly throughout the Aspen Parkland, dominated by the single Plains rough fescue (*Festuca hallii*) species. Forbs such as northern bedstraw (*Falium boreale*) and Three-flowered avens (*Geum triflorum*) are found in fescue areas as well, which differentiates them from drier grasslands (Thorpe 1999:137).

On the valley floor floodplain, many of the previously mentioned species are present along with an assortment of plants that require a higher moisture content. Plants such as red-osier dogwood (*Cornus stolonifera*), hawthorn (*Crataegus chrysocarpa*), and cattail (*Typha spp.*) thrive in the bottom of the valley. Dogwood and cattail grow close to and in the waters of the creek, inhabiting the moistest environment. The most common shrubs are the western snowberry and Wood's rose, but chokecherry, hawthorn, saskatoon and buffalo berry (*Shepherdia canadensis*) also appear deep in the valley. The Manitoba maple (*Acer negundo*) thrives in riparian woods and is commonly found along the Opimihaw creek and the South Saskatchewan River (Thorpe 1999:137). A complete list of flora and fauna known to occur in the Opimihaw Creek Valley can be found in the Archaeological Resource Assessment: Tipperary Creek Project (Walker 1983).

2.8 Geoarchaeology of the Study Area

The Wolf Willow site has previously been studied from a geoarchaeological perspective by Stumborg (2016) to understand site formation processes. This work is used to inform data interpretations and to understand the site formation processes impacting excavation and the preservation of artifacts. However, the greatly expanded site area changed the way that the stratigraphy presented since its interpretation by Stumborg (2016) and has made it extremely complex. The stratigraphy at the Wolf Willow site is intricate, a feature of it that is highlighted by the marked differences in cultural level interpretations between previous and current research.

This complex nature is encapsulated well with the gravel lens that is present intermittently throughout the site. It is not present in all excavation units and more heavily impacted the units excavated and interpreted as a part of Mampe (2015) and Stumborg (2016)'s theses. This gravel level is typically found between 25 and 40 cm below surface in the main block of the excavation and occasionally presents as a sandy clay rather than gravel. Stumborg (2016) interpreted this lens as a gravelly "C Horizon" and notes the layer is consistent with a creek bed. The Opimihaw

creek is known to meander and move laterally within the wide valley (Burt 1997). Where the gravel layer is found there is an absence of cultural materials, initial interpretations thus noted a cultural hiatus. As excavations and research work continued at Wolf Willow, greatly expanding the footprint of the total area excavated, cultural material is present in other areas at the depths the gravel layer would have been at. This gravel layer can clearly be seen in Figure 2.2.

As cultural material was absent in the parts of the site that were excavated first, initial identification and designation of cultural levels did not include the gravel layer as no cultural materials had been recovered from this depth. With continued excavations (years 2016 through 2020) cultural material recovered indicated a clear cultural occupation exists. This cultural material is currently being studied in depth; however, it is important for this work to note that the gravel lens led to the intermittent nature of level 2 and subsequent identification and classification as levels 2a and 2b. Levels 2a and 2b blend and separate depending on location within the site and are absent in places due to this gravel lens. The orange tags in Figure 2.2 denote cultural occupations, from top to bottom they indicate Cultural Level 1, 2a, 3, 4 and 5. The image is from the 2015 excavations and thus predates the identification of Cultural Level 2b which would occur at the same depth as the identified gravel layer.

The complex stratigraphy over a large site area made for interpretation of artifact and faunal remains difficult. Throughout the site a slight downslope towards the north can be observed based on the depths cultural artifacts are coming from. This thesis does not investigate or interpret the site from a geoarchaeological perspective however it does impact the way that the cultural levels are identified.

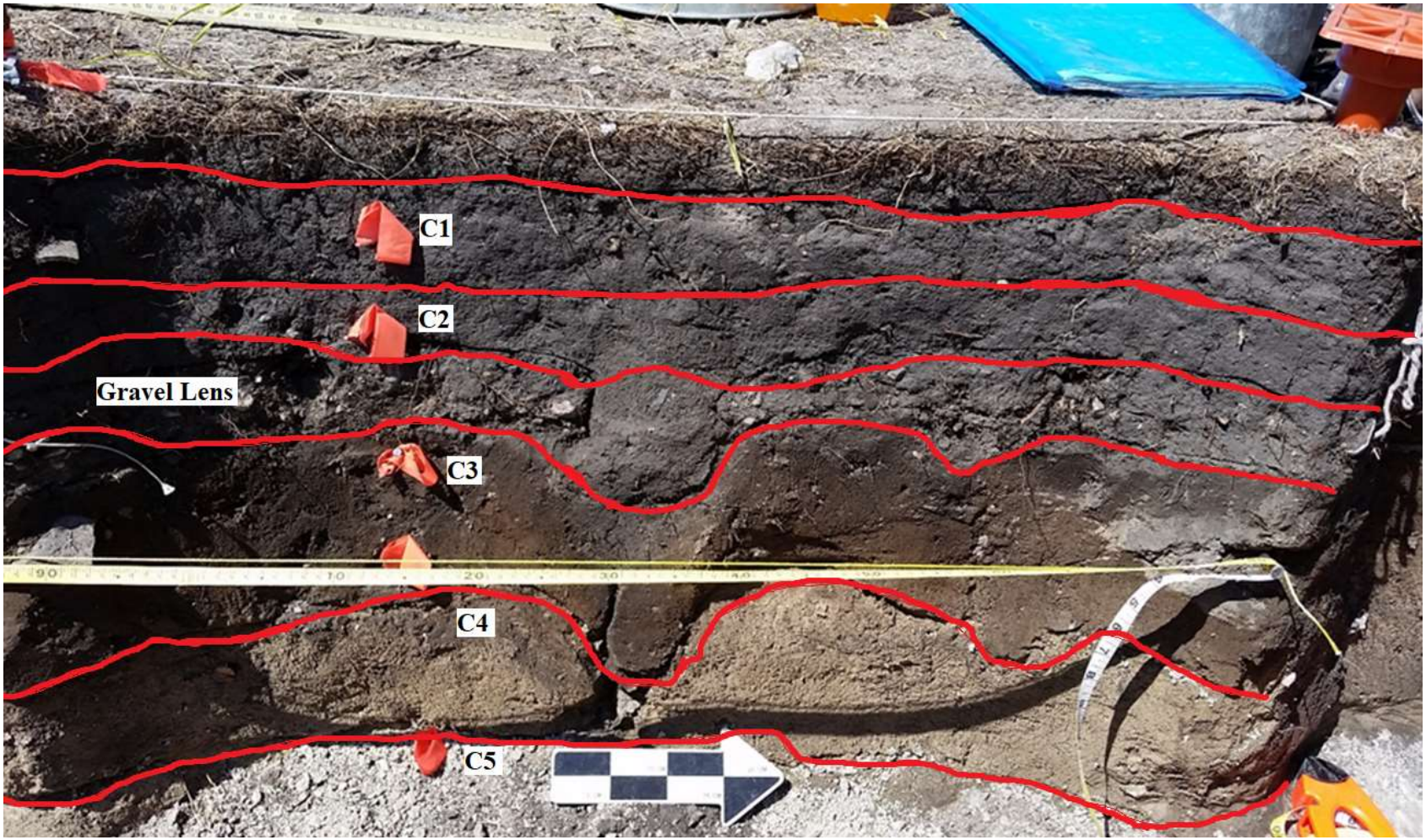

Figure 2.3: Stratigraphic profile, west wall of unit 18S 15E (Image: Glenn Stuart)

Chapter 3: Methodology and Cultural Chronology

3.1 Site reconnaissance

An extensive valley survey conducted in 1982 and 1983 by Dr. Ernie Walker identified the Wolf Willow site as one of the 19 precontact sites in the Opimihaw Creek Valley. Identification was made through test excavations and the site was recognized as having 4 occupation levels. It was given the Borden Number FbNp-26 and is one of the northernmost sites within the Opimihaw Creek Valley, located on a point bar formed by the meandering creek (Figure 3.1).

Figure 3.1: Wolf Willow Site Aerial View (Google Earth 2023)

Two master's theses have previously been written on the Wolf Willow focusing on the 2010 through 2014 excavations. The works of Maria Mampe (2015) and Devon Stumborg (2016) will be used as background context and research for this work and will provide a framework for this thesis. Conclusions drawn by the author will incorporate their findings as necessary and when available. Due to the many years of excavation and the extensive collection from Wolf

Willow, the artifacts from the 2015 through 2020 excavations were divided into two separate projects. This thesis will solely examine the faunal assemblage from the site including all of the bone, shell, and teeth as well as the few fossils that were recovered. A separate thesis is being written concurrently to examine all cultural artifacts including lithics, pottery, and metals as well as the fossils for the same years of excavation.

Figure 3.2: The Wolf Willow Site in 2022. Looking North from the Southeast Corner of the Main Excavation Block.

3.2 Excavation Methodology

Excavation of the Wolf Willow site first began in May 2010 by the University of Saskatchewan's archaeology undergraduate field school. Field schools were operated at the site from 2010 through 2019 running early May through the end of June each year. The 2020 excavations were conducted by Dr. Walker and the author to finish the final units at the site. The Saskatchewan Archaeological Society (SAS) conducted a public field school during the summer months for several years (2012-2016) at the site, excavating a small portion of the total units excavated. The only years of the SAS excavations included in this thesis are 2015 and 2016. A

total of 149 units were excavated at Wolf Willow; 66 of which are analyzed in this work with the others having previously been studied by Mampe (2015) and Stumbord (2016).

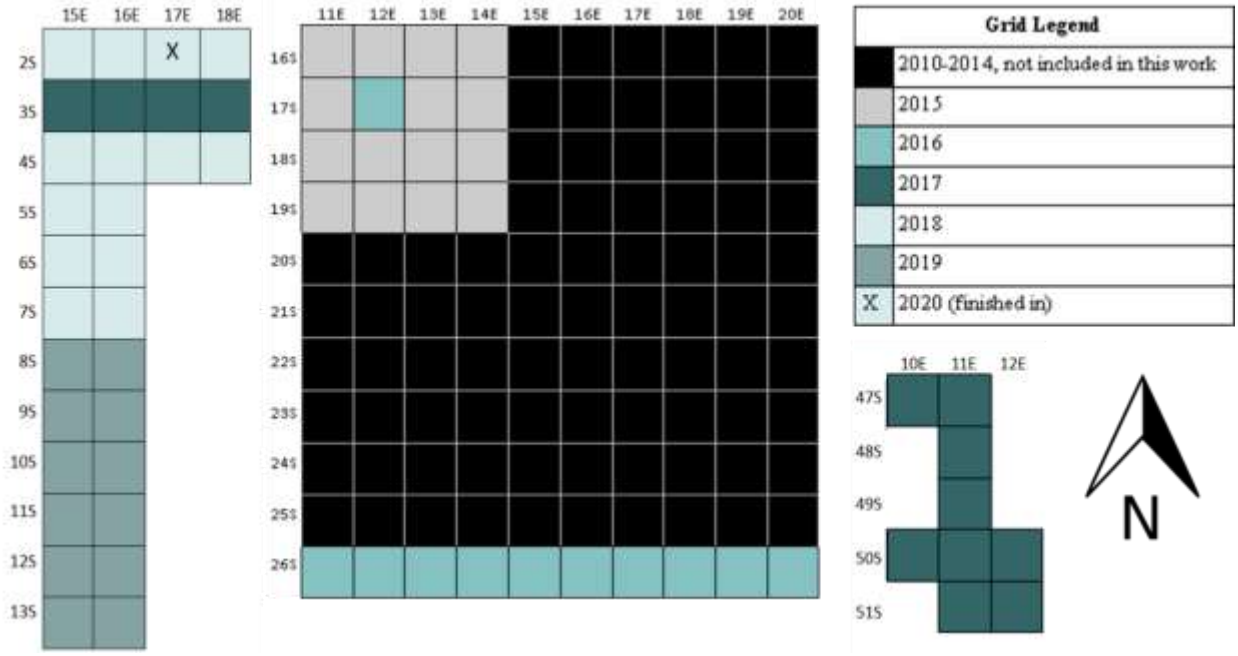

Figure 3.3: Wolf Willow Map of Units Excavated

A datum point was set at the northwest corner of the site prior to excavations beginning in 2010 and designated 0 South 0 East (0S 0E) which serves as the point from which all units and artifacts are measured. An initial 10 m by 10 m block was identified to be the main excavation and started in 2010. The 2015 field season resulted in 15 units being excavated completing the 100 m^2 excavation originally intended for the site. Due to its proximity to the Wanuskewin visitor centre and high yield of artifacts at relatively shallow depths, Wolf Willow served as an excellent site for field schools. Thus, in 2016 an additional 10 units were added to the southern edge of the block expanding it by 1 meter further south. The 2017 field school attempted to find the northern and southern extents of the site by placing four units as a 4 m by 1 m trench 13 m north of the original excavation block. Additionally, nine units were excavated 21 meters south of the excavation's main block. The southern extension of the site produced significantly fewer artifacts per unit therefore 2017 was the only year that excavation in this southern area took place. The 2018 field school extended the northern trench to be 3 m by 4 m and began extending its footprint south towards the original excavation adding a total of 14 units. In 2019 the field school continued this extension south adding 12 more units (Figure 3.2).

During field school each student was assigned a one-meter squared unit to excavate for the duration of the term. Students were partnered for excavations only in 2017. The first step of the excavation was to divide the unit into 50 cm by 50 cm quadrants and establish a unit datum point in the NW corner of the unit from which everything was measured. The excavation proceeded through the removal of the sod layer (approximately the uppermost 5cm of grass soil and root matrix). The sod level was excavated using a spade and sod cutters and examined for artifacts by hand but not screened. Following the removal of the sod layer students proceeded to excavate the quadrants of their unit sequentially in 5 cm arbitrary levels. The unit as a whole was excavated to the same depth quadrant by quadrant prior to excavation continuing. A map was drawn for every 5 cm level with artifact positions and features accurately drawn into the map to provide a visual level record. Due to the field school nature of the excavation differences exist in level thickness consistency and recording accuracy as students learned while excavating.

Excavation was done using trowels and 5 cm wide paint brushes to carefully and slowly uncover the artifacts and avoid damaging or moving them. All soil from the excavation, except for the sod layer, was screened through 6 mm mesh to find any smaller artifacts and fauna that were missed during initial trowel excavation. The 6 mm mesh is suitable for the purposes of field school and is sufficient for many analyses but creates a bias in the faunal analysis as many fragments are smaller than 6 mm, especially those of fish and birds. These fragments, along with other smaller unidentifiable ones found in the quadrant, were all placed in bags called “frag bags”. Each quadrant would get one “frag bag” per arbitrary level to collect all the small and broken pieces of cultural and faunal material, primarily anything less than 2 cm in diameter and unidentifiable. The “frag bag” largely consists of small bone and enamel fragments, small lithic debitage, as well as very small pottery sherds. Occasionally, identifiable faunal pieces were collected and accidentally placed in the “frag bags” by students. These were separated out during the re-cataloguing process conducted by the author, identified, and included in the site catalogue.

Upon the excavation of an artifact, pieces that were identifiable faunal or lithic materials or fragments greater than 2 cm were left in situ. The excavation would continue with the artifacts pedestaled, where all dirt was removed but the artifact remained in place and was then mapped and measured in as is once the maximum depth of the level was reached for the quadrant. Three-point provenience measurements of southing, easting, and depth below surface (DBS) were taken

for each artifact. The depth measurement was taken using a line with an attached level tied to the unit datum and left in place for the duration of the excavation so that depth measurements were consistent. All artifacts within a unit were given a sequential catalogue number and logged in a catalogue sheet. Each was given an artifact card documenting the site unit and all known artifact information. For features such as hearths and rock pits, as well as soil anomalies, soil samples were collected at the discretion of Drs. Walker and Stuart to be studied further in the laboratory as samples for paleoenvironmental analysis.

Shovel-shaving was typically employed between 60 and 80 cm depth. When approaching the bottom of the excavation a clayey soil texture was reached. It was remarked in earlier years that these strata typically yielded significantly fewer artifacts. For this reason, arbitrary levels at this depth were often larger, around 10 cm thick. This was conducted using a large flat-edged square shovel to scrape off one layer of dirt at a time. This method of excavation was closely monitored for any artifacts or changes that would necessitate hand trowel excavation. The soil was screened, and any fragments that had been missed were collected in “frag bags”.

As excavations proceeded through arbitrary levels, cultural levels were passed and recognized by changes in soil colour and texture as well as frequency and types of artifacts found. Such changes in cultural levels were studied on a site-wide basis, not per unit, to align the units with the site as a whole in order to draw a complete picture of occupation at Wolf Willow. Excavation ceased upon reaching heavy gravel, large rocks, or percolating groundwater often between 80 cm and 1 m deep throughout the site. A level record was done for each arbitrary level for the site by the excavators documenting soil texture, types and number of artifacts found, samples taken, and other comments of importance. A daily log was completed at the end of each day documenting conditions of excavation and observations and listing significant artifacts recovered and trends observed. Artifacts were regularly taken back to the University for further study in a laboratory setting.

3.3 Laboratory Methodology

Initial laboratory procedures included washing all artifacts as suitable with water and a soft bristle toothbrush to remove excess dirt and then leaving them to dry completely on a tray to prevent mold growth when stored. Cleaning artifacts facilitates better visual analysis in future research and accurate data collection. For some artifacts such as pottery ochre, fragile bone and

enamel, washing with water was not a suitable procedure and these artifacts were carefully dry brushed to remove as much dirt as possible. At the same time, artifacts were re-catalogued to correct errors made in the field identification and artifact cards redone as necessary to ensure the information was accurate and legible. Artifacts were separated by material: faunal, lithic, ceramic, and metal. Only the faunal remains were studied for this work.

3.3.1 Faunal Analysis

The faunal analysis included identification of remains in order to create a comprehensive catalogue of all faunal remains found in the 2015 through 2020 excavations. The textbook This was designed to determine the species of animals present in the assemblage, the relative abundance of each species, the degree of fragmentation of the assemblage, and to examine elements present. This information was then used to interpret the type of site excavated, to determine the seasonality of occupation, and what activities took place in the area as well as animals selected for and important in hunts. Artifacts were classified as an element, a specimen, or a fragment. Elements include complete bones, teeth, or shell for which a taxonomic identification was possible as well as siding of the element. Specimens are all bones, teeth, or shells that were identified which could be sided, but were incomplete pieces. Taxonomic classification was possible for all specimens to at least the Family level. Fragments were all those that could not be described beyond belonging to a general element such as a long bone, or the size class of the animal they might belong to, and as such were largely described as bison/large mammal size, small mammal size or small rodent size.

For each unit, the “frag bags” collected were examined and catalogued first to separate any identifiable artifacts to be catalogued with the main catalogue then weighed as a whole to note the total mass and abundance of fragments in that quadrant of the level. A separate catalogue for the “frag bags” recorded the mass level and depth of the bag’s contents and sequential cataloguing numbers were given to the bags. Observations such as a high proportion of burned bone or concentration of a certain size of fragment were noted to aid in better site interpretation. Fragments were weighed and described in terms of mass, as opposed to individual count, to better show true abundance due to the high variability in size.

Many artifacts were not identifiable to a species level due to the highly fragmentary nature of the faunal assemblage as is consistent with many habitation areas and sites with a high

degree of processing. Many bone fragments were preliminarily identified as Plains bison simply because of their overall size and shape; however, these fragments were not used in species percent (%) abundance determinations or overall species counts. Bone fragments are the largest category present in the catalogue although are not considered identified specimens.

Faunal remains were catalogued using Microsoft Excel. Bones were identified to the most precise point possible, weighed, and any unusual or identifying features such as pathological anomalies or taphonomic changes were documented. Taphonomic changes are all processes affecting the bone as it transitions from the biosphere to the lithosphere (Lyman 2010). Evidence of human caused taphonomic processes or cultural taphonomy was recorded as found. These marks are indicative of human or carnivore activity and include cut marks, gnawing, polishing, and burning. Thermally altered bone such as burnt or calcined was identified while cataloguing, which indicates the use of fire and likely cooking and human consumption. Burned bone is the result of lower heat fires which leads to carbonization of the bone turning it black in colour. Calcined bone which is white to blueish white or grey in colour and very fragile, comes from high temperature fires and is this colour as only the mineral components of the bone remain (Ellingham et al. 2015). As neither calcined nor burned remains were present in large quantities they were examined together and labelled “Thermally Altered”. Taphonomic changes were analyzed on a site wide level and used to interpret use, activity, and processes within the site to better understand animal use as a whole.

The faunal comparative collection housed in the Department of Archaeology and Anthropology was used to identify bones for which the species identification was difficult, such as identifying and differentiating canid species. It was also useful in determining the species of animals found less frequently as the comparative collection consists of nearly every animal known to the area. A comprehensive comparative collection for fetal and immature bison is also housed within the Department and was used to determine ages of immature long bones and dentition whenever possible. Animal identification and naming was conducted using Animal Diversity Web (2023). Long bones were used to determine seasonality of site occupation as very little deciduous dentition was present and thus could not be used. However, limitations exist due to the limited amount of research into standard growth and epiphyseal synthesis in bison and

other mammals. The data on seasonal attribution is preliminary and not conclusive but is the best indicator present and available given the assemblage.

3.3.2 Quantitative Analysis

To utilize the collected data for interpretation of the site and its occupation, quantitative analyses were conducted. Faunal analysis was conducted and performed in a manner that aligns this work with those previously executed on the faunal assemblage from Wolf Willow (Mampe 2015; Stumborg 2016). Guidelines from Reitz and Wing (2008) as well as Lyman (1994) were followed. For each cultural level identified, the total Number of Identifiable Specimens (NISP) was calculated which includes all elements and specimens that were identified by skeletal element and side (right or left) where possible and applicable. For example, two proximal radii were considered as two separate specimens, whereas a proximal and a distal end would only be counted for one to avoid any duplication skewing data. This gave the total number of identified pieces from each level. From this the Minimum Number of Individuals (MNI) could be calculated for each species present in each level. The MNI is the smallest possible number of individuals that can represent the elements present in the assemblage calculated using the largest number of a single portion of one side. Both MNI and NISP offer incomplete lenses into the true total of individuals present due to inherent limitations within archaeology. A preservation bias indicates larger elements will be preserved better and within a habitation site the highly fragmentary nature of the assemblage reduces bones to smaller pieces, additionally the significant limitations that exists for determining which bones truly come from the same individual. Due to the nature of the faunal assemblage, no indicators of sex were examined as the collection of any one element that can be used in this process was not large enough to render significant conclusions. Counts for the minimum number of elements (MNE) were done by cultural level. For bison, these values can be found in Appendix A, and all other species found in Wolf Willow in Appendix B.

3.4 Culture Chronology

The existing lithic projectile point based culture chronology for the Great Plains was used to determine age estimates for the cultural levels in the field. Stylistic differences in lithic projectile point shapes indicate broad ranges for time periods of occupation and are generally consistent over time and place. As projectile points were uncovered in the excavation their style

was matched to known and dated projectile types found throughout the Great Plains. Using an established chronology gives an approximate date for the level during excavation and early study and for levels that radiocarbon dates have not yet been determined. From the first five years of excavation, it was known that the following cultural groups were present in the site area: Plains Side Notch (ca. 250-600 BP), Prairie Side Notch (ca. 800-1,200 BP), McKean Cultural series (ca. 3,500-4,200 BP), and Oxbow (ca. 4,100-4,500 BP) cultural groups were present based on the styles of arrowheads and dart tips found. Excavations from 2015 through 2019 expanded this chronology to include Pelican Lake (ca. 2,100-2,800 BP) and Mummy Cave Complex/Gowen (ca 4,500-7,500 BP) cultural groups present at the site. An absence of both Avonlea and Besant points at this site is noteworthy, both are adept bison hunters, and their presence is under investigation concurrently with this writing (Reeves 1983; Walker 2016). Both are present in many of the other archaeological sites within the Opimihaw Creek Valley (Frary 2009; Kelly 1986; Mack 2000; Ramsay 1993; Smith 2012). Very little absence of cultural material is observed in between cultural levels. This establishes a nearly complete cultural chronology within the Wolf Willow site alone and broadens that of the Opimihaw Creek Valley. Information and a discussion on the explicit cultural affiliation of each level of the Wolf Willow site is discussed in the thesis being written concurrently with this one by Bailey Pelletier.

3.5 Chronometric Dating

Absolute dates were obtained using radiocarbon dating from five bone samples conducted as a part of Mampe's (2015) thesis. Radiocarbon dates obtained are almost all congruent with the cultural levels present. Further excavations expanded and confirmed the dates obtained through Mampe's work by finding cultural artifacts that correspond with more of the radiocarbon dates than previous. Dates can be found in Table 3.1. Sample #414919 is consistent with the Pelican Lake cultural material found at the same depth in the 2016 excavations. The date obtained for what is referred to as Level 5 (now called Cultural Level 5 (C5)) correctly corresponds with the Gowen points that have been found at this depth. No new samples were submitted for dating as a part of this thesis as this was seen as unnecessary due to the five dates already obtained for the site.

3.6 Summary

The faunal analysis was conducted to align this research with that which had previously been performed on materials from the Wolf Willow site. It measures the abundance of different animals in the site area, the minimum number individuals of each animal present, and the amount of fragments in the site was measured by mass. These methods are combined with the works of Mampe (2015) and Stumborg (2016) to give perspective on the whole site area. This also helps distinguish where cultural occupations are and how they were affected by geologic processes. An examination of the taphonomy enables interpretation of activities occurring in the site area by past occupants. Radiocarbon dates obtained as a part of the previous works corroborate the cultural level identifications made based on projectile point typology, and the expanded excavation and research helped clarify certain dates that previously appeared as outliers.

Table 3.1: Radiocarbon Dates from the Wolf Willow Site (Adapted from Stumborg 2016)

Sample Number	Cultural Level	Depth (cm)	Sample Type	Uncalibrated Age (Years BP)	Calibrated Age (Years BP)	Calibrated Error (+/-)	Two Sigma Minimum (Years BP)	Two Sigma Maximum (Years BP)
Beta-414920	1	11	Bone	220	285	30	145	310
Beta-414919	2b	52	Bone	2620	2750	30	2735	2770
Beta-414921	3	21	Bone	3300	3533	30	3543	3590
Beta-414922	4	56	Bone	4620	5317	30	5303	5447
Beta-414922	5	74	Bone	4960	5660	30	5608	5743

Chapter 4: Faunal Analysis of the Wolf Willow Site 2015-2020

4.1 Introduction

Faunal analysis was conducted to align with the methods of previous works done on the site. For each level, as indicated in the methods section, all faunal pieces that were whole parts of the skeleton where both the side and the taxonomic classification could be determined were classified and studied as elements. Specimens then were all those that could be identified to the part of the skeleton from which they belong and have the side and taxonomic classification determined but were incomplete elements of the skeleton. This distinction assisted in the quantification of the assemblage and remains found. With the high degree of fragmentation, to properly show the small portion of the assemblage that was not fragmented, this separation was made. This method was used throughout all levels and is consistent within this work and renders this work comparable with the previous works on the faunal remains from site.

Many of the undetermined rodent remains are potentially intrusive to the site. Various burrowing rodents including Northern Pocket Gophers, Thirteen Lined Ground Squirrels, and Richardson's Ground Squirrels are all known to be present in the modern-day site area. Definite bioturbation was present in the site and in many units, however, it was not noted whether the rodent remains were found within collapsed burrows. Given the condition, colouring, and frequency of small rodent remains in the site they are considered to be intrusive unless otherwise noted.

4.2 Cultural Level 1

Cultural Level One begins immediately following the sod layer at approximately 5cm below surface and generally extends through to 15cm below surface. It has been attributed to a Plains Side Notch cultural affiliation blended with Protohistoric and Contact era artifacts in certain excavation units. An uncalibrated radiocarbon date of 220 $\pm$30 BP (Beta-414920) was obtained for this level which is consistent with the recovery of Plains Side Notch projectile points (Mampe 2015).

The Cultural Level 1 excavation produced a total of 85 identifiable elements belonging to a variety of animals common to the Northern Plains weighing a total of 1,249.6 grams. A total of 328 specimens were identified with a mass of 3,699.3 grams. Unidentifiable fragments total to

11,845 grams and include thousands of small fragments found. Unidentifiable fragments account for 70.5% of the assemblage by weight. Due to the highly fragmented and dense nature of the remains classified and bagged as “frags” in the field, mass as opposed to a numerical count was used as the unit of measure. This provides a more accurate and less skewed glimpse of the nature and quantity of fragmentation observed within the site with respect to the quantity of identified pieces. The total mass of fragments in this level is 11,845 grams. The vast majority of the remains are unburned (98.54% by mass), with 1.44% being thermally altered.

Table 4.1: Cultural Level 1 Faunal Counts

Faunal Type	Number of Elements	Mass (g)	Number of Specimens	Mass (g)	Mass of Unidentified (g)
Unburned Bone	70	1073.9	283	3296.5	11514.9
Thermally Altered Bone	2	1.8	5	76.2	166.1
Unburned Dentition	11	163.8	40	326.6	158.8
Thermally Altered Dentition	1	0.4	0	0	0
Shell	1	9.7	0	0	5.2
Totals	85	1249.6g	328	3699.3g	11845g

4.2.1 Artiodactyla

4.2.1.1 *Bison bison*

The majority of identified elements and specimens, 98.4% by mass (n=272, m=3,678.8 g), belong to the Plains bison, *Bison bison bison*, which is consistent with previous work conducted throughout the Opimihaw Creek Valley. Given that there are no other large mammals identified in the assemblage, such as moose or elk, the majority of large to very large sized mammal fragments are assumed to belong to bison as well.

The excavation of Cultural Level 1 produced the remains of at least five (5) mature and two (2) juvenile bison present within the site. The MNI of 5 was calculated given the presence of five right ulnar carpals. The work of Mampe (2015) indicates an MNI of 2 based on lateral malleoli, however, one right ulnar carpal is present and when incorporated into the data of this work the total MNI is six (6), the MNI_{total}= 8 ulnar carpals and juveniles. Stumborg did not include specifics upon which the MNI was calculated, thus unfortunately his data cannot be incorporated into this work.

At least two juveniles (MNI=2) are present within the assemblage. The presence of a second phalanx from an animal approximately seven months of age as well as the presence of a humerus consistent in size with that of a newborn indicates two separate individuals. These ages were determined using the comparative collection. The use of immature long bones in the determination of seasonality is not implemented due to the high degree of variability in rate of growth. However, as bison are most often born through the springtime with calving most often occurring mid to late April through May. The newborn bison humerus indicates a springtime occupation. Given that there are two different ages of immature remains within the site, it is likely that the site was occupied for at least two separate points in time or for an extended time period.

Table 4.2: Cultural Level 1 Faunal Remains by Taxa

Common Name	Taxon	NISP	MNI
Mammals			
Bison	*Bison bison*	272	5
Canids	*Canis* sp.	18	1
Badger	*Taxidea taxus*	1	1
Snowshoe Hare	*Lepus americanus*	1	1
Leporid	*Lepus* sp.	1	1
Red Fox	*Vulpes vulpes*	11	1
Fox	*Vulpes* sp.	1	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	1	1
Beaver	*Castor canadensis*	1	1
Cricetid Rodent	*Cricetid* sp.	1	1
Rodent	Unidentified Rodents	4	3
Avians			
Bird	Aves	1	1
Invertebrates			
Freshwater clam	Unionidae	5	3
Fish			
Northern Pike	*Esox lucius*	1	1
Miscellaneous			
Bison to Moose Size	Large to Very Large Mammal	226	n/a
Rabbit Size	Small Mammal	5	n/a
Grand Total		**550**	**22**

4.2.2 Carnivora

4.2.2.1 *Vulpes vulpes*

A red fox is represented by several dental elements with an NISP of 11. Maxillary teeth, including two right incisors, premolars three and four (P^3 and P^4), two canines, as well as maxillary molars one and two (M^1 and ^{2}) were present (Figure 4.1). A fragment of the premaxilla was also present. No duplicate elements are in the assemblage thus the MNI is one.

4.2.2.2 *Vulpes sp.*

One third phalanx consistent in size and shape with that of a fox was present. No species could confidently be assigned to the element, the MNI for foxes is one.

4.2.2.3 *Canis sp.*

Cultural Level 1 produced several canid remains with an NISP of 19. This includes cranial and enamel fragments and four molars identified as maxillary molars one, two, and three, and a left second mandibular molar. Postcranial remains include a lumbar vertebra, a radial carpal, a fourth tarsal, and a first metacarpal as well as phalangeal and metapodial fragments. No duplicating elements are present within the assemblage and thus the MNI is one.

Figure 4.1: *Vulpes vulpes* teeth (Cat. Numbers: 2533, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2544, 2552)

4.2.2.4 *Taxidea taxus*

The American badger is represented by one rib element (MNI=1). Using a comparative specimen from the University of Saskatchewan, the rib was congruent in size and shape with that of a badger.

4.2.3 Lagomorpha

4.2.3.1 *Lepus americanus*

One right scapula, consistent in size and shape with that of a snowshoe hare, was present representing at least one animal (MNI=1).

4.2.3.2 *Lepus sp.*

At least one bone belonging to an undetermined lagomorph was identified, the frontal bone. Given morphology present it could not be confidently assigned to a species.

4.2.4 Rodentia

4.2.4.1 *Castor canadensis*

One humerus belonging to a beaver is present in the Cultural Level 1 assemblage. Beavers are native to the area and are still present in abundance in the Opimihaw Creek Valley.

4.2.4.2 *Spermophilus richardsonii*

Richardson's ground squirrel is represented by the presence of one right maxilla containing teeth likely belonging to an intrusive animal.

4.2.4.3 *Cricetinae sp.*

A cricetid rodent, such as a vole, was identified based on the presence of one complete mandible with teeth in the assemblage. A variety of voles are found within the Opimihaw Creek Valley and are known to burrow through the site thus the bone is likely intrusive to the level.

4.2.4.4 *Unidentified rodents*

Various rodent remains were found (NISP=7) unidentifiable to the species level. They belong to small rodents within the pocket gopher-ground squirrel size class of animals. Remains include three left femora and four mandibles, one right three left, making for at least 3 individuals found (MNI=3).

4.2.5 Fish

4.2.5.1 *Esox lucius*

Two vertebrae with fin supports attached were found in Cultural Level 1 and identified as belonging to the Northern Pike fish (MNI=1). Pike are common within the region of South Central Saskatchewan and are known to be found in the South Saskatchewan River (South Saskatchewan River Watershed Stewards 2010).

4.2.6 Birds

4.2.6.1 *Aves sp.*

One bone fragment consistent with that of a bird indicates at least one bird is present (MNI=1). No species could be assigned to the specimen and the element could not be confidently identified. Bird bones are generally lighter in weight and have increased pneumatization to enable flight and given the morphology and composition of the bone it was identified as belonging to that of a bird.

4.3 Cultural Level 2a

Cultural Level 2a begins at approximately 17 centimeters and continues through to 27 centimeters below surface. Several Prairie Side Notch points were found in association with the faunal remains of this level. A radiocarbon date of 3300±30 BP (Beta-414921) was obtained but is not consistent with the finding of the Prairie Side Notch projectile points found in this level. Mampe (2015) attributes this to poor stratigraphic control in excavation as the date is consistent with artifacts found in Cultural Level 3. No date that corroborates the Prairie Side Notch age of the level has been obtained at the time of this writing. This level contains the greatest number of catalogued faunal remains and the greatest mass of fragments.

The faunal assemblage making up Cultural Level 2a (C2a) primarily consists of bison remains. A total of 128 identifiable elements were found belonging to a variety of animals from the Northern Plains weighing a total of 2,651.2 grams. Additionally, C2a produced a total of 478 identifiable specimens weighing 9,278.3 grams. These bone pieces were identifiable as to which component of the skeleton they belonged to but were largely incomplete. Unidentifiable elements of various sizes comprised of thousands of fragments from very small bone pieces to long bone shaft fragments have a total mass of 21,734.9 grams and account for 65.7% of the

assemblage. By mass, the vast majority of the remains are unburned at 33,072.41 grams (98.24%), with 592.0 grams (1.76%) thermally altered.

Table 4.3: Cultural Level 2a Faunal Counts

Faunal Type	Number of Elements	Mass (g)	Number of Specimens	Mass (g)	Mass of Unidentified (g)
Unburned Bone	115	1945.8	460	8459.6	20925.31
Thermally Altered Bone	1	5.9	3	82	461.7
Unburned Enamel	11	682.9	13	713.1	328.5
Thermally Altered Enamel	0	0	2	23.6	18.8
Shell	1	16.6	0	0	0.6
Totals	128	2651.2g	478	9278.3g	21734.91g

Table 4.4: Cultural Level 2a Faunal Remains by Taxa

Common Name	Taxon	NISP	MNI
Mammals			
Pronghorn	*Antilocapra americana*	4	1
Bison	*Bison bison*	403	4
Canids	*Canis* sp.	14	1
Leporid	*Lepus* sp.	1	1
Richardson's ground squirrel	*Spermophilus richardsonii*	1	1
Beaver	*Castor canadensis*	2	1
Cricetid Rodent	*Cricetid* sp.	1	1
Rodent	Unidentified Rodents	4	1
Invertebrates			
Freshwater clam	Unionidae	3	2
Miscellaneous			
Bison to Moose Size	Very Large Mammal	336	n/a
Rabbit Size	Small Mammal	1	n/a
Grand Total		**770**	**13**

4.3.1 Artiodactyla

4.3.1.1 *Bison bison*

The vast majority of identified specimens and elements belong to bison, with 98.7% by mass (n=403 m=9,165.8g). Fragments are predominantly attributed to bison, the largest mammal and most frequently identified animal in the assemblage.

The excavations in Cultural Level 2a produced the remains of at least four mature and four juvenile bison. Six petrous temporals were found in total, two left and four right, giving an MNI of four for mature bison for this level. As excavations progressed through the years of field schools, the way in which cultural levels were delineated and identified shifted, hence the presence of levels 2a and 2b. As such, it is difficult to correlate these findings with those of Mampe (2015) as different level measurements were used in their work. That said, the depths used by Mampe (2015) for level 2 are a close match to the depths for level 2a and thus MNI counts from their thesis have been incorporated into this level. A total MNI for all years of excavation (less those evaluated by Stumborg (2016)) is based on the finding of 5 right side petrous temporals and 5 each right and left side fused second and third tarsals, thus the MNI_{total} of mature bison is five.

A minimum of four (4) immature individuals were recovered within level 2a. One is identified as a newborn given the presence of both a metacarpal and a humerus shaft that are consistent in size with that of a neonate. A calcaneus of an individual two to three weeks of age, as well as a larger humerus of an individual one to two months old was found. Finally, the phalanges of an individual around seven months of age were also recovered. The newborn, two to three week, and month old remains indicate a spring and early summer occupation. The more developed limb element indicates an older occupation likely a secondary occupation during late autumn or early winter. The juvenile remains bring the MNI_{total} to nine animals in this cultural level.

4.3.1.2 *Antilocapra americana*

An American pronghorn is represented in level 2a by four specimens including a right side fused central and fourth tarsal, an ulnar carpal, a distal metapodial end, and a distal metatarsal shaft segment. The absence of duplicating elements indicates at least one (MNI=1) individual is present.

4.3.2 Carnivora

4.3.2.1 *Canis sp.*

While not identifiable to species, several canid remains were found in level 2a that are consistent in size with the *Canis* genus. At least one individual is present as no duplicating elements were found in the 12 specimens identified (MNI=1). Both axial and appendicular skeletal elements are present as are a select few fragments from the dentition. The proximal ends of metatarsals and unidentified metapodial shafts were found (Figure 4.2), each element cut off at a similar point on the diaphysis. This breakage pattern is further discussed in the taphonomy section at the end of this chapter.

Figure 4.2: Canid Metapodial Ends (Cat. #: 1067, 1069, 1076, 1152, 1153, 1204, 1761)

4.3.3 Lagomorpha

4.3.3.1 *Lepus sp.*

Lagomorphs are represented by the presence of a single right-side glenoid fossa of the scapula. No other remains can confidently be assigned to this order (MNI=1).

4.3.4 Rodentia

4.3.4.1 *Castor canadensis*

At least one American beaver is represented by two specimens including one humerus and one mandibular condyle (MNI=1).

4.3.4.2 *Spermophilus richardsonii*

Two elements belonging to a Richardson's ground squirrel were found represented by one mandible and one femur for an MNI of one. As the teeth were still present in the mandible it could be given a species designation.

4.3.4.3 *Unidentified rodents*

A total of five rodent bones were recovered identified that could not be given a species designation. The remains represent at least one animal as no duplicating elements are present. The remains are the size of a small rodent, such as a pocket gopher or vole, which are common to the area.

4.3.5 Fresh Water Clam

4.3.5.1 *Unionidae*

Three pieces of freshwater clam shell were found (MNI=2). None have the hinge parts attached thus identification to the species level is not possible. However, they most likely belong to a species native to the area found in the creek and river nearby such as the Brook Lasmigona (*Lasmigona compressa*) mussel (Clarke 1981).

4.3.6 Feature

Cultural Level 2a contains a bone pit feature. It extends through level 2b and into level 3 and was found in four adjoining units. Relevant to this work, the pit feature is found in two separate units, 26S17E and 26S18E. It was an expected find in these units as it had been uncovered during the first year of excavation at the site in the adjacent units 25S17E and 25S18E. This bone pit feature contains an extremely fragmented collection of bison bones with very few identifiable pieces. Identified pieces from the site include molar fragments (n=4), a humerus shaft segment, a rib segment, and the spinous process of a thoracic vertebrae. A total mass of 1,531.7g unidentifiable fragments were recovered, and 269.9g of identified bones came from the bone pit. The bones show a high degree of processing which is typical of pits found in habitation areas. Bones contained in this pit feature are primarily unburned, however, there are small quantities of both burned and calcined bones within the comminuted bone collection. It is viewed as a midden where bones were deposited as a means of discarding them. Mampe (2015) concluded that this midden feature indicates an extended stay at the site.

4.4 Cultural Level 2b

Cultural Level 2b (C2b) comprises the remains found in some areas of the site, typically from 27 to 33 cm below surface. As always, due to the large surface area of the site and gradual sloping nature of the area the depths range significantly. The level 2 of previous works was divided into two sub levels for this work for a few reasons. Within level 2, both Prairie Side Notch and Pelican Lake projectile points have been found. As well, the large quantity of artifacts found within the level indicated the presence of intense and extensive occupation. These artifacts come from various depths amidst the previously discussed gravel lens. Level 2 as one cultural occupation was large and inconsistent. The depth to which it expands can be seen as two separate cultural levels, the older and therefore lower of which is intermittent in nature due to fluvial activity. This distinction became increasingly apparent in the northern extent of the site halfway through excavations at Wolf Willow. Thus, earlier analyses and years do not separate Cultural level 2 into a and b. Separation into sublevels begins in years 2016 and 2017 but differs throughout the areas of the site. Cultural Level 2b is sparse and immediately below Cultural Level 2a rendering complete distinction between the two levels difficult. The presence of Pelican Lake points gives Level 2b that a cultural affiliation and while no radiocarbon date has been taken since the delineation of the sublevel 2b, the sample Beta #414919 date of 2620 uncalibrated radiocarbon years BP is consistent with a Pelican Lake cultural affiliation.

Table 4.5: Cultural Level 2b Faunal Counts

Faunal Type	Number of Elements	Mass (g)	Number of Specimens	Mass (g)	Mass of Unidentified (g)
Unburned Bone	87	2086.1	365	6650.8	6559.7
Thermally Altered Bone	0	0	2	46.2	95.9
Unburned Enamel	23	488.2	9	98.1	135.1
Thermally Altered Enamel	0	0	0	0	13.7
Shell	1	7.5	0	0	4.2
Totals	111	2581.8g	376	6795.1g	6808.6g

A total of 111 identified elements with a total mass of 2,581.8 grams were recovered in this level. Elements represent a wide variety of animals found in the Opimihaw Creek Valley. A total of 376 specimens were determined, with a mass of 6,795.1 grams. Many were identifiable but some are incomplete and often not sided. Unidentified fragments are fewer when compared to other levels at only 6,808.6 grams and are 42.5% of the total assemblage by mass. Unburned remains account for 99.04% of the total mass although very little evidence of burning activities has been found in this level. Burned remains are 0.92% of the total mass with calcined accounting for only 0.04% of the total.

Table 4.6: Cultural Level 2b Faunal Remains by Taxa

Common Name	Taxon	NISP	MNI
Mammals			
Pronghorn	*Antilocapra americana*	1	1
Bison	*Bison bison*	268	4
Canids	*Canis* sp.	18	1
Beaver	*Castor canadensis*	1	1
Northern Pocket Gopher	*Thomomys talpoides*	1	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	1	2
Rodent	Unidentified Rodents	1	1
Avians			
Bird	Aves	1	1
Invertebrates			
Cephalopod	Cephalopoda	1	1
Freshwater clam	Unionidae	1	1
Fish			
Shark	Chondichthyes	1	1
Miscellaneous			
Bison to Moose Size	Very Large Mammal	164	n/a
Rabbit Size	Small Mammal	3	n/a
Grand Total		**462**	**15**

4.4.1 Artiodactyla

4.4.1.1 *Bison bison*

Bison represent 97.98% by mass (n=432, m=8350.7g) of identified specimens and elements in level C2b. The majority of unidentified fragments are categorized as bison as they

are the only identified large mammal in this level. A minimum of four mature and two immature bison are present. Based on the finding of four right side lateral malleoli and four each left side fused central and fourth and fused second and third tarsals, the mature bison MNI_{total} is four.

At least two immature bison can be identified in the level 2b assemblage with the presence of three humeri shafts indicating at least two individuals. One shaft was given an approximate age of 8 months fetal gestation. Only one out of three of the humeral shafts could be sided. The age of 8 months fetal gestation indicates an occupation in very late winter and into early spring, however, the lack of identifiable newborn remains shows occupation may have ended prior to bison births in the area. The two juveniles bring the MNI_{total} to six for this occupation level.

4.4.1.2 *Antilocapra americana*

The pronghorn is represented by one distal metapodial segment recovered (MNI=1).

4.4.2 Carnivora

4.4.2.1 *Canis sp.*

One canid is represented in the assemblage with an NISP of 27 and an MNI of 1. Similar to level 2a, multiple proximal ends of metapodials were discovered with some evidence for utilization and manufacture of beads. This level also included a canid mandible, wolf sized, that was reconstructed from fragments found together (Figure 4.3). While nearly complete it could still not be used to identify the species or whether or not it is that of a domesticated canid.

4.4.3 Rodentia

4.4.3.1 *Castor canadensis*

Beaver remains found in this level consist of a molar and a thoracic vertebra representing at least one individual (MNI=1).

4.4.3.2 *Spermophilus richardsonii*

Richardson’s ground squirrel remains were identified by upper and lower dentition and a femur with an NISP of 7 representing at least 2 individuals (MNI=2) given the presence of multiple maxillae. As previously stated, these rodents are known to be intrusive to the site and that is likely the explanation for their presence in the assemblage.

Figure 4.3: Reconstructed Canid Mandible (Cat. # 11, 12, 13, 14)

4.4.3.3 *Thomomys talpoides*

A northern pocket gopher is represented by a fragment from its cranium (MNI=1).

4.4.3.4 *Unidentified rodents*

One mandible whose teeth were not present was identified as belonging to an unknown rodent but is consistent in size with that of the ground squirrels or pocket gophers present (MNI=1).

4.4.4 Fresh Water Clam

4.4.4.1 *Unionidae*

A single piece of freshwater clam shell was found. The absence of the hinge component renders species identification impossible.

4.4.5 Chondrichthyes

4.4.5.1 *Shark*

One fossilized shark tooth was found, the shark species to which it belongs was not able to be determined. Fossil remains are known to erode from the Opimihaw Creek Valley walls. It

must be made clear that sharks were not present at the time in which Wolf Willow was occupied, rather their fossils can be found eroding from the banks of rivers and lakes around the post-glacial landscapes of Saskatchewan and Alberta. Fossils such as this are intrusive to archaeology sites.

4.4.6 Cephalopod

4.4.6.1 *Cephalopoda sp.*

A fossil cephalopod was recovered. The fossil is that of an aquatic animal known to exist in the Cretaceous Sea that covered the Saskatoon area 66 million years ago (Yacobucci 2017).

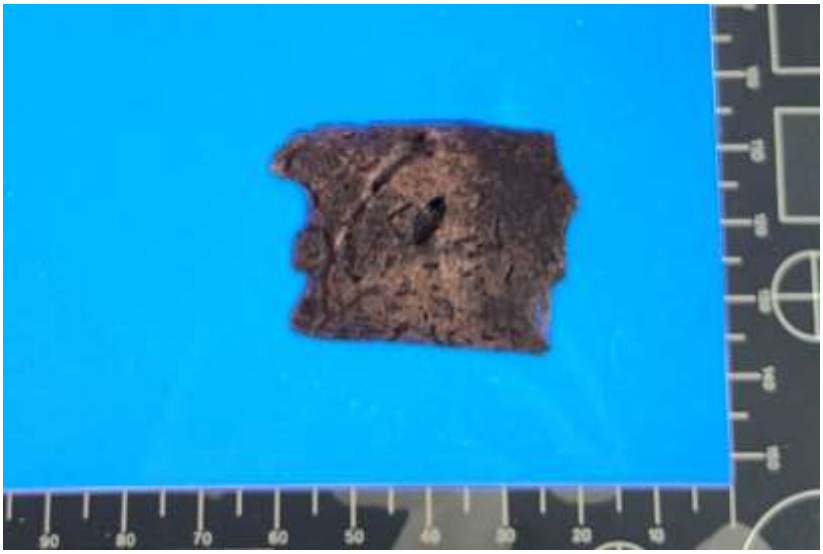

Figure 4.4: Cephalopod Fossil (Cat. # 2386)

4.5 Cultural Level 3

Cultural Level Three encompasses artifacts recovered between 33 and 45 centimeters depth below surface throughout the Wolf Willow site. The cultural affiliation for this level is known to be McKean series based on the finding of several projectile points. An uncalibrated radiocarbon date of 3300 BP was obtained for this level (Beta-414921) which is consistent with a McKean occupation at this depth. A total of 154 identifiable elements in the level weigh a total of 5,843 grams. A number of identifiable but incomplete specimens were recovered as well, 461 specimens weighing 12,853 grams, a relatively high amount with respect to other levels. A total mass of 12,345.25 grams of unidentifiable fragments were in various sizes of breakage and account for 39.8% of the total faunal mass. By weight, 99.48% of the remains are unburned with only 0.52% thermally altered. This is a very low proportion of the total mass being heat treated.

Table 4.7: Cultural Level 3 Faunal Counts

Faunal Type	Number of Elements	Mass (g)	Number of Specimens	Mass (g)	Mass of Unidentified (g)
Unburned Bone	135	5375.5	441	12506.9	12187.85
Thermally Altered Bone	0	0	2	95	53.0
Unburned Enamel	18	465.1	18	251.1	98.5
Thermally Altered Enamel	1	2.8	0	0	0
Shell	0	0	0	0	5.9
Total	154	5843.4g	461	12853g	12345.25g

Table 4.8: Cultural Level 3 Faunal Remains by Taxa

Common Name	Taxon	NISP	MNI
Mammals			
Pronghorn	*Antilocapra americana*	1	1
Bison	*Bison bison*	378	8
Canids	*Canis* sp.	21	1
Badger	*Tazidea tazus*	1	1
Muskrat	*Ondatra zibethicus*	1	1
White-tailed Jackrabbit	*Lepus townsendii*	1	1
Beaver	*Castor canadensis*	1	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	1	1
Microtine Rodent	*Microtinae* sp.	2	2
Rodent	Unidentified Rodents	5	1
Avians			
Duck	*Anas* sp.	1	1
Invertebrates			
Freshwater clam	*Unionidae*	1	1
Miscellaneous			
Bison to Moose Size	Very Large Mammal	136	n/a
Rabbit Size	Small Mammal	3	n/a
Grand Total		**553**	**20**

4.5.1 Artiodactyla

4.5.1.1 *Bison bison*

A total of 99.19% by mass (n=360, m=18,696.4g) of the identifiable pieces from Cultural level 3 belong to bison. It is also concluded that a majority of the unidentified fragments belong to bison as well as they come from large mammals and bison continue to be the only large

mammal present. At least eight (8) mature and two juvenile bison are present. Mature bison (MNI=8) determined on the presence of nine lateral malleoli, eight of which are left, were recovered within the level. This is the highest MNI by level at the site. When combined with the work of Mampe (2015), who identified an MNI of 10 given right side tali and the two left side lateral malleoli from their work, an MNI_{total} of 10, is accepted for this level. This level also produced a relatively intact cranium, primarily in unit 4S16E, during the 2018 excavation found. The cranium was reconstructed as a part of this work and will be discussed further in Chapter 5.

There are a total of 17 juvenile bone or dental pieces identified in the level, two of which can be assigned an age and thus representing at least two immature individuals (MNI=2). One is known by the presence of a right first rib consistent in size with that of an individual approximately one month old. The other is represented by a distal tibia consistent in size with that of one who is between eight and nine months of age. The differences in the likely ages of the juvenile remains indicates two separate periods of occupation within the site during this time period, one in the springtime given the month-old rib, and another winter occupation. This brings the MNI_{total} to 12.

4.5.1.2 *Antilocapra americana*

One single pronghorn bone was found in level 3, a lumbar vertebra which indicates at least one pronghorn in the site (MNI=1).

4.5.2 Carnivora

4.5.2.1 *Canis sp.*

At least one canid is present in level 3. Primarily cranial, including dental, remains were recovered, however, some axial and appendicular skeletal elements are present in small numbers. The absence of duplicating elements indicates an MNI of one.

4.5.2.2 *Taxidea taxus*

One left side mandibular condyle belonging to that of the American Badger was found in level 3. Identified as such using the comparative specimens available, the morphology and size most closely match that of the badger (MNI=1).

4.5.3 Lagomorpha

4.5.3.1 *Lepus townsendii*

The white-tailed jackrabbit in level three is represented by a portion of one left humerus. The speciment is consistent in size and shape with that of a jackrabbit given the comparative collection used (MNI=1).

4.5.4 Rodentia

4.5.4.1 *Castor canadensis*

A single beaver is present in the assemblage, represented by a right-side humerus (MNI=1).

4.5.4.2 *Ondatra zibithecus*

A single incisor consistent in size and shape with that of a muskrat was found in level three and identified using the comparative collection (MNI=1).

4.5.4.3 *Spermophilus richardsonii*

One left os coxae represents the Richardson's Ground squirrel in this level (MNI=1).

4.5.4.4 *Rodentia sp.*

Several small fragments of rodent remains, unidentifiable to a species level, are recovered in this level. A total of six pieces representing at least one individual are present (MNI=1). They are all consistent in size with either a ground squirrel or a pocket gopher.

4.5.5 Fresh Water Clam

4.5.5.1 *Unionidae*

Two fragments of a local freshwater clam were found in level three for an MNI of one.

4.5.6 Birds

4.5.6.1 *Anas sp.*

One right ulna identified as belonging to a duck species was found in this level (MNI=1). Ducks are present throughout the spring and summer months in the region but migrate south of the Opimihaw Creek Valley during the winter months (Smith et al. 2019).

4.6 Cultural Level 4

Artifacts found between the depths of 45 and 65 centimeters below surface are assigned to Cultural Level Four. This level has previously been assigned an Oxbow cultural affiliation, giving it an age of 4,000 to 4,400 years ago. An uncalibrated radiocarbon date of 4620 BP (Beta-414922) was obtained for this cultural level (Mampe 2015). Excavation units examined in this thesis produced a total of 150 identifiable elements with a total mass of 8,688 grams. Identifiable but incomplete specimens totaled 423 with a mass of 16,847.6 grams. Only a measure of mass is taken for unidentifiable fragments totaling 6,595 grams and 20.5% of the total mass. Unburned remains account for 99.47% of the total discovered with 0.53% being thermally altered.

Table 4.9: Cultural Level 4 Faunal Counts

Faunal Type	Number of Elements	Mass (g)	Number of Specimens	Mass (g)	Mass of Unidentified (g)
Unburned Bone	135	8070.8	404	16387.8	6483.7
Thermally Altered Bone	0	0	3	143.6	24.8
Unburned Enamel	15	617.2	16	316.2	81.3
Thermally Altered Enamel	0	0	0	0	0
Shell	0	0	0	0	5.2
Total	150	8688g	423	16847.6g	6595g

4.6.1 Artiodactyla

4.6.1.1 *Bison bison*

Consistent with the rest of the levels previously examined, the majority of the remains found are identified as belonging to bison. Of the identifiable specimens, 99.43% by mass (n=318, m=16,615.27g) are identified as that of the bison. As with other levels, the vast majority of fragments are attributed to bison based on size and shape and the absence of any other large animals identified in assemblage.

At least five (5) mature individuals are present in this level on the presence of five left sided fused central and fourth tarsals and five right sided calcanei. Mampe (2015) identified four mature and one juvenile in the assemblage, based on four right and two side fused central and

fourth tarsals to determine the MNI. When combined with this research, an MNI_{total} of eight (8) is ascertained.

Table 4.10: Cultural Level 4 Faunal Remains by Taxa

Common Name	Taxon	NISP	MNI
Mammals			
Bison	*Bison bison*	348	5
Canids	*Canis* sp.	18	1
White-tailed Jackrabbit	*Lepus townsendii*	1	1
Beaver	*Castor canadensis*	1	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	1	1
Microtine Rodent	*Microtinae* sp.	3	2
Rodent	Unidentified Rodents	4	1
Avians			
Bird	*Aves*	1	1
Invertebrates			
Freshwater clam	*Unionidae*	2	1
Miscellaneous			
Bison to Moose Size	Very Large Mammal	112	n/a
Deer Size	Medium Mammal	1	n/a
Rabbit Size	Small Mammal	2	n/a
Grand Total		**494**	**17**

Immature remains indicate at least one fetus and one neonate. Fetal remains, approximately seven months of age, consist of a humerus shaft consistent in size with that of a seven-month-old fetus and fetal unerupted incisors. The radius of a newborn-to-week-old individual is present as well. The presence of these two ages together indicates a likely spring occupation. Given that bison have a 2-3 month timeframe during which they calve, the presence of late gestation fetal remains and those of a neonate are consistent.

4.6.2 Carnivora

4.6.2.1 *Canis* sp.

A single individual (MNI=1) is represented by 17 identifiable specimens from the genus *Canis*. No species could confidently be ascertained given the remains present. Remains include cranial and dental elements, as well as some limb elements.

4.6.3 Lagomorpha

4.6.3.1 *Lepus townsendii.*

A white-tailed jackrabbit is represented by a single right glenoid fossa of a scapula in this level (MNI=1).

4.6.4 Rodentia

4.6.4.1 Microtinae *sp.*

Three mandibles, one left and two right, were identified as belonging to the microtine subfamily of rodents. Microtinae include animals such as voles and muskrats, both of which are known to occur in the area. The size indicates that the mandibles represent at least two (MNI=2) vole sized rodents.

4.6.4.2 *Unidentified rodents*

Most rodent remains found in level four could not be assigned to a species. All four elements identified, a right femur, an incisor, a right mandible, and a vertebral fragment are all consistent in size with those of a smaller rodent such as a Northern Pocket Gopher or a ground squirrel. The MNI is one.

4.6.5 Fresh Water Clam

4.6.5.1 *Unionidae*

Four shell pieces were found in this level; however, hinge parts were not present therefore species could not be determined. The MNI for clams is two.

4.6.6 Birds

4.6.6.1 *Aves sp.*

A single bone fragment consistent in morphology and weight with that of a bird was recovered. No species could be ascertained (MNI=1).

4.6.7 Feature

A bone pit feature was noted in Cultural Level 4 on the final day of excavation for the 2016 field school. This bone pit laid beneath a rock filled pit feature in unit 26S11E and extended to a maximum depth of 68cm below surface. Excavation of the pit feature finished later that same year. One rib was found in an upright position and was surrounded by fire cracked rock. Bone within this pit was all large pieces, not small fragments discarded, including humerus

shaft segments, the glenoid fossa of a right scapula, a proximal right ulna segment, as well as pieces of a left femur and left ilium (Figure 4.5). The majority of the pieces of bone in the pit feature were identifiable. When compared to a midden feature such as the one discussed in Cultural Level 2a, the bones are unusually intact and in large pieces, not the small fragments typical of food processing discarded debris. Given this, the pit feature is interpreted as intentionally placed bones in this arrangement and not haphazard or simply discarded. The vertical placement of the rib is likely explicit, possibly as a marker for this pit however this is uncertain.

Figure 4.5: Bones from the Bone Pit Feature in Unit 26S11E (Cat. # 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159)

4.7 Cultural Level 5

Cultural Level 5 presents the smallest assemblage within the site. Found below 65cm in depth through to the base of excavations, which range from 80cm to 1.0m in depth, it includes a collection consisting largely of whole elements and is the oldest level within the site. Previous

works (Mampe 2015; Stumborg 2016) note the presence of faunal remains, but due to a lack of cultural remains do not include level 5 as a cultural level. No definitive cultural remains were recovered until the later years of excavation. A tentative date of approximately 6,000 years before present can be assigned based on the presence of two Gowen points from the Mummy Cave complex. An uncalibrated radiocarbon date of 4960 BP was obtained as a part of previous works at the site has been obtained from a sample at this depth. This date is consistent with the Mummy Cave cultural artifacts found. Cultural Level 5 occurs predominantly in the northern extent of the excavation.

Level 5 produced a total of 80 identifiable elements with a mass of 7,511.8 grams. Identifiable specimens numbered 232 and a mass of 11,126.9 grams, and unidentified fragments weighed 2,397.7 grams for 13.5% of the total faunal assemblage by mass. This low degree of fragmentation and processing is consistent with the earlier uncertainty about the cultural affiliation of the level or whether it was simply a bone bed underlying Cultural Level 4. However, the faunal remains associated with the cultural materials clearly indicate a cultural occupation. Unburned bone accounts for 99.98% of the assemblage, with only 0.018% thermally altered.

Table 4.11: Cultural Level 5 Faunal Counts

Faunal Type	Number of Elements	Mass (g)	Number of Specimens	Mass (g)	Mass of Unidentified (g)
Unburned Bone	73	6931.6	226	11065.7	2878.9
Thermally Altered Bone	0	0	0	0	3.9
Unburned Enamel	7	580.2	6	61.2	14.9
Thermally Altered Enamel	0	0	0	0	0
Shell	0	0	0	0	0
Total	80	7511.8g	232	11126.9g	2897.7g

4.7.1 Artiodactyla

4.7.1.1 *Bison bison*

Bison are the most commonly found animal in the faunal assemblage from Cultural Level 5, the identifiable components in the assemblage by mass are 99.16% bison remains (n=156,

m=10,866.4g). At least three mature individuals are present (MNI=3), based on the presence of three right fused second and third carpals, as well as three right astragali and calcanei. An array of immature remains are found representing at least one individual. A thoracic vertebra spinous process is aged to a neonate, newborn-to-one-week of age, in the collection. Additionally, several teeth and cranial fragments were found belonging to an immature individual for which an age could not be determined. Mampe (2015) did not assume a cultural presence, but found two right calcanei, which brings the total MNI to five (MNI_{total} =6).

Table 4.12: Cultural Level 5 Faunal Remains by Taxa

Common Name	Taxon	NISP	MNI
Mammals			
Pronghorn	*Antilocapra americana*	1	5
Bison	*Bison bison*	181	3
Canids	*Canis* sp.	9	1
Northern Pocket Gopher	*Thomomys talpoides*	1	1
Cricetid Rodent	*Cricetid* sp.	1	1
Rodent	Unidentified Rodents	4	1
Invertebrates			
Freshwater clam	*Unionidae*	2	1
Miscellaneous			
Bison to Moose Size	Very Large Mammal	69	n/a
Deer Size	Medium Mammal	1	n/a
Rabbit Size	Small Mammal	2	n/a
Grand Total		**271**	**13**

4.7.1.2 *Antilocapra americana*

An NISP of two is present for pronghorn in level five. One individual is represented by a calcaneus and a long bone shaft fragment (MNI=1).

4.7.2 Carnivora

4.7.2.1 *Canis sp.*

At least two canids of unknown species classification are present. A total of nine identifiable elements includes both two right side mandibular condyles and two right side calcanei which indicates an MNI of 2.

4.7.3 Rodentia

4.7.3.1 *Cridetinae*

The rodent family cricetinae is identified based on the presence of one mandible with teeth (MNI=1). Cricetids include voles and muskrats.

4.7.3.2 *Thomomys talpoides*

One left side mandible belongs to the Northern Pocket Gophers taxon based on dentition (MNI=1).

4.7.3.3 *Unidentified rodents*

A total of four rodent remains were found in level five, consistent in size with Northern Pocket gophers. The remains are all different bones thus the MNI is one.

4.7.4 Fresh Water Clam

4.7.4.1 *Unionidae*

Two pieces of clam shell, likely native to the bodies of water in the vicinity of the site, were found. No hinge components present render more precise taxonomic classification impossible (MNI=1).

4.8 Taphonomy

Taphonomy, when discussed in archaeology, encompasses all processes affecting biological remains as they enter the archaeological record, transitioning from the biosphere to the lithosphere up to the point at which they are recovered (Lyman 2010). The study of taphonomy can be used to understand site formation processes, geologic and biologic activities, as well as cultural processes and the impacts these all have on the archaeological record (Lyman 2012). Understanding these processes aids in site interpretation as well as understanding the preservation bias within a specific study area. Taphonomic changes observed are discussed at a site wide level to understand the complete array impacting the faunal remains from the Wolf Willow site.

The study of taphonomy can be separated into cultural and ecological pathways, such that the marks either originate from human caused activities or from natural environmental processes. The agent markings left signatures on the bones are examined to indicate all processes impacting the faunal assemblage. The absence of complete skeletons, as is the case at Wolf Willow, is in

itself a taphonomic process. The overall completeness of the assemblage is taken into consideration as well. Together, the natural and cultural changes present on the bone are indicative of various taphonomic pathways.

4.8.1 Natural Taphonomic Processes

The natural taphonomic processes include all those that impact the bone that are not human activity induced. Markings from rodent and carnivore chewing and gnawing, fluvial and aeolian abrasion, root growth, and pathological lesions all fall into this category. It is important that these markings be identified, examined, and discussed to differentiate them from the markings that relate to human activity, preventing confusion and misrepresentation of the site activities.

Root etching is the most commonly observed natural taphonomic process and observed on almost all of the faunal remains in the site. Roots of plants growing within the site area, since the deposition of the bones, leave characteristic marks on the cortical surfaces of the bones as they grow against them (Behrensmeyer 1978). Chemicals released by the roots during their growth and decay leave winding, twisting, and complex impressions on the bone surfaces and occasionally cause the bone to crack or break. These root etchings are not particularly useful in this site interpretation as the paleoenvironment and plants within the site are not the focus of study. Figure 4.6 shows an example of this root etching on an ulna shaft fragment.

Signs of both carnivore and rodent chewing are present on bones found in Wolf Willow. Figure 4.6 and 4.7 show gnawing and chewing on the surface from a carnivore. These indicate animal predation of bones left within the living area and may be a result of domestic canids or other wild carnivores. At least 8 bones exhibited signs of chewing predation. Rodent chewing was observed, but only once in the assemblage and was not clear enough to be photographed.

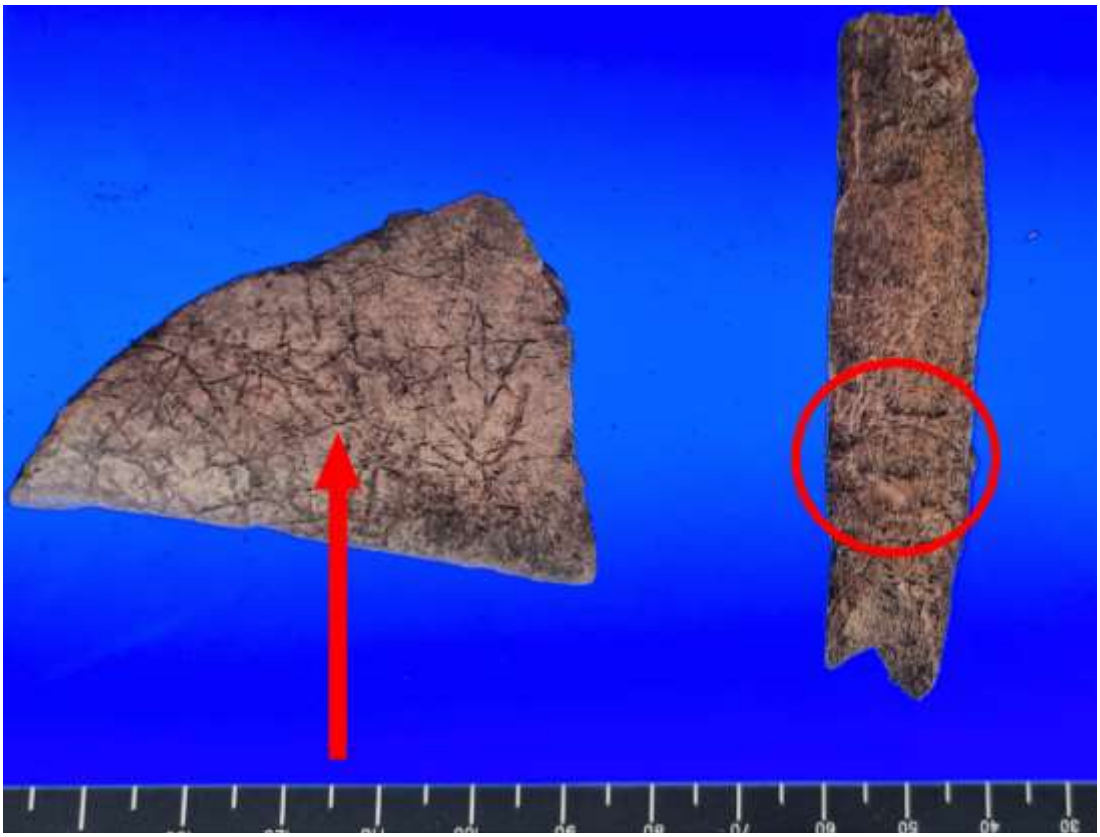

Figure 4.6: Root Etching on Ulna Shaft (Indicated by Red Arrow) and Carnivore Chewing Marks on Bone Frag (Indicated by Red Circle) (Cat. # 901, 1171)

Figure 4.7: Chewed Bone (Cat. # 893)

Weathering on bone occurs with exposure to air, sunlight, and wind on the earth's surface when remains are not interred rapidly after deposition (Fisher 1995). Within the Wolf Willow site very little evidence of weathering was present on any bones. No faunal remains exhibited weathering evidence in any way that was remarkable or worthy of photography. From this, a rapid burial process can be inferred as the bones do not display these weathering marks and thus did not spend a significant amount of time on the surface, exposed, before burial.

Other non-human-induced changes observed are pathological conditions that present on the bone. While not a factor of post-depositional environments, these pathological lesions are examined when determining population health and also to prevent misidentification and misrepresentation of the markings. Pathological changes occur in life and are the result of disease directly impacting the bone. The disease process must occur over a significant period of time for it to change the bone and represents long term illnesses and conditions in the living animal (Buikstra 2010).

Figure 4.8: Pathological Canid Bones. Anomalies Indicated by Red Arrows (Cat. # 139, 1250)

Pathological anomalies are present on few (n=3) bones in the assemblage. Figure 4.8 exhibits osteophytic lesions on two canid bones including a third metatarsal and a small calcaneus. These are the only canid bones observed to have these lesions in this collection. Very few bison bones were observed to have pathological lesions. However, there is an excellent example of both inflammatory and degenerative disease processes present on a distal bison humerus. Figures 4.9 to 4.11 demonstrate these lesions. They present as the result of long-term destruction of the joint due to an initial infectious process and the subsequent degenerative changes. On the distal end (Figure 4.9) significant eburnation can be observed on the trochlea, where grooves formed as a result of bone-on-bone contact and wear. The medial aspect of the bone displays changes consistent with infectious disease process (Figures 4.10 and 4.11) which would have occurred over a significant period of time to alter the bone surface to the degree observed. This infection can also be seen on the anterior or cranial aspect of the humerus, on the medial side.

Figure 4.9: Distal End of Humerus, Distal View. Lesions indicated by Red Circle (Cat. # 3087)

Figure 4.10: Distal End of Pathological Humerus, Cranial View. Eburnation Indicated by Red Circle. (Cat. # 3087)

Figure 4.11: Distal End of Pathological Humerus, Medial View. Lesions Indicated by Red Circle (Cat. # 3087)

4.8.2 Cultural Taphonomic Processes

Cultural taphonomic processes include all marks on the bone inflicted by human activity. The Wolf Willow site assemblage presents with eight different types of cultural marks on the bones, primarily those associated with butchering activity, tool manufacture, and the manufacture of personal adornment items. These marks explain a range of human activities and are very important in interpreting human uses and the type of site being excavated.

4.8.2.1 *Butchering*

The butchering processes executed at Wolf Willow left a variety of marks on the bones. As a campsite, these marks are the result of secondary or tertiary processing of the animal after the hunt, including activities such as marrow extraction and food preparation. Both cut marks and impact fractures are observed on many bones as well as spiral fractures. Cut marks are observed on 19 different specimens, impact fractures on 32 specimens, and spiral fractures on 11 specimens. Bone flakes and flake scars appear 22 times in the assemblageObserving these processing marks alongside the highly fragmented faunal assemblage aid in the interpretation of the site clarifying that processing for consumption was likely the primary activity. Cut marks are clearly observed on the bones in Figure 4.12.

Figure 4.12: Cut Marks on Bone Indicated by Red Circles (Cat. # 2590, 1024)

Impact fractures are the most commonly observed butchering marks and are present on numerous specimens. These impact fractures are indicative of extensive processing and manipulation of the faunal remains. The bone in Figure 4.13 is an example of an impact facture where the force that radiated from the point of impact was captured in the bone. Step and spiral fractures are also frequently observed. Together, these marks are indicative of bones being broken open for marrow extraction in the final stage of butchering.

Figure 4.13: Impact Fracture on Bone Indicated by Red Arrow (Cat. # 1938)

4.8.2.2 *Tool Manufacture*

There are a few examples of tool manufacture observed in the faunal assemblage. Figure 4.14 showcases a long bone that was flaked to turn it into a tool. Bone flakes that would correspond with a tool of this kind being made were also found within the site (Figure 4.15). A

large portion of a mandible is observed to have been made into a flint knapping tool (Figure 4.16) as it exhibits wear on the distal end which has been worked to a point.

Figure 4.14: Long Bone with Flake Scars (Cat. # 1938)

Figure 4.15: Bone Flakes (Cat. # 1294, 1295)

Figure 4.16: Mandible Tool. Wear Indicated by Red Circle (Cat. # 1858)

4.8.2.3 *Items of Personal Adornment*

Another example of cut marks are striations and grooves incised on canid metapodials. These marks are the result of bone bead manufacture where the shaft of a metapodial would be cut into small sections creating beads with a naturally hollow centre. One such metapodial shaft, exhibited a series of cuts running the length of the shaft spaces approximately 5 to 6 millimetres apart. Figure 4.17 shows these regularly spaced grooves which occur on all sides of the shaft however, one side has nine, another six, and the other only five that are visible. This is the step prior to the bone beads being formed with the beads created as the bone shaft is snapped along these grooves (Vickers 1989).

Figure 4.18: Canid Metapodial Ends from Bead Manufacture (Cat. # 1204, 1153, 1152, 1067, 1076, 1069, 1761)

Figure 4.17: Canid Metapodial Shaft with Cut Marks for Bead Manufacture (Cat. # 2306)

Figure 4.18 displays all of the canid metapodial ends which are the resulting waste of the same bone bead manufacturing process. Figure 4.19 is a clear example of bone bead manufacture as it is a preserved break away spur wherein the groove on the proximal end of the metapodial shaft remains intact. All of these metapodial ends and the evidence of bone bead manufacture come predominantly from depths associated with cultural levels 2a and occasionally 2b. Vickers (1989) observed a similar phenomenon at the Ross site in Alberta which comes from a similar time period approximately 1500 BP possibly indicating a cultural practice for this time period.

Figure 4.19: Canid Bone Bead Breakaway Spur (Cat. # 1204)

The polished bone fragment (Figure 4.20) displays cortical polish resulting in a shiny appearance. The piece is the broken from an undetermined skeletal element. It exhibits intentional polish rather than from a natural and environment origin such as fluvial or aeolian erosional activity. Given its size, shape, and the degree of polish this bone piece is interpreted as a pendant piece. In the 2014 excavations an elk (*Cervus canadensis*) tooth was found and identified as an amulet Stumborg (2016).

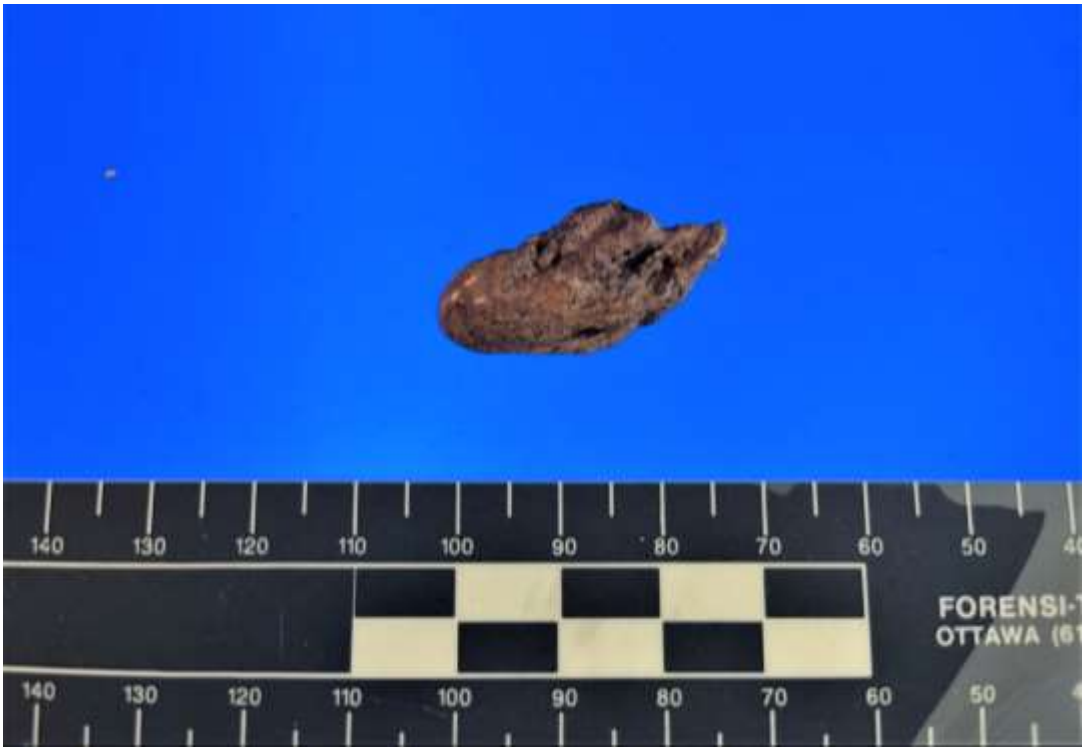

Figure 4.20: Polished Bone Fragment (Cat. # 2391)

A freshwater clamshell piece carved into a circle and exhibiting clear, intentional abrasion creating a shiny, pearly lustre and is identified as a gaming piece (Figure 4.21). It is smooth in comparison to other shells found within the site and has a sheen on its outer surface. The edges are abraded and intentionally polished around the circumference which is indicative of its use as a gaming piece. This shell gaming piece comes from the uppermost level of the site (Cultural Level 1) found at 7 cm DBS. This is the second instance in which gaming pieces have been found within the Opimihaw Creek Valley. Two polished and abraded clay disks from the first occupation level Late Precontact Period) at the Thundercloud site (FbNp-25) are described by Mack (2000) as being 7mm thick, and with diameters of 10mm and 18mm. The pieces are flat, nearly perfectly circular, and are small but very precisely made with no decoration (Mack 2000:89-90).

Figure 4.21: Polished Shell Gaming Piece (Cat. # 2033)

4.9 Site Interpretation and Overview

The faunal assemblage within all levels at the Wolf Willow site indicates a habitation area. Throughout the site the faunal remains are highly fragmented often with a greater mass of unidentified fragments than identified elements and specimens. Twenty-two different animal species are present in the faunal assemblage. Cultural Levels 4 and 5 are the exception to this with many larger and intact bones recovered which outweigh the fragmentary remains. This is likely the result of differential preservation; the smaller fragments are more susceptible to alteration and have likely decayed since their deposition several thousand years ago, the larger bones and pieces were durable enough to last. However, this could also reflect differences in how faunal remains were processed. Fragmentary remains, to the degree seen at Wolf Willow, indicate food processing in its final stages. Activities such as cooking and pemmican production cause high degrees of bone fragmentation. This is consistent with the conclusions drawn by Mampe (2015) and Stumborg (2016) who also indicate that the site was a habitation area for thousands of years.

Juvenile bison remains were found in each cultural level, however very few per each occupation. These remains were both long bones (Figure 4.22), dentition (Figure 4.23), and phalanges (Figure 4.24). Juvenile remains can be used in the determination of site seasonality, however, the minimal amount present at Wolf Willow makes this difficult. Throughout the whole site, very few deciduous dentitions were found, and most were loose teeth rendering age estimates highly inconclusive and difficult. The long bones shown below are those of fetuses, 7 to 9 months gestation and baby bison up to 3 months of age. The remains were used and provide an estimate, but it is not definitive nor does this method have a substantial research base to it. As such, no estimations on seasonality were determined.

Figure 4.22: Juvenile Bison Long Bone Shafts (Cat. # 1147, 1093, 1392, 1921, 861, 2885, 1489)

Figure 4.23: Deciduous Bison Second Molars (Cat. # 472, 1943, 469)

Figure 4.24: Juvenile Bison Phalanges (Cat. # 1160, 1162, 2958, 1184, 2624)

Overall, the remains are largely those of the bison. By mass, each level's identifiable specimens and elements are nearly 100% bison, at least 97.9% as in Cultural Level 3 and up to 99.4% in Cultural Level 4. By count of identified specimens, all are over 90% bison. Table 4.13 summarizes the percentage of bison remains by count. As a result, a reasonable conclusion drawn is that the fragments that are not identified to an animal can largely be attributed to bison. No other large or very large mammals such as moose or elk have been identified in the assemblage. Pronghorn are the next largest animal, but are considerably smaller and only appear in reduced quantities in a few levels of the site. Bison are largely the animal used for food and processed to the greatest extent. Canids are the only other remains to show taphonomic marks.

Table 4.13: Percent Bison Remains by Count of Identifiable Specimens

Cultural Level	Percent Bison (%)	Percent Canid (%)	Percent Other Animals (%)
1	91	3	6
2a	96	2	2
2b	94	4	2
3	93	4	3
4	94	4	2
5	93	3	4

Taphonomic processes and unique artifacts found in Cultural level 1 include a shell gaming piece, made from a local freshwater clamshell, as well as an assortment of bone displaying evidence of butchering. Cut marks, spiral fractures, bone flakes, and many impact fractures indicate activities related to butchering and food processing. Chewed bones are also found within this level which indicates animal activity was present.

Cultural Level 2a has 12 instances of marks on bone associated with butchering activities. Cut marks are present on three bones and five instances of impact fractures are observed as well as two spiral fractures on long bone shaft fragments. Two bone flakes are present, likely associated with bone worked for tool formation. This evidence is all indicative of substantial processing and food preparation in the site area. These are all consistent with butchering and food processing during these points of occupation. Both levels 2a and 2b have polished bone, that in 2b is intentionally polished and decorative.

The Cultural Level 3 assemblage has eight bones with impact fractures and one with a hinge fracture. Additionally, bones that have been cut and bone flakes are present as are three bones that have been chewed. The largest number of identifiable bison remains come from this level corresponding to the high MNI of 10. This is consistent with butchering and food processing activities and possibly used as a secondary processing site for a portion of the time it was occupied due to the amount of identifiable remains and fragmentation. The bison cranium that was reconstructed is attributed to this level due to the culturally diagnostic artifacts found in association with it.

Fewer taphonomic signatures are observed in the lower cultural levels. Cultural Level 4 has four bones with processing marks including hinge and spiral fractures as well as cut and chewed bone, but only one of each is present. This level also includes a pathological humerus (Figure 4.10) indicating the hunting of infirm animals on at least one occasion. Cultural Level 5 contains both bone flakes and fractured bone clearly indicating human occupation. Generally, both levels 4 and 5 have much larger bones preserved and therefore have much greater masses of identified specimens and elements. This likely results from the age of the level and the smaller fragments decaying with time. The faunal remains from these levels are consistent with a habitation setting with food processing activities.

After bison, canids are the most commonly found animal by number of identifiable remains in every cultural level. The anatomical structures that are used to differentiate and identify domestication are not present on any remains. No butchering marks are present on the canid bones, however, cut marks that are related to bone bead manufacture are identified on several metapodials. These metapodial ends and the metapodial shaft are segmented and occur in both Cultural Level 2a and 2b (Figures 4.17 to 4.19).

The midden feature in Cultural Level 2a, 2b and into the upper depths of Cultural Level 3, is filled with bone, and indicates very intense use during a short period of time. The remainder of Cultural Level 2a's faunal assemblage includes the largest amounts of identified specimens and elements.

The feature in Cultural Level 4 is intentional and not likely a midden. It is an explicit internment of larger bones possibly indicating a place people intended to return to, the bone feature used to mark the area. The vertical rib within the rock pile is a marker for the collection of bones underneath. No further analysis of the feature was undertaken, but it is a notable feature in the level. This level also has instances of butchering activities, including one bone each displaying a definite cut mark, a hinge fracture, a spiral fracture, and a bone flake.

Also of note are two fossils, both are from Mesozoic era marine life, a shark tooth and a cephalopod fragment found in Cultural Level 2b. These are intrusive and may be the result of natural process incorporating them into the site record through erosion, or they may have been carried in and deposited by humans. Neither is modified by humans nor are they utilitarian in nature.

The radiocarbon date obtained for Cultural Level 5 of 4960 uncal. RCYBP (Beta #414922) is consistent with the projectile points found at this depth which indicate a date of approximately 5,000-6,000 years old. Faunal remains are dominantly large and nearly complete specimens with very low numbers of fragments observed. Some evidence for butchering in the form of a bone with an impact fracture and another with a spiral fracture, and three bone flakes are present in the site. This expands on the previous works which had no conclusive evidence for cultural occupation at this depth (Mampe 2015; Stumborg 2016).

Wolf Willow is a well lived in site and displays good preservation. Ultimately, the faunal assemblage indicates extensive occupation of the space, very consistently, and on many occasions over a long period of time. Highly processed remains give insight into food processing activities, and an extensive midden feature indicates a lot of use. From the faunal remains found, bison are identified as the most abundant animal in every cultural level in the site. This is consistent between both count faunal remains and by mass. The remains and the animals identified within the assemblage serve as a clear example that bison were the main animal used by people in the area.

Chapter 5: Bison and History

5.1 Introduction

Across the Great Plains bison are revered and recognized as an iconic animal. Many people form a direct association between the bison, the grasslands, and life on the Plains. As a keystone species for ecology and culture, they are an animal around which many lifeforms revolve. Keystone species are biological components to an ecosystem which the rest could not function without; they impact many aspects of their ecosystem change or disappearance of them would impact nearly every other (Paine 1995). Cultural significance can be observed in the ways that the bison is incorporated into so many aspects of life – ceremony, naming, iconography. Ecologically, their impacts are extensive and deeply integrated making them definitively a keystone species of the grasslands ecosystem. Through archaeological, cultural, and ecological evidence, the story of bison at Wanuskewin is well documented within the Opimihaw Creek Valley. Following their near extinction towards the end of the 19th century, this connectedness began to disappear, however, their return in 2019 saw this story come to life in real time and emboldened it for generations to come.

5.2 Archaeological Overview

Archaeological evidence shows the presence of bison and people as expert bison hunters within the Opimihaw Creek Valley beginning 6,000 years ago. Archaeology has a rich history within the valley and each excavation has confirmed that bison are the most dominant and commonly found animal. Of the 19 identified Precontact archaeology sites in the Opimihaw Creek Valley (Figure 2.1), nine have been excavated and all tell the same story. More than any other animal, bison are always the most represented in the faunal assemblages. The following section will review the prevalence of bison within archaeological sites in the Opimihaw Creek Valley.

5.2.1 Dog Child

The oldest site to date is the Dog Child site (FbNp-24), situated on the northernmost terrace in the valley. It is a habitation site with six distinct occupation levels. Following the work of Cyr (2006) and Pletz (2010), Dog Child was determined to be a campsite with an occupation beginning at 5890 ± years cal. BP (BGS #2892) (Pletz 2010). This site includes fragmentary

faunal remains indicative of consistent habitation from nearly 6,000 years ago through to approximately 200 years ago. Contact era artifacts are found in the uppermost level. The Dog Child faunal assemblage is highly fragmented. By level this ranges from 55% to 98% being unidentifiable. For each level of occupation, more than 50% of what could be identified to a species was identified as belonging to bison (Cyr 2006; Pletz 2010).

5.2.2 Thundercloud

The Thundercloud site (FbNp-25), located on the next terrace south of the Dog Child site, exhibits a similar story and was extensively excavated and researched (Mack 2000; Webster 1999). Thundercloud was determined to be both a processing and a habitation site and is deeply stratified with good preservation and 10 identified cultural occupation levels. The oldest occupation from Thundercloud is 4140±90 ca. years BP. The uppermost and more recently occupied levels represent Historic and Late Precontact period occupations and exhibit evidence consistent with pemmican production. The older levels have radiocarbon dates of 3381 ± 50 cal BP through 4715 ± 90 cal BP, with the oldest occupation lying below the oldest radiocarbon dated level (Webster 1999; Mack 2000). These lower levels contain faunal assemblages frequently associated cooking activities (Mack 2000). The remains are highly fragmented and exhibit significant butchering and processing marks. The majority of the remains in each level belong to bison. The work of Webster (1999) documents more than 70% of the identifiable assemblage in each cultural level are those of the bison.

5.2.3 Newo Asiniak

Newo Asiniak (FbNp-16) was one of the first sites excavated and is one of two identified bison jumps within the Opimihaw Creek Valley, and includes a kill site, a processing area, and a habitation component. The site lies at the base of a steep valley wall and the processing and habitation portions extend onto the point bar immediately east of the valley wall. The bison jump was used at two distinct times based on the radiocarbon dates obtained for the top and base of the identified bone bed. The uppermost remains date to 185 ± 190 years BP (S2763) and those at the base of the bone bed date to 1540 ± 70 years BP (S2528). The kill site portion of Newo Asiniak is a bison jump and the faunal remains found at the base of the jump are almost exclusively those of bison. These remains were largely fragmented (78%) and show evidence for primary and secondary butchering taking place. The faunal remains are predominantly from the axial

skeleton. The higher utility portions were typically removed, further butchered and used elsewhere, and notably absent from the assemblage. The MNI obtained are thus very conservative with only seven individuals positively identified in the assemblage. Likely many more animals were hunted and the high degree of fragmentation obscures the true number of individuals present as well as only a small portion of the kill area having been excavated. The processing area cannot be concretely determined to correspond with the hunting area and exhibits a much more deeply stratified and complex history but given the similarity in dates and diagnostic artifacts to the upper levels it is assumed there is a relationship between the two components. The habitation component significantly predates the bison kill area with the earliest faunal remains dating to 3455 ± 230 years BP (S2766) (Kelly 1986). Throughout all levels of occupation in this portion of the site, bison are the primary animal found among the faunal assemblage. While the MNI, where it could be determined, for each of the seven levels is only two, Kelly (1986) remarks that the high degree of fragmentation of the remains is the reason for this and the numbers should actually be much higher. Bison remains are almost exclusively the faunal materials in the first cultural level and this trend continues for levels two and three. In the lower levels (five, six, and seven), the number of specimens confidently identified as bison is significantly reduced but remains greater than that of other animals in the remaining levels.

5.2.4 Amisk

The Amisk site (FbNp-17) is habitation area found in the middle of the Opimihaw Creek Valley, immediately southeast of the Newo Asiniak site on a hill wash slope. Amundson (1986) describes evidence of activities consistent with a habitation area including tool making and food processing. Like many others in the valley, it is a multicomponent site. The faunal remains found within the site, across all occupation levels, predominantly belong to bison and are found in great abundance. The MNI for all levels ranges from two to six bison in each level. The presence of bison remains is described as being approximately 99% for each level based on fragments and fully identified pieces. Amundson (1986) draws the conclusion that the comminuted bone belongs to bison as it is the primary animal whose remains are found in the site. The same conclusion could be drawn for all of the other sites in the Opimihaw Valley. This is similar to how the remains at the Wolf Willow site are interpreted in this thesis and Amundson (1986:183) states that it can be concluded that “in each occupation people were almost entirely dependent upon bison hunting”.

5.2.5 Redtail

The Redtail site (FbNp-10) has been the focus of extensive excavation and research. The site is well preserved, highly stratified with fifteen distinct occupation levels, and was the result of repeated habitation. The earliest date is from around 5,000 years ago and occupation continues through to 1,300 years before present (Williams 2015:28). Throughout all levels bison are the primary animal found in far greater abundance than any other species. Each level has bison accounting for at least 60% of the identified remains. A nearly complete bison cranium found in level 10 (Ramsay 1993:214) is of importance to this thesis. The base of this cranium was broken and mostly absent, the maxillary dentition was scattered around the immediate area, and it was lying prone. Ramsay did not elaborate on the interpretation of the cranium within the site, but it is possible that it was related to processing activities rather than habitation and its placement upside down and with a broken basal area may indicate brain extraction (Ramsay 1993). This cranium is further discussed later in this chapter and compared to the Wolf Willow cranium.

5.2.6 Cut Arm

The Cut Arm site (FbNp-22) is another multicomponent habitation site and is located in a drainage swale on the north bank of the South Saskatchewan River adjacent to the Opimihaw Creek valley (Smith 2012). Occupation was extensive at this site with 11 different cultural levels identified. Calibrated radiocarbon dates indicate occupation as early as 4270 ± 55 yrs BP through 650 ± 40 yrs BP (Smith 2012:36). Consistently through each level, bison are the dominant mammal. In every level of this site the faunal remains that can be identified are overwhelmingly identified as bison at more than 90% for each level. The tenth cultural level shows a large amount of canid remains in addition to the bison. The faunal assemblage is highly fragmented and indicative of a high degree of processing. The MNI is around two per level which Smith (2012) interprets as a conservative estimate. This is consistent with the other sites in the valley of this nature. The upper levels of this site have fairly small faunal assemblages compared to what is typically seen in habitation sites within the valley.

5.2.7 Meewasin

Along the South Saskatchewan River adjacent to the Opimihaw Creek Valley is the Meewasin site (FbNp-9), a complex multicomponent archaeological site spanning 4,000 years BP. Seven distinct cultural levels are identified with occasional sublevels present. This area was

likely used as a bison kill area with Cultural Level 1 representing a small-scale hunting event and Cultural Level 2 a large-scale bison hunting and processing event. Cultural level 3 also exhibits characteristics consistent with a bison kill perhaps on a smaller scale. The Meewasin site exhibits higher MNI values through the hunting levels especially when compared to other sites in the area. When coupled with landscape of the site and the butchering marks observed on the faunal remains, the conclusion drawn is that it is a hunting area. Prior to its use as a hunting area, the space was occupied at several points in time similar to the Newo Asiniak site. Bison make up between 97% and 100% of the faunal assemblage that could be positively identified to species for each level (Frary 2009).

5.2.8 FbNp-1

The first site excavated, FbNp-1, produced faunal remains and a significant amount of pottery and cultural artifacts. Only cultural materials were examined by Harty (2005). A faunal analysis was conducted by Dr. E. Walker following the excavation but is unpublished.

5.2.9 Summary

Within many of the sites discussed, the bison remains are highly fragmented and the MNI is relatively low and perhaps not suggestive of an abundance of bison within the site. What is noted to be consistent between the sites is that many fragments are attributed to the "Very Large Mammal" size class, as they are at the Wolf Willow site. In each site, bison are the only animal identified that belong to this class. There are rarely other animals, such as elk or moose, that would fall into this size class that can be identified. This leads to the reasonable conclusion that, the majority of the fragments in the "Very Large Mammal" size class belong to the bison, even if they cannot be positively identified as such.

Given the extensive archaeological record at Wanuskewin, it is clear that bison are the dominant animal and have been for at least 6,000 years. Throughout all the sites discussed previously, regardless of method of analysis or presentation of the data, bison are consistently the dominant animal found. Amundson (1986:183), with regard to the Amisk site, goes so far as to state that people were entirely dependant on bison at Wanuskewin. While the remains of other animals are found, it can be interpreted that people primarily looked to utilize bison for many aspects of life and other animals were used only occasionally.

5.3 Bison Hunting and Near Extinction

The landforms of the Opimihaw Creek Valley are useful in the employment of different bison procurement strategies. Within the valley, two bison jumps have been recorded as well as possible bison pound formations (Walker 1988). The landforms present lend themselves well to both of these hunting methods. The use of bison jumps began to increase throughout the Middle Precontact period on the Plains increasing dramatically in the Late Middle Precontact period (Walker 2016). It is known that some cultural groups, namely Besant and Sonota complexes, were more inclined to hunt using mass-kill methods on a nearly industrial scale (Walker 2016). The Newo Asiniak site (Section 5.2.3) has a significant amount of bison bone found at the base of the jump in a distinct bone bed. The other bison jump in the valley, Opimihaw (FbNp-17), has not been excavated beyond the initial survey identification of the site, but is thought to be both older and larger than Newo Asiniak (Walker 1983). Within the surveyed areas and test pits, the presence of large quantities of bison bones indicates a well-used jump. These two bison jumps indicate the prevalence of bison in the area and the need people had for hunting bison *en masse*. The Meewasin site is also indicative of bison hunting activities perhaps utilizing a pound-style trap. The bison jump and pound hunting methods used here were at least a reason for repeated, consistent occupation of the Opimihaw Creek Valley.

For more than a century, the population of bison declined dramatically as a result of a multitude of factors. Generally, estimations of the bison population in North America were 26-30 million animals towards the end of the 1700s (Lott 2002:76; Lueck 2002). This number subsequently plummeted to less than a thousand animals by the end of the 1800s, a mere 80 years later (Aune and Plumb 2019:27; Lott 2002:170; Lueck 2002). Intentional preservation was needed to conserve the remaining animals in an attempt to remediate the changes that had occurred during the 19th century. There are a multitude of reasons for the dramatic decline in population some from unknowing actions and some intentional, discussed in the following sections. Regardless of the cause, the loss of the bison was devastating for both people and the landscape (Binnema 2016; Knapp et al. 1999). The following section will provide a brief overview of some of the reasons for the demise of the bison which is necessary for understanding present day restoration efforts.

A factor in near disappearance of the Plains bison was the robe and hide trade, and the rapid increase of it throughout the 1800s (Aune and Plumb 2019:30; Barsness 1985). Trade routes and uses of the bison hide had been established for millennia and formed an economy for Plains Indigenous peoples. Despite dramatic increases in procurement activities and Precontact mass kill hunting methods, the hunting strategies employed by Indigenous peoples were far from the scale necessary to cause such a dramatic population decline (Walker 2016). Fur and hide trade grew over the course of the 1800s to an unsustainable level. Bison were slaughtered at a higher rate than their birth rate leading to a population decline (Aune and Plumb 2019; Cunfer and Waiser 2016). Hides and furs were the sole reason for the hunting and the whole animal was no longer being used like it had been for millennia. Bison hides were thicker and thus more durable than other animals and were processed in the United States and shipped to Europe for use as belts in machinery that had been newly created during the Industrial Revolution (Aune and Plumb 2019:28; Barsness 1985:112; Hansen 2016). Yet, Colonel Richard Irving Dodge notes that only a quarter to a third of the total hides hunted were used and reached market and the hunt was in excess to such a degree that the majority went to waste (Barsness 1985). Bison tongues were considered delicacies thus a compounding factor for why the bison were hunted in such great numbers. The tongues were sought by people in the Eastern United States as a special and luxurious food (Aune and Plumb 2019:28; Barsness 1985:119). They were shipped by the barrel to the south and to the east, and much of the rest of the animal's carcass was left to rot rather than be used to maximum capacity as had been done previously. Simultaneously, bison were taken as a trophy and proof of a successful hunt which had to be shown off (Barsness 1985:102; 112). Yet large scale hunting such as this alone could not lead to the near complete disappearance of the species. While the hide hunters in the United States were often blamed for the disappearance of the bison, the quick demise began long before the hide trade and hunters came into force (Barsness 1985; Lott 2002:170). The Métis hide trade flourished across the Canadian prairies throughout the mid-1800s. Hunting bison year-round and killing more than ever before with hides largely being traded and demanded by the Hudson's Bay Company resulted in a rapid decline of bison on the Canadian prairies (Lott 2002:174)

Horses and livestock posed a threat to the bison on the Plains as well and contributed in part to their population decline. Horses had been introduced more than a century prior to when the bison population began to decline; they created a cultural shift and dramatically changed

ways of life (West 2016). The horse greatly expanded hunting capacity and made it possible to be selective of which animals one wanted to kill. Additionally, bison cows were preferred due to the meat's texture and the qualities of the hide. Previously, bison cow meat may have been preferred, but there was little opportunity to be selective in communal hunting. Equestrian hunters could be selective and repeatedly targeted cows which changed the population ratio in a herd and over time bulls began to outnumber cows which caused a problem for population growth (Lott 2002:172). Hunting on horseback was faster and more exciting, yet also more dangerous, it became something of a sport in itself and a way to demonstrate one's abilities (Hornaday 2002[1889]:470).

The horse was able to cohabitate with the bison on the Plains to some degree but presented as resource competition in a way that had not been experienced before by instigating a dwindling supply of forage (Lott 2002:161–162; West 2016). Additionally, new animal populations of farming domesticates, including cattle and sheep, increased the resource competition and introduced diseases to the bison (Aune and Plumb 2019:28; Lott 2002; Posthumus 2016). Similar to human populations, introduced diseases from Europe including bovine tuberculosis, brucellosis, and Anthrax arrived and devastated bison populations (Aune and Plumb 2019:28; Flores 2016). These diseases continue to impact and devastate bison populations today (Freese et al. 2007; Lott 2002:112–114). The combination of a growing horse population, using horses for hunting, and the introduction of firearms all lead to instability in the relationship between bison and people (West 2016).

As a result of the increasing hide trade and the introduction of the horse, the landscape rapidly changed. Agricultural practices, far more extensive than anything that had been practiced previously on the Plains, were introduced and were quickly reshaping the landscape. The grasslands that covered the middle portion of North America were transformed into monocrop farms and cleared for homesteading with the desire to expand west and convert the land into something productive (Aune and Plumb 2019:28). When combined with a climatic shift and drought, grasslands were threatened (Flores 2016). Simultaneously, people and bison furthering the rapid decrease in bison populations (Olson 2022).

Bison had been observed as key in Plains peoples' ways of life, integral to culture and daily life. The American government eventually adopted a way to control and "settle" the

Indigenous people which included extermination of the bison population (Aune and Plumb 2019:28; Waiser 2016). The Canadian government initially supported the conservation of bison. However, over time they came to the conclusion that the existence of bison and their continued survival and hunting of them was contributing to the difficulties being had in "settling" Indigenous groups on Reserves (Waiser 2016). While not explicitly in favour of eradication of the animal, there was little opposition or concern for the declining numbers. Prime Minister Sir John A. MacDonald sought to develop and enhance agricultural practices on reserve to diminish the need for bison hunting and turn the Indigenous peoples into farmers rather than mobile hunters (Waiser 2016). He is known to have said he was not sorry the bison disappeared, "…the disappearance of the bison came to be seen as a good thing. Indians had to accept a new way of life or become extinct like the animals they once chased" (Waiser 2016:258). As people could not be settled with the animal around and "the bison hunt was incompatible with civilizing" Indigenous populations (Waiser 2016:258). It is said that the American government created explicit policies to hunt and kill the bison as a means of assimilating Indigenous people into Western Culture or rid the area of them all together. Many decrees point to this, notably that which stated "kill every buffalo you can. Every buffalo dead is an Indian gone" in 1867 (Butler 1872:241).

Additionally, railways were constructed in both Canada and the United States to connect the east coast to the west coast and facilitate movement, exploration, transport, industrialization, and to aid in building a nation (Carver 1847; Hornaday 2002[1889]:491; Marsh 2021). The construction of rail lines physically separated bison herds into northern and southern groups, damaging their relationship with the land and each other (Cunfer 2016; Lott 2002; Lueck 2002). The railways were advertised, and the bison used as incentive, to have people move west by inviting bison hunting with a firearm from the moving railcar (Barsness 1985:104). Hunting increased with the railway as more people moved out west and larger kills happened more frequently. Simultaneously, the rail lines facilitated hide and bone transport back to the east coast expediting trade and increasing the demand for bison hides dramatically (Barsness 1985:112; 129; Cunfer 2016).

5.4 A Resurgence of Bison

As demonstrated, no one cause accounts for the declining bison population throughout the 19th century. Compounding factors together contributed to their near extinction and carelessness and disregard for the animal and ecology are part of this story. The number of bison rapidly declined throughout the 1800s, and while the final population number is not known exactly but every account has less than 1000 head of animals in total across the Plains by the 1890s (Lott 2002). The story of the bison does not conclude here. Their restoration began as their numbers continued to decline, and this restoration has continued into today. Fortunately, the few remaining animals were protected, and a number of notable people had the foresight to protect the remaining bison by maintaining herds on ranches, on reservations, and within the newly created Yellowstone National Park (Aune and Plumb 2019:69; Lott 2002:186). People such as Charles Goodnight, Michel Pablo, William Hornaday, Charles Jones, Samuel Walking Coyote, Theodore Roosevelt, and Charles Allard were instrumental in protecting the remaining bison (Lott 2002; Repanshek 2019).

Established to protect the geologic marvels and the wildlife, including the bison that remained in the area, Yellowstone National Park is the only place in North America to always have had bison and is one of the progenitor herds for the majority of pure Plains bison today (Aune and Plumb 2019:85–100; Freese et al. 2007). The Pablo-Allard herd is another of note. It started as a means to protect the last few animals that Michel Pablo and Charles Allard purchased from Walking Coyote, some of the last on the Northern Plains (Lott 2002:186). The Pablo-Allard Herd on the Flathead Reservation in Montana was one of the last remaining herds of wild bison, but a maintained herd, nonetheless. With the American government shrinking the size of the reservation to increase land available for homesteading, the herd needed to be relocated to avoid slaughter (Aune and Plumb 2019:78–79; Lott 2002:187). As a result, Michel Pablo needed to sell them. The Canadian government sought to buy them and thus the bison were relocated to Lamont, Alberta later moved to Wainwright, Alberta and then finally settled in Elk Island National Park near Edmonton, Alberta. This group of animals eventually formed the Elk Island National Park herd, the progenitor herd for all animals in the Parks Canada system today. These animals were shipped from Montana to Alberta by rail over the course of several years beginning in 1906 through 1912 with a total of 695 moved (Barsness 1985:160; 164–165).

Early attempts to increase bison population numbers and maintain genetic diversity included significant interbreeding with cattle in the 20th century (Freese et al. 2007; Hedrick 2009; Lott 2002:196). This interbreeding produced viable offspring and cattle genes became mixed into those of the bison. The full scope of the effects of cattle genes on bison is not completely understood making the modern specification of 'pure Plains bison' significant. This introgression of cattle genetics is found in almost all bison and very few remain as pure plains bison (Freese et al. 2007; Hedrick 2009). The animals in Yellowstone National Park are among one of a few groups to have little to no cattle genetics, making this herd significant and in need of protection. However, as Freese et al. (2007) state, over time it will get increasingly difficult to prevent cattle gene introgression into pure plains bison herds. The number of private bison herds that do not control for this is increasing and mixing between these and conservation herds is difficult to control for in practice (Freese et al. 2007). Genetic diversity, and a lack thereof, results in different problems for the animal (Repanshek 2019:158)

Restoration of the bison continues through North America today. Each year, bison and grasslands are restored in more areas across the Plains benefitting bison populations and grassland conservation as their existence is intertwined. Bison exist today on tribal and reserve lands, in conservation herds, and on ranches in commercial herds (National Park Service; Aune and Plumb 2019:69; Repanshek 2019:152–159). Each year, more are returned to Indigenous owned and cared for spaces, on reserves and reservations, and to places like Wanuskewin Heritage Park. The ideal space for bison is on open prairie, feeding off the land and with minimal human interaction, as similar to the pre-European contact conditions as possible. This attempt at rewilding the bison and increasing population size in conservation and on-reserve herds is incredibly important.

Wanuskewin Heritage Park returned bison to park area in December 2019 after many years of hope, planning, and work. A reintroduction of bison had been a park of the plan for Wanuskewin since its conception (Walker 1983). An initial introduction of six young females from Grasslands National Park occurred on December 7th, 2019, each animal was approximately six months of age. Ten days later, an additional five animals were introduced to the Park on December 17th, 2019, coming from a private ranch in South Dakota with ancestral origins in the Yellowstone herd. This group consisted of four pregnant females each approximately 3.5 years

old and one bull aged 4.5 years. A quick start to a rapidly growing herd, by the winter of 2023 the population includes 28 healthy animals ranging from a few months old to 7.5 years.

The earliest visions for Wanuskewin as a heritage park included bison returning to the land. Founding Elders had the animals in their plans for what the Park would be and how it would connect people with culture and history on the Plains. Decades of work was necessary to realize this vision. They will reside at the Park and be there for visitors to learn from in perpetuity. It has been observed how their return and revitalization, and thus revitalization of the land and space, is akin to that of Plains Indigenous cultures. With the history of bison in the valley, it is abundantly clear they belong there today and into the future.

The bison at Wanuskewin are a conservation and spiritual herd. The animals are protected and meant to ensure ecological diversity and cultural connections to the land and the animal for generations into the future. While the presence of the bison is special for the Park, their genetic pedigree is significant to bison restoration across the Great Plains. With ancestry lying in Yellowstone National Park and in Grasslands National Park, these animals have a lineage with two of the last remaining groups of bison that date to the end of the 19th century. Few places today have and produce animals that are pure Plains bison without cattle gene introgression and fewer yet have the genetic lineage tied to both the Yellowstone and Pablo-Allard herds. Some of the calves born in the summer of 2022 at Wanuskewin have a maternal lineage in Grasslands National Park and the paternal lineage derived from the Yellowstone group. They are some of the first to combine these genetic lineages since the end of the 1800s. As a conservation herd, the bison were returned to a few acres of land within the Park that had never been cultivated and were suitable for grazing. As more land is reseeded to native prairie, the bison habitat will be expanded. Presently the herd grazes on just under 500 acres of land on rotation. Through their presence, they assist in grassland restoration and rebuilding and shaping of the ecosystem. Within their first summer after returning to the land, the impacts could be observed through the increased presence of other wildlife in the pastures and through seed counts in the bison dung (Craig Thoms, personal communication 2022). Bison have begun to heal the land and return it to what it was prior to agricultural practices.

5.5 Bison Significance through Symbolism

Bison can be viewed as a piece of Wanuskewin so integral that it is the animal, and the relationship held between it, the land, and the people that make it a truly unique and exceptional place on the Great Plains. Using the previously presented findings from within archaeology sites as well as larger pieces of evidence for the importance of bison as discussed below, it is clear that bison are integrated into the Plains lifeways.

The symbolism of important animals is something shared between people all over the world, throughout humanity's history. Animals depicted in art, as figurines, statues, or in stories are often those of incredible importance to the people that made them (Keyser and Klassen 2001). Art is made as a way of showing respect and reverence for a being and is often viewed as a way of honouring the animal recreated in the art. In addition to the rock art imagery, other symbols of the bison are found within the archaeology sites of the Opimihaw Creek Valley. A small token, a piece of sandstone carved into a four-legged animal, was found at the Wolf Willow site. This figure is small, no more than 2 cm in length, and was found in Cultural Level 2a. Not necessarily a bison, the four-legged animal stylized carving is very much intentionally created and representative of the ideological domain. This item could be interpreted as a "fetish" and is further examined and discussed in Pelletier's work but given its possible representation of an animal it is worthy of including in this work.

5.5.1 Petroglyphs and Newo Asiniak

Large-scale communal bison hunting required large and stable bison populations. The goal of the hunt was to procure large amounts of bison, a fruitful hunt, but for there to be enough available to guarantee stable populations for future generations (Walker 2016). Precontact communal bison hunting was known to be at least partly under spiritual control (Keyser and Klassen 2001; Schneider 2003). Rock art is an example of the physical expression of these beliefs, a tangible component of the spirituality and beliefs held by the people creating the art (Schneider 2003; Sundstrom 2004). Many forms of rock art are interpreted in this way including the Hoofprint Tradition, the most commonly observed tradition in Saskatchewan (Schneider 2003). The connection and depiction of female reproductive organs, bison, and themes of fertility and fecundity observed in many instances are interpreted as connecting to and offering ritual to

increase bison fertility which in turn increased bison population and likelihood of successful future hunts (Keyser and Klassen 2001).

Summer of 2020 brought the uncovering of four petroglyphs at Wanuskewin. By mid-August 2020, the activity of the recently returned bison in their paddock had disturbed the grass and ground surface enough to uncover the surfaces of four rocks with incised designs on them. As Dr. Walker and Craig Thoms, the Bison Manager at Wanuskewin, were tending to the bison herd they remarked the designs that appeared to be incised on the rocks. A quick study of the uppermost surfaces of the rocks and the lines on them indicated to Dr. Walker that they merited further examination. Consultation about how best to protect and preserve these petroglyphs was soon undertaken with Wanuskewin's Elders' Council. Following the Elders' guidance, later that summer and into early autumn, Dr. Walker and a small team of archaeologists excavated the petroglyphs. The bison had uncovered markings on three large, reddish sandstone boulders buried deep into the ground and one similar smaller hand-held sized rock. Each was incised with a series of lines, pits, and grooves and each bore a distinct pattern. Dr. Walker determined the marks on the rocks were intentionally created, not the result of implement damage from a century of farming the land, and belonged to the Hoofprint Tradition of rock art. The petroglyphs were assigned to the Newo Asiniak (FbNp-17) site given their proximity to the bison jump and the driveline for it.

The first petroglyph examined and excavated is identified as a "ribstone" where the rock is turned into the body of an animal as the ribcage forms to the contours of the rock. Figure 5.1 shows the petroglyph *in situ* during excavation. A line is observed running the length of the long axis of the rock within which there is a figure recognized as a spirit figure with a head, body, and horns, whose tail runs down the rock into a crevasse; the lines running perpendicular to it are ribs. This spirit figure, seen clearly in Figure 5.2, is an important aspect of the design and while interpretation is subjective, it could represent a connection to or a reflection of a supernatural power or entity. The rib lines coming down the sides of the rock continue to what was likely ground surface at the time of the carving, approximately a quarter of the way down the sides of the entire rock. This petroglyph is the only ribstone in the group of petroglyphs and its significance is discussed later in this section. During excavation, a biface was found lying immediately next to the rock and is likely the tool that was used to carve the lines into the

petroglyph. The black biface has a quartz inclusion on the edge that is the cutting and working edge and was used to incise the grooves.

Figure 5.1: Ribstone Petroglyph *in situ* (Image: Wanuskewin)

Figure 5.2: Ribstone Petroglyph. Spirit Figure Indicated by Red Oval (Image: Wanuskewin)

The other three petroglyphs present grid patterns. Two are significantly larger than the previously discussed ribstone while the other is small enough to hold in one's hands. The lines on the two larger boulders are less visible and clear than those of the ribstone but are definite and purposeful incisions into the rocks (Figure 5.3). The lines incised run the length of the rock with some lines running perpendicular creating the grid pattern. The smallest of the four petroglyphs has a mass of approximately five kilograms and exhibits several lines running in many directions with pits pecked across the rock's surface (Figure 5.4). The technique used for these is termed the pit and groove method which is commonly associated with the Hoofprint Tradition (Schnieder 2003).

Figure 5.3: Grid Pattern Petroglyph (Image: Wanuskewin)

Hoofprint Tradition rock art is the most commonly found and observed tradition on the Northern Plains and is closely related to the rock art of the eastern Woodland region (Keyser and Klassen 2001). Hoofprint Tradition art often displays pit and groove designs, animals, humans (especially women), genitalia, and hoofprint motifs of various animals (Keyser and Klassen 2001). Ribstones are also determined to belong to this tradition due to their frequent co-occurrence with the aforementioned styles and depictions (Schneider 2003). This tradition clearly demonstrates the importance of and respect for the bison by people in the past. The portrayal of the bison is constant and clear throughout. The majority of petroglyphs, including the most well-known and notable ones in Saskatchewan, belong to the Hoofprint Tradition including both the St. Victor and the Herschel petroglyphs (Schneider 2003). This tradition typically dates from 300 to 1,800 years before present and is associated with the Late Precontact Period on the Plains (Keyser and Klassen 2001). However, given the nature of rock art, it is difficult to get absolute dates and it is most commonly dated through associated artifacts (Keyser and Klassen 2001).

It is proposed that the presence of the ribstone at Wanuskewin as related to the Newo Asiniak site served to draw the bison to the kill site. Hoofprint Tradition is connected to femininity and fertility, therefore the connection of Hoofprint art with bison procurement sites would be logical. The concept is that both women and bison were viewed as life producers and thus a reverence towards them grew and the art would be created to recognize and honour such a belief and thought (Keyser and Klassen 2001). The infrequent occurrence of ribstones in close proximity to bison kill sites renders the concept of their connection difficult to examine. However, they may serve a similar purpose wherein it is located near, overlooking, or built into the hunt itself as a way of ensuring success and safe hunts.

Figure 5.4: Small Petroglyph displaying Pit and Groove Style (Image: Wanusekwin)

As Greer and Greer (2002) indicate, the presence of rock art boulders at bison kill sites provides a more direct association of this art tradition with bison hunting and procurement. Some Hoofprint Tradition petroglyphs are identified as ribstones where, as previously discussed, the ribcage carving implies the transformation of a rock into a bison. These ribstones have been

found across the Northern Plains and are often associated with special places and hunting areas. The Wahkpa Chu'gn site near Havre, Montana is one instance of a bison ribstone in close proximity to a hunting area. It is a smaller boulder carved as a ribstone directly associated with a pound hunting site (Keyser and Klassen 2001). The two boulder petroglyphs at Saddle Butte, Montana, are located close to a camp area directly across the Milk River from a collection of bison kill sites (Keyser and Klassen 2001). The Pine Coulee ribstone in Alberta is situated across a valley from and overlooking a large bison kill site and are thought to be related (Amundsen-Meyer 2015). The close proximity of these Hoofprint Tradition boulders to hunting areas is significant and almost certainly not by chance. Boulders like these near hunting sites supports the idea that they are connected with bison procurement and hunting magic wherein their proximity is useful in the hunt itself. They are a physical manifestation of the respect for bison and connect the cognition in the past to something that can be interpreted and seen and felt today.

5.5.2 The Cranium

A relatively complete bison cranium was found at the Wolf Willow site in the third cultural level at a depth of 59 cm through 69 cm. Based on depth, the lowest parts of the cranium lie within Cultural Level 4, however, associated diagnostic artifacts attribute it to Cultural Level 3. The majority of the cranium lies within level 3. A McKean series projectile point was found in a unit adjacent to the bison cranium and at the same depth, and thus the cranium is attributed to the same occupation. This discrepancy between depth and cultural affiliation could be the result of mixing and shifting of the cultural strata or a slope of the site's topography, an area of research that has not yet been examined in this part of the site area. There are no obvious signs of a pit having been dug at the time of occupation. The presence of a bison cranium at a campsite with no hunting occurring specifically in the site area is relatively uncommon across the Plains with only approximately four sites noting this (Nicholson and Nicholson 2007). Bison crania are a direct and dramatic representation of the animal and to this day are often used in imagery to convey their importance and presence. Bison crania are often found to be a part of ceremony and are spiritually significant; their presence in a site gives such a connotation to the area (St. Clair 2000). Its significance in the site area is in the relative absence of other cranial elements in the cultural levels. It can be concluded that intact crania were not frequently brought to habitation areas as few cranial elements are found in the site, apart from this nearly complete example. Significance of such a specimen is in not only its presence, but also the relative absence of other

specimens like it in habitation sites. Hunting spaces, such as the Newo Asiniak site generally have an increased frequency of cranial elements in proportion to postcranial elements, especially when compared to habitation areas (Kelly 1986).

The bison cranium was relatively intact and in good condition when first uncovered. It was found lying on the dorsal aspect of the cranium, the basicranium area as the highest point and first portion to be uncovered with the frontal and nasal bones as lowest portion (Figure 5.5). It was orientated from northeast to southwest when looking from the posterior aspect of the cranium to the nasals. As it was uncovered and excavated the cranium fragmented into a large amount of very small bone pieces. The fragmentation and original positioning can be observed in Figures 5.5 and 5.6. Since it was uncovered intact, a reconstruction of the cranium was considered possible and was conducted by the author. The cranium consisted of a lot of comminuted bone with some larger pieces that were used to start the reconstruction process. The bison cranium was reassembled over the course of several months. Much of the comminuted bone was small pieces of pneumatic bone from within the cranial vault and frontal bones and could not be reassembled hence the reconstruction focused on the external portions of the cranium (Figure 5.7).

Figure 5.5: Bison Cranium Excavation (Image: Wanuskewin)

Figure 5.6: Bison Cranium *in situ* Lying Prone (Cat. # 2021) (Image: Alexis Hunter)

Figure 5.7: Reconstructed Bison Cranium Including Hyoid (Cat. # 2021)

The intriguing aspect of the bison cranium found within the Wolf Willow site is the absence of the basicranial portion. The frontal bones, nasals, and horn cores are well preserved and were largely able to be reassembled as well as portions of the orbits, parietal bones and superior-lateral portions of the occipital. The only identified piece from the basicranial region was a of basioccipital. It appears that the basicranium and internal cranial portions are absent within the assemblage to the extent that the petrous temporals, which are the most commonly preserved and recovered cranial artifacts, are absent. A possible explanation is the extrication of brain matter for the process of hide tanning, however the brain is typically accessed through the frontal bones, which are considerably thinner and less muscled and more a direct route than basal access (Reilly 2015). Thus, no full explanation for this absence of the basal elements could be determined based on what was present, but the absence is peculiar.

Regardless of the absence of the basicranial elements, the cranium was largely able to be reconstructed and is important to the interpretation of Wolf Willow and the importance of bison within the valley. Bison crania are often considered to be ceremonial in nature with the earliest example coming from the Cooper site in Oklahoma (Bement 1999). The Cooper site represents a Folsom period hunting site. The cranium found within was decorated with red ochre, however, it is located in close proximity to the rest of the skeleton thus there is no evidence for transportation to locations outside the hunting site (Bement 1999). Crania have also been found in close proximity to burial sites and often have artifacts found in close association with them (Low 1994; Nicholson 1994).

Similarities can be drawn between this cranium from the Wolf Willow site and the one recovered from the Red Tail site (Ramsay 1993). Ramsay (1993) describes the cranium, from the McKean period in Cultural Level 10, as being positioned upside down with the nasals of the cranium pointed in the south-southeast direction, similar to that of the Wolf Willow site. It has a second, complete pair of nasals placed immediately above the other is considered to be intentional. The similarity in occupation type that both the Wolf Willow and the Red Tail crania come from makes the comparison of the two pertinent and logical and the similarity in their placements significant. The prone positioning of both, where the basal area of the cranium is the highest point, is unique and no clear explanation can be offered. Ramsay (1993) proposes brain extraction from the cranium as a possible explanation for the positioning and also relative

absence of basicranial elements which is possible. However, no specific evidence supporting this hypothesis was found with either cranium. Both are directly within a living area, the one at Red Tail in close proximity to a hearth. The Wolf Willow cranium had a uniface found immediately underneath it. The uniface is interpretated as possibly used in the processing of the cranium while a McKean projectile point found in relatively close proximity in a neighbouring unit gives a cultural affiliation to the cranium (Fender 2018) .

5.6 Summary

It is abundantly clear that bison are important to life on the Great Plains, specifically in the Opimihaw Creek Valley. From an archaeological perspective, the Opimihaw Creek Valley contains a record of many occupations over the course of 6,000 years, each of which comes back to bison. The faunal assemblage from each level of each site is dominated by bison remains which tell of many activities and practices that occurred in the valley and surrounding area. This dependence on bison is related to their abundance, with millions roaming the Plains it made sense to hunt them the most. Importance of the animal can be seen beyond the faunal remains, furthered through the iconography and symbolism of the animal. Hoofprint Tradition petroglyphs honour and respect the bison and the relationship they have with people. A nearly intact cranium at the Wolf Willow site, similar to that at the Redtail site, may be present to be a physical reminder, a visual of the animal in a habitation space. Until their near extinction, bison populations are estimated to have reached nearly 30 million (Lott 2002). Despite the many aggravating factors in their demise, conservation of the last few animals protected them and ensured future generations would see bison on the Plains. Today, herds in conservation areas such as Wanuskewin protect and grow the bison population. The importance of this animal is evident through its pervasive presence, through its history, and its successful resurgence. Each part of the Park can orient from the bison, because of their record in the valley.

Chapter 6: Bison and UNESCO World Heritage Site Designation

6.1 What is UNESCO?

The United Nation Educational Scientific Cultural Organization (UNESCO) is an organization that “contributes to peace and security by promoting international cooperation in education, sciences, cultures, communication and information” (UNESCO 2023). UNESCO was created with the goal of promoting knowledge and idea sharing, with the aim of creating better understanding of each other’s lives. UNESCO formed at the end of the Second World War in 1945 as a means of rebuilding education systems and preserving the world history that remained intact with the goal of preventing any future destruction of the same magnitude (UNESCO 2023). With the development of the organization, an assembly on the protection of natural and cultural heritage was held creating the international treaty or Convention concerning the Protection of the World Cultural and Natural Heritage. It is this convention that oversees the World Heritage List and the properties inscribed to it as well as the qualities and attributes that make a property worthy of designation to the List (UNESCO 2021).

6.1.1 World Heritage Site Designation

This UNESCO World Heritage List seeks to protect both cultural and natural heritage throughout the world (UNESCO 2021). UNESCO sites are found around the world and capture the unique and monumental works of humanity from cultural and natural landscapes and the areas in which they intersect. Per the Convention (2021), cultural heritage includes monumental architectural works and sculptures, archaeological structures and features, building groups, and sites of archaeological history, all of which bear testament to the accomplishments of humans through time. Natural heritage includes physical or biological natural formations, geological and physiographical formations, areas to protect threatened species of animals and plants, areas for the conservation of scientific information, and places of natural beauty (UNESCO 2021). These can come together, combining cultural and natural heritage, with mixed sites forming a separate category on the World Heritage List. Ultimately, these places that are deemed worthy of UNESCO World Heritage Site designation must convey an Outstanding Universal Value which is defined in the *Operational Guidelines* as the significance of the site "is so exceptional as to transcend national boundaries and to be of common importance for present and future generations to all of humanity" (UNESCO 2021). The space being nominated must be important

and unique to all people on earth, past and present, and be unique or at least exceptional in how it preserves and demonstrates heritage.

UNESCO and the World Heritage List are important to aid in the preservation of areas that tell the collective human history and to create international awareness and appreciation for these spaces. World Heritage Sites demonstrate commonalities and differences between cultures and landscapes around the globe and showcase how humans have used and admired them for millennia. These sites provide ways for archaeological information, garnered by years of research, to be shared with broader audiences and reach the classrooms of people who have yet to visit the site itself. This awareness creates an appreciation and recognition of the past and the shared history of humanity.

Inscription to the World Heritage List is not final, sites are delisted should their statement of OUV fail to be protected by future developments. Establishing and maintaining a buffer zone for UNESCO sites is integral, to actively protect and preserve the heritage is imperative for the inscription on the World Heritage List (UNESCO 2021). Contravention of the *Operational Guidelines* and failure to protect results in the rare cases of removal of designation and deletion from the World Heritage List.

6.1.2 An Understanding of OUV

Designation as a UNESCO World Heritage Site is a lengthy and exhaustive process in the hopes of curating a list that exhibits truly unique and exceptional testaments of humanity. Selection to the list is dependent on establishing and showcasing the Outstanding Universal Value (OUV) of a space, its authenticity and integrity, and ultimately its unique and exceptional properties. A list of criteria for the assessment of OUV compiled by UNESCO World Heritage Sites committee is critical. Each property aiming for inscription to the list must select at least one criterion to showcase the attributes of the site. The criteria are set out in the *Operational Guidelines* (UNESCO 2021) and maintained and periodically revised by the World Heritage Committee of UNESCO.

The list of criteria for establishing a space's uniqueness captures much of what makes life and nature so magnificent and describes both cultural feats (criteria I through VI) and natural marvels (criteria VII through X). These criteria for Outstanding Universal Value reflect

international significance and importance and value on a local or national scale are not what define it, but also to the broader international audience. These criteria showcase all aspects of heritage. Per the *Operational Guidelines* manual (2021) and with examples from UNESCO (2023); Criterion I focuses on masterpieces of human creative genius like the Rideau Canal in Ottawa; Criterion II is for built architectural feats that demonstrate an interchange of values, attributed most often to towns and planning areas such as the Historic Centre of Mexico City and Xochimilco. Criterion III is for spaces that showcase cultural traditions, past and present such as Writing-on-Stone/Áísínai'pi in Alberta, and Criterion IV for buildings and landscapes that tell of significant stages in human history with the Historic District of Old Quebec as an example. An example of human settlement, land or sea use that represents a specific culture history that is under threat of destruction falls under Criterion V, such as the Landscape of Grand Pre marshlands in Nova Scotia. Criterion VI is preferred to be used in conjunction with others demonstrating the tangible association with events or living traditions and is the basis for which Head-Smashed-In Buffalo Jump in Alberta takes its designation. The criteria for natural heritage begins with Criterion VII, where a site will showcase a natural phenomenon or be an area of exceptional natural beauty, such as Gros Morne National Park in Newfoundland as an example. Criterion VIII recognizes such major stages in earth's history in the form of geological processes landform development, or the record of life and evolution such as the Burgess Shale within the Canadian Rocky Mountain Parks site. Finally, Criterion IX recognizes ongoing ecological and biological evolution and ecosystem preservation, as seen in Pimachiowin Aki in Manitoba, and Criterion X for *in situ* conservation of biodiversity and threatened species like in Wood Buffalo National Park in Alberta and the Northwest Territories.

Looking at a map of the established UNESCO sites across the globe, there is a marked absence of any sites in the middle of North America, across almost the entirety of the Great Plains. With only a few sites in the American Southwest, peripheral to the Plains, and in Alberta, Canada on the very Western edge of the Great Plains, little of the Great Plains has been protected and preserved to the level of UNESCO World Heritage Site designation. This absence could come from a variety of causes since the establishment of the World Heritage Site Convention; however, a probable reason is the subtlety that lies in this landscape. The history of humanity in this region, this ecosystem and this geography are all very subtle. A lack of monumental

architecture due to the lifeways, environment, and needs of people in this area do not equate to a lack of known and recorded history of human activity. Rather it equates to a lack of built heritage to preserve and attract modern attention. The history, the knowledge, and the past is in the subtlety of the land. The records are extensive and well preserved as in many other areas, but an absence of features visible from afar necessitates interpretation and the use of one's imagination when understanding the history of the space. The Opimihaw Creek Valley, and Wanuskewin as a park and protected area provide the space to do just that. The valley provides the framework or the structure to what must be preserved, the bison provide the authenticity, the archaeology provides the tangibility.

6.2 Bison as a foundation of Wanuskewin: A Statement on Outstanding Universal Value

A statement of Outstanding Universal Value (OUV) encompasses the reasons why a property is unique, why it is the exceptional testimony, and includes a justification for this statement using attributes of the property and how they can be perceived and appreciated. The OUV statements support the criterion(a) selected for the inscription and clearly supports the one(s) selected. Further to this, the authenticity of a property uses the attributes, the given features and components of a site area, to support the OUV statement and links them to the OUV to assist in conveying the value of the property's importance and uniqueness in a truthful manner. With respect to archaeological sites, the measure of authenticity lies in the ability for the archaeological remains to truthfully convey the meaning of the site.

The following section is a statement on Outstanding Universal Value for Wanuskewin Heritage Park discussing why the designation as a World Heritage Site for this property is not only applicable and realistic, but important to the site area. The OUV for Wanuskewin relates to the presence of the bison in the Park area, and their demonstrated importance to the people that occupied the land for thousands of years and are present on the land today.

The proposal for Wanuskewin Heritage Park to be inscribed on the World Heritage Site list and designated a Heritage Property by UNESCO is based on Criterion III as described in Paragraph 77 of the *Operational Guidelines*. This criterion speaks to a space that encompasses a repetitively used and culturally significant landscape. With Wanuskewin, the evidence for such

significance lies with the Plains bison. This is exemplified with the clear relationship between bison, people, and landscape within the Opimihaw Creek Valley for thousands of years. The archaeological record clearly demonstrates the presence of bison in the valley and surrounding area in large numbers. Not only are they present, but they are abundant and show definite use and interaction with humans. The presence of people in the Opimihaw Creek Valley being so consistent and constant is most certainly a direct result of the presence of bison, ensuring a source of food in addition to the shelter that the valley provided.

Criterion III – to bear a unique or at least exceptional testimony to a cultural tradition which is living or which has disappeared.

The earliest inhabitants of the North American Great Plains focused on bison hunting as the primary source of food, shelter, tools, and clothing. Bison procurement strategies varied by time and region and the sites that are preserved are unique to the space and the landscape people were occupying. The Northern Plains region focused on communal bison hunting as a procurement strategy where groups of people would join to hunt bison in large numbers. This type of activity is captured within the Opimihaw Creek Valley alongside habitation areas. However, Wanuskewin is far more than a bison procurement area – the Opimihaw Creek Valley captures a complete story of prairie life in an extensive archaeological record. Through the presence of 19 distinct archaeology sites spanning more than 6,000 years of near continuous occupation in a defined area many aspects of Precontact life can be studied at Wanuskewin. Throughout these sites, which are both ceremonial and utilitarian in purpose, bison have been present in Hoofprint Tradition the petroglyph rock art which depicts bison, and the two bison jumps and a bison pound structure that give tangible evidence for procurement strategies employed in the area.

The archaeological record and the presence of bison at Wanuskewin Heritage Park provide tangible lines of evidence. They bear exceptional testimony to the cultural traditions that survived thousands of years. The quantity of bison remains that have been uncovered within the Opimihaw Creek Valley in numbers in the hundreds of thousands of bones, including fragments. The remains of the bison are the most plentiful animal specimen in the entirety of the Opimihaw Creek Valley study area. They outnumber every other type of artifact and animal remains found

and all of the other animal remains uncovered in the 40 years of research at Wanuskewin. Through each archaeology site, the faunal remains belong to the bison over 95% of the time. The abundance of this animal indicates a reliance and deep integration into the lifeways of Precontact Plains groups. Supported by other archaeological features and artifacts, the bison permeates Plains life in every regard. The highly fragmented remains found in several sites indicate food processing and the use of meat, fat, and marrow and the topography and sites associated with landscape features indicate hunting activity and bison herd manipulation. Imagery and symbolism of the bison can be found throughout the sites as well giving a physical presence to concepts that are more intangible in nature and further denoting the importance of the bison. The petroglyph rock art gives light to the cognition of the people who occupied this valley. The ribstone conveys the importance of bison. Taking time to carve rock signifies importance, the boulder interpreted as a physical representation of the animal. The faunal remains are plentiful, the presence of mostly intact crania far from procurement sites indicates the significance of the animal.

Human settlement in the Opimihaw Creek Valley, and therefore the establishment of Wanuskewin, was dependent on and a result of the presence of bison in the valley. The valley incorporates many important factors in a habitation area: shelter, running water, plant and diversity, even into today. Even with all these other factors, the valley likely would not have presented as such an ideal habitation area for people and encouraged such long and repeated residence in the area without bison being as present as they were. It is evidenced in the archaeology sites present that bison are obviously dominant and integral to life. Culture histories on the Great Plains, from stories and teachings to ceremonies and names, identify the bison as a key component and life source in the region. The Opimihaw Creek Valley provides an excellent collection of tangible evidence for such practices. All relate back to the bison, which recently returned to the land as a reminder of the past and their importance.

Few other places on the Great Plains record such a cohesive and consistent record of human and bison interactions. The stories that can be told from occupation in one specific, defined area are unparalleled and provide an excellent record of Plains life before colonization. This makes the space a unique and an exceptional area which merits preservation. Bison are tied to every aspect of Plains life and to every aspect of Wanuskewin, the valley provides such a

detailed story of bison and people. Without bison, Wanuskewin Heritage Park would not exist in the capacity that it does. Bison present on the landscape today amene easy storytelling, almost a reminder and visual of what the space would have looked like in the past. Bison are what make Wanuskewin special and unique, they are what give Wanuskewin its Outstanding Universal Value.

Chapter 7: Conclusion

Wanuskewin Heritage Park is home to a legacy of archaeological research and has been the subject of innumerable pieces of scholarly work. The Park itself serves as a centre for education and experience on the Great Plains, integration and immersion in cultural experiences for all visitors, as well as education about Great Plains culture histories and perpetuation into today. Each and every aspect of Plains life, and thus experience at Wanuskewin as a heritage park, relates to the Plains bison. The focus of this work has been on bison from an archaeological perspective. A large and dominant proportion of the archaeological remains found within all archaeological sites of the Opimihaw Creek Valley have been those of the bison. These remains are almost all modified and indicative of human interaction with and use of the bison.

A detailed analysis of the faunal remains from Wolf Willow years of excavation 2015-2020 comprised the first half of this work. The analysis expanded upon the previously completed research on this site. The primary difference in the work is the identification of six distinct occupations throughout the site compared with the previous four. Diagnostic artifacts assisted in the identification of these cultural levels and expanded those identified in the site, however, the projectile points and faunal remains clearly indicate an increase in the number of levels of occupation than Mampe (2015) and Stumborg (2016) identified. This helps to clarify points of uncertainty and discontinuity of the site stratigraphy within their works. The expanded footprint of the excavation, into the north portion of the site area, helped identify and determine the nature of the gravel lens both previous theses documented. Most importantly a clear cultural level was ascertained, Cultural Level 2b, and cultural affiliation via the diagnostic artifacts found in the 2016 through 2019 excavations.

Each level is consistent with habitation in the area as the primary activity. Extensive and final faunal processing can be inferred from the degree of fragmentation and the abundance of faunal remains in the activity area. Throughout all levels of occupation at the site, bison persist as the most prominent animal. They are always the most frequently found animal often representing more than 95% of the total faunal assemblage that can be identified to the species level. In addition, each work written on this site has “Large to Very Large Mammal” as the greatest category by mass for fragments. The faunal assemblage is highly fragmented, it was a well lived in site that shows consistent and extensive occupation in the area. People repetitively

came to the area and occupied it for a long time. This prevalence of bison in the site area is consistent with the other archaeology sites in the Opimihaw Creek Valley. Bison were the most important animal for all years of occupation and at all sites.

Future work in archaeology or research at Wolf Willow is not necessary, the site has been studied extensively, but definite avenues for continued research exist. The possibility of future work is restricted given the site has been filled in, however, future work would be merited in re-examination of the geoarchaeology of the site through studying the excavated components. Complex stratigraphy on a gradually sloping surface and a site covering a large surface area has led to ambiguity in the distinction of cultural levels. Occupation levels could be more confidently defined and delineated. A re-examination and reanalysis of artifacts and faunal remains from this site would be possible as well.

The second part of this work examined the importance and prevalence of bison at Wanuskewin within the archaeological sites and through symbolism. Looking at all of the archaeological sites that have been excavated, the Plains bison are consistent and plentiful throughout. They permeate every level of occupation and are a consistent, obviously important presence. This information is then brought into the larger discussion of bison on the prairies, their history, and near extinction. Impacts of this decimation are still felt today throughout the Plains; hte bison are just beginning their return to the lands they once populated in herds of millions. Returning bison to places as a part of conservation herds, with human intervention only to the extent of ensuring genetic diversity and survival, is as close to the pre-1800 bison population and conditions as is possible to attain today. Bison have been returned to many provincial, state, and national parks, as well as tribal and reserve lands throughout the United States and Canada. Relevant to this work is the monumental return of Plains bison to Wanuskewin in 2019. This herd continues the story, importance, and presence of bison in the Opimihaw Creek Valley area as a cultural and conservation herd. The continuing, reemergent presence of bison into today makes the animal and their significance at Wanuskewin even more influential. Ecological and cultural benefits are plenty and the return of bison are a sign of revitalization of the prairies and cultures within.

Additionally, this work is the first to include the petroglyphs that were found at Wanuskewin. These Hoofprint Tradition rock art pieces are another means that demonstrates the

influence and prevalence of the bison. Furthermore, the direct association of this rock art by its close proximity to the Newo Asiniak bison jump proves the importance of the animal from a cognitive lens. Art is connected with spirituality, thought, and belief and expression. These petroglyphs demonstrate the importance of the bison in this regard, beyond a utilitarian significance. When combined with the cranium from the Wolf Willow site, the symbolism of the bison is clear throughout the valley and the archaeology sites.

The importance of bison at Wanuskewin Heritage Park is evident in many different ways. Without a doubt, the bison were paramount to life and culture on the prairies and few places capture this story better than Wanuskewin does. No version of the story of Wanuskewin can be told without bison playing a significant part in it. Wanuskewin and the Opimihaw Creek Valley give insight into the past lives lived on the Plains. Its uniqueness lies in the way that all the information, and all of the stories, are captured in and relate to one defined landscape. This is what makes Wanuskewin and the area it encompasses truly unique, exceptional, and outstanding. It is on the basis of this, the record of bison and people, their interactions and lives, the presences and consistency in the Opimihaw Creek Valley that makes Wanuskewin worthy of designation as a World Heritage Site from the United Nations Educational, Scientific and Cultural Organization (UNESCO). Clearly displaying Outstanding Universal Value, as described in this work, bison are the key part of the story of Wanuskewin.

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Appendix A: Bison Faunal Analysis

Cultural Level 1 Element Quantification: *Bison bison bison*						
Element	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Petrous Temporal	2	1		1	4	2
Maxilla				3	3	1
Jugal		1			1	1
Mandible, Body	1	3		1	5	1
Mandible, Condyle		1			1	1
Mandible, Ramus		1		1	2	1
I_1	2	4			6	4
I_2		2			2	2
I_3	1	1			2	1
Incisor	1	1		1	3	1
P_2		1			1	1
M_2	1	2			3	2
M_3		1			1	1
Mandibular Molar		2		2	4	2
P^2	1	2			3	2
P^3	1	2			3	2
P^4	1			1	2	1
Premolar				2	2	1
M^1	1			2	3	1
M^2	1			1	2	1
Maxillary Molar	2	2		1	5	1
Molars				21	21	2
Cervical Vertebra			1		1	1
Cervical Vertebra (Axis)			1		1	1
Thoracic Verterbra			5		5	1
Lumbar Vertebra			1		1	1
Vertebra, Indeterminate			10		10	1
Rib				44	44	1
Scapula	1	1		5	7	1
Humerus	1	1		10	12	1
Radius	1	2		6	9	2
Ulna	2	1		3	6	2
Unciform		1			1	1
Internal Carpal		2			2	2

Ulnar Carpal	5	1			6	5
Metacarpal		1		1	2	1
Pubis	1				1	1
Ilium				1	1	1
Femur		2		2	4	2
Tibia	1	1		11	13	1
Astragalus		1			1	1
Calcaneus	1	2		1	4	2
Lateral Malleolus	2	3			5	3
Metatarsal	2			2	4	2
First Phalanx (8)	3	4		1	8	1
Second Phalanx (8)	5	4		2	11	2
Third Phalanx (8)	4	2			6	1
Sesamoid				24	24	1
Metapodial				4	4	1
Totals					272	5

Cultural Level 2a Element Quantification: *Bison bison bison*						
Element	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Basicranium			1		1	1
Petrous Temporal	4	2		4	10	4
Temporal Fossa				1	1	1
Maxilla		1		2	3	1
Mandible	3	1		6	10	3
Mandible, Ramus	1			1	2	1
Mandible, Mandibular Condyle	2			1	3	2
Incisor	3	4		1	8	1
P_2	3	1			4	3
P_3	2				2	2
P_4	2				2	2
M_1	1	1			2	1
M_2	1	1			2	1
M_3		1			1	1
Mandibular Molar	1	1		2	4	1
P^2	1	2			3	2
P^3		1			1	1
M^1	2	1			3	2
M^2		1			1	1
M^3		1			1	1
Maxillary Molar	4	4			8	2
Premolar				1	1	1
Molar				28	28	3
Vertebra, Thoracic			5		5	1
Vertebra, Lumbar			2		2	1
Sacrum	2				2	1
Vertebra			14		14	1
Rib	6	4		64	74	1
Scapula		1		4	5	1
Humerus	1	2		17	20	2
Radius	2	2		10	14	2
Ulna	3	4		12	19	4
Fused 2nd And 3rd Carpal	1				1	1
Radial Carpal	1				1	1
Ulnar Carpal		1			1	1

Internal Carpal	1	1			2	1
Unciform	1				1	1
Metacarpal	3			1	5	3
Ilium		1			1	1
Ischium				1	1	1
Femur	1			8	9	1
Tibia		3		21	24	3
Patella	2				2	2
Astragalus	1	3			4	3
Calcaneus	1	1		2	4	1
Lateral Malleolus	3	2			5	3
First Tarsal		1		1	2	1
2nd And 3rd Tarsal	2	3		1	6	3
Fused Central And 4th Tarsal		3			3	3
Metatarsal	1	2		1	4	2
First Phalanx (8)	5	5		1	11	2
Second Phalanx (8)	7	13		1	21	3
Third Phalanx (8)	2	6		1	9	2
Phalanx, Indeterminate				2	2	1
Sesamoid				24	24	1
Metapodial				5	5	1
Totals					403	4

Cultural Level 2b Element Quantification: *Bison bison bison*						
Element	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Petrous Temporal	2	1		3	6	1
Maxilla		1			1	
Mandible	1	2		1	4	2
Frontal, Horn				1	1	1
I_1	2	1			3	2
I_2	2	2			4	2
I_3	3	1			4	3
I_4		1			1	1
Incisor	2			2	4	1
P_2		1		1	2	1
P_3		1			1	1
M_2	1	1			2	1
M_3	1	3			4	3
Mandibular Molar		1			1	1
P^2		1			1	1
P^3	1				1	1
P^4	1				1	1
M^1		1			1	1
M^2				1	1	1
M^3	1				1	1
Maxillary Molar	1	1		1	3	1
Molar				12	12	1
Vertebra, Axis			1		1	1
Vertebra, Thoracic			5		5	1
Vertebra, Lumbar			2		2	1
Sacrum			2		2	1
Vertebra, Caudal			2		2	1
Vertebra			5		5	1
Rib	4	3		37	44	1
Scapula		1		2	3	1
Humerus	1	1		11	13	1
Radius	3	2		3	8	3
Ulna	3			5	8	3
Fused 2nd And 3rd Carpal		2		1	3	2

Radial Carpal	3	1			4	3
Ulnar Carpal		3			3	3
Internal Carpal		2			2	2
Unciform	1	2			3	2
Metacarpal	3	1		1	5	3
Ilium (Blade)	1				1	1
Pubis		2			2	2
Acetabulum	2	1		1	4	2
Femur	1	1		9	11	1
Tibia	1	2		11	14	2
Patella	1				1	1
Astragalus	1	1			2	1
Calcaneus	1	1			2	1
Lateral Malleolus	4	1			5	4
First Tarsal		1			1	1
2nd And 3rd Tarsal		4			4	4
Fused Central And 4th Tarsal	1	4			5	4
Metatarsal		3		1	4	3
First Phalanx (8)	4	3		2	9	1
Second Phalanx (8)	2	4			6	1
Third Phalanx (8)	3	2			5	1
Sesamoid				13	13	1
Metapodial				7	7	1
Totals					268	4

Cultural Level 3 Element Quantification: *Bison bison bison*						
Element	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Occipital Condyle	1				1	1
Petrous Temporal				1	1	1
Maxilla				2	2	1
Mandible		1		6	7	1
Mandible, Ramus	2				2	2
Mandible, Mandibular Condyle		1			1	1
I_1	1	1			2	1
I_2		1			1	1
I_3		1			1	1
I_4		1			1	1
Incisor	1	2			3	1
P_2		1			1	1
M_2	1	2			3	2
M_3	2	1			3	2
Mandibular Molar	1	1		2	4	1
P^2		3			3	3
P^3	1	1			2	1
P^4	1	2			3	2
M^1		1		2	3	1
M^2		4		3	7	4
Maxillary Molar	2	4		1	7	1
Vertebra, Cervical			2		2	1
Vertebra, Thoracic			7		7	1
Vertebra, Lumbar			1		1	1
Sacrum			2		2	1
Vertebra, Caudal			1		1	1
Vertebra			11		11	1
Rib	3	3		69	75	1
Scapula	1	1		10	12	1
Humerus	2	4		7	13	4
Radius	3	5		8	16	5
Ulna	3	2		10	15	3
Fused 2nd And 3rd Carpal	1	1		1	3	1
Radial Carpal		3			3	3
Ulnar Carpal	1	1			2	1

Internal Carpal	5	3			8	5
Unciform	3	1			4	3
Accessory Carpal				1	1	1
Metacarpal	1	1			5	1
Ilium	1			2	3	1
Ischium	1			1	2	1
Acetabulum	1	2			3	2
Os Coxa				1	1	1
Femur	3	2		11	16	3
Tibia	1	5		16	22	5
Astragalus	1	1		1	3	1
Calcaneus	2	2		2	6	2
Lateral Malleolus	1	8			9	8
First Tarsal	1	1			2	1
2nd And 3rd Tarsal	2			1	3	2
Fused Central And 4th Tarsal	1	3		1	5	3
Metatarsal	2	2		1	5	2
First Phalanx (8)	11	4		3	18	3
Second Phalanx (8)	5	6		1	12	2
Third Phalanx (8)	6	5			11	2
Sesamoid				9	9	1
Metapodial				6	6	1
Totals					375	8

Cultural Level 4 Element Quantification: *Bison bison bison*						
Element	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Basisphenoid			1		1	1
Cranium			1		1	1
Frontal				1	1	1
Maxilla				4	4	1
Mandible	2	1		7	10	2
Mandible, Condyle		1			1	1
Palatine				1	1	1
Petrous Temporal		3		2	5	3
Occipital			1		1	1
Occipital Condyle	1				1	1
P_2	1	1			2	1
P_3	2				2	2
P_4	3				3	3
M_1	2	1			3	2
M_2	4				4	4
M_3	2	1			3	1
Mandibular Molar	1	1			2	1
Maxillary Premolar	1				1	1
P^2	1				1	1
P^3	1				1	1
M^1		2			2	2
M^2		1			1	1
M^3		1			1	1
Maxillary Molar	1	3			4	1
Molar				9	9	1
Cervical Vertebra			3		3	1
Cervical Vertebra (Atlas)			1		2	1
Cervical Vertebra (Axis)			1		1	1
Thoracic Verterbra			5		5	1
Lumbar Vertebra			3		3	1
Vertebra			3		3	1
Rib	3	3		50	56	1
Scapula	1	2		5	8	2
Humerus	2	1		10	13	2
Radius	2	4		11	17	4

Ulna	1	2		6	9	2
Radial Carpal	4	1			5	4
Ulnar Carpal	3	2			5	3
Internal Carpal	2	1			3	2
Fused 2nd And 3rd Carpal	1	2			3	2
Unciform		3			3	3
Metacarpal	3	5		5	13	5
Fifth Metacarpal	1				1	1
Ilium	1	2		2	5	2
Ischium	1	2		1	4	2
Pubis	2	1		4	7	2
Femur	1	1		6	8	1
Patella	1	1			2	1
Tibia	3	2		9	14	3
Astragalus	2	3		1	6	3
Calcaneus	5	2		5	12	5
First Tarsal		1			1	1
Fused Central And 4th Tarsal	2	5			7	5
Fused 2nd And 3rd Tarsal	1	2			3	2
Lateral Malleolus		2			2	2
Metatarsal	1	3		4	8	3
First Phalanx	8	5		1	14	2
Second Phalanx	7	6		2	15	2
Third Phalanx	8	4			12	2
Metapodial				5	5	1
Sesamoid				5	5	1
Totals					348	5

Cultural Level 5 Element Quantification: *Bison bison bison*						
Element	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Basisphenoid			1		1	1
Frontal, Orbit	1				1	1
Maxilla				2	2	1
Mandible	1	1		2	4	1
Petrous Temporal				2	2	1
Occipital, Temporal Fossa		1			1	1
Temporal		1			8	1
Temporal, Jugal Arch		1			1	1
P_2		2			2	2
Mandibular Molar		1			2	1
Premolar				1	1	1
P^3		1			1	1
P^4		1			1	1
M^1		2			2	2
M^2		2			2	2
M^3		1			1	1
Maxillary Molar				6	6	1
Molar				1	1	1
Thoracic Verterbra			1	1	2	1
Lumbar Vertebra			2	1	3	1
Vertebra			2		2	1
Rib	8	2		29	39	1
Scapula	2	2		3	7	2
Humerus	3	1		6	10	3
Radius	3	1		5	9	3
Ulna	3			2	5	3
Radial Carpal	1	1			2	1
Internal Carpal		1			1	1
Fused 2nd And 3rd Carpal	3				3	3
Unciform	2			1	3	2
Accessory Carpal		1			1	1
Metacarpal	2	1		2	5	2
Ilium				1	1	1
Pubis	1				1	1
Acetabulum	1				1	1

Femur	1	2		1	4	2
Tibia	2			2	4	2
Astragalus	3	1			4	3
Calcaneus	3	2			5	3
Fused Central And 4th Tarsal	1	2			3	2
Lateral Malleolus	1				1	1
Metatarsal	1	3			4	3
First Phalanx	1	3			5	1
Second Phalanx	1	4			5	1
Third Phalanx	3	3			6	1
Sesamoid				6	6	1
Totals					181	3

Appendix B: Non-Bison Faunal Analysis

Cultural Level 1 Element Quantification: Non-bison								
Common Name	**Taxon**	**Element**	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Bird	Aves	Bone Frag				1	1	1
Canid	*Canis* sp.	Cranial Frag				3	3	1
		Mandibular Molar 2		1			1	1
		Maxillary Molar 1	1	1			2	1
		Maxillary Molar 2		1			1	1
		Maxillary Molar 3		1			1	1
		Lumbar Vertbra			1		1	1
		Radial Carpal		1			1	1
		Fourth Tarsal	1				1	1
		First Metacarpal		1			1	1
		Metapodial				1	1	1
		Proximal Phalanx				3	3	1
		Intermediate Phalanx				1	1	1
		Enamel Frag				1	1	1
North American Beaver	*Castor canadensis*	Humerus	1				1	1
Cricetid Rodent	Cricetinae sp.	Mandible			1		1	1
Snowshoe hare	*Lepus americanus*	Scapula	1				1	1
Rabbit	*Lepus* sp.	Frontal Bone	1				1	1
Northern Pike	*Esox lucius*	Vertebra			1		1	1
Small Rodent	Rodent sp.	Mandible	1	3			4	3
		Femur		3			3	3
Mammal	Small mammal	Rib				4	4	1
		Cranial Frag				1	1	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	Maxilla	1				1	1
American Badger	*Taxidea taxus*	Rib	1				1	1
Red Fox	*Vulpes vulpes*	Incisor	2				2	1

		Maxillary Premolar 4	1	1			2	1
		Maxillary Premolar 3		1			1	1
		Canine				2	2	1
		Maxillary Molar 1	1	1			2	1
		Maxillary Molar 2		1			1	1
		Premaxilla Frag	1				1	1
Fox	*Vulpes* sp.	Third Phalanx					1	1
Freshwater Clam	Unionidae	Shell Fragment				5	5	3

Cultural Level 2a Element Quantification: Non-bison								
Common Name	**Taxon**	**Element**	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Pronghorn	*Antilocapra americana*	Fused Central and Fourth Tarsal	1				1	1
		Ulnar Carpal		1			1	1
		Metatarsal				1	1	1
		Metapodial				1	1	1
Canid	*Canis* sp.	Mandibular Premolar					1	1
		Premolar					1	1
		Dentary	1				1	1
		Mandibular Ramus		1			1	1
		Maxillary Molar Root					1	1
		Thoracic Vertebrae			1		1	1
		Metatarsal 4 Proximal End	1				1	1
		Metatarsal 5 Proximal End	1				1	1
		Metacarpal 5		1			1	1
		Metapodial					1	1
		First Phalanx	1				1	1
		Ilium Acetabulum Frag	1				1	1
Beaver	*Castor canadensis*	Distal Humus	1				1	1
		Mandibular Condyle	1				1	1
Rabbit	*Lepus* sp.	Scapula	1				1	1
Rodent	Rodent sp.	Distal Humerus	1				1	1
		Tibia				1	1	1
		Femur	1				1	1
		Ulna	1				1	1
		Mandible	1				1	1
Richardson's Ground squirrel	*Spermophilus richardsonii*	Mandible	1				1	1
		Femur		1			1	1
Freshwater clam	Unionidae	Shell				3	3	2

Cultural Level 2b Element Quantification: Non-bison								
Common name	**Taxon**	**Element**	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Ammonite	Cephalopoda	Ammonite (Fossil)				1	1	1
Pronghorn	*Antilocapra americana*	Metapodial, Condyle				1	1	1
Canid	*Canis* sp.	Incisor					1	1
		Incisor, Maxillary 2	1				1	1
		Incisor, Maxillary 3	1				1	1
		Canine		1		1	2	1
		Premolar 2, Mandibular		1			1	1
		Premolar 3, Mandibular		1			1	1
		Premolar 4, Mandibular	1	1			1	1
		Molar 1, Mandibular	1			1	2	1
		Molar 2, Mandibular	1				1	1
		Molar 3, Mandibular	1				1	1
		Mandibular Molar		1			1	1
		Mandible, Ramus		1			1	1
		Mandible		1		1	1	1
		Cervical Vertebra			1		1	1
		Caudal Vertebra			1		1	1
		Indeterminate Vertebra			2		2	1
		Radius					1	1
		Ulna	1			1	2	1
		Metatarsal 4	1				1	1
		Metatarsal 5	1				1	1
		Metapodial Shaft				2	2	1
		1st Phalanx				1	1	1
Beaver	*Castor canadensis*	Molar					1	1
		Thoracic Vertebra			1		1	1
Small Rodent	Rodent sp.	Mandible		1			1	1

Shark	Chondrichthyes	Tooth					1	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	Maxilla	1	1		1	3	2
		Mandible		1		1	2	1
		Incisor				1	1	1
		Femur				1	1	1
Northern Pocket Gopher	*Thomomys talpoides*	Cranial				1	1	1
Freshwater clam	Unionidae	Shell				1	1	1

Cultural Level 3 Element Quantification: Non-bison								
Common Name	**Taxon**	**Element**	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Duck	*Anas* sp.	Ulna	1				1	1
Pronghorn	*Antilocapra americana*	Lumbar Vertebra			1		1	1
Canid	*Canis* sp.	Incisor					1	1
		Second Maxillary Molar	1				1	1
		Canine					1	1
		Premolar					3	1
		Molar					2	1
		Mandible		1			1	1
		Mandible, Condyle	1				1	1
		Maxilla	1	1			2	1
		Temporal				1	1	1
		Basihyoid			1		1	1
		Cervical Vertebra			2		2	1
		Caudal Vertebra			2		2	1
		Ulna	1				1	1
		Third Metacarpal	1				1	1
		Metapodial					1	1
		Third Phalanx					2	1
Beaver	*Castor canadensis*	Humerus	1				1	1
White-Tailed Jackrabbit	*Lepus townsendii*	Humerus		1			1	1
Microtid Rodent	Microtinae	Mandible	2				2	2
Muskrat	*Ondatra zibithecus*	Maxillary Incisor	1				1	1
Small Rodent	Rodent sp.	Mandible	1	1			2	1
		Scapula	1				1	1
		Humerus		1			1	1

		Incisor	1	1			2	1
Richardson's Ground Squirrel	*Spermophilus richardsonii*	Os Coxa		1			1	1
American Badger	*Taxidea taxus*	Mandibular Condyle		1			1	1
Freshwater Clam	Unionidae	Shell				1	2	1

Cultural Level 4 Element Quantification: Non-bison								
Common name	**Taxon**	**Element**	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Bird	*Aves*	Bone Frag				1	1	1
Canid	*Canis* sp.	Basioccipital			1		1	1
		Maxillary Incisor				1	1	1
		Third Incisor	1	1			1	1
		Mandibular Incisor	2	1			3	1
		Premolar Root				1	1	1
		Mandibular Molar				1	1	1
		Mandible	2				2	1
		Tibia	1				1	1
		Astragalus		1			1	1
		Calcaneus	1				1	1
		Second Metatarsal		1			1	1
		Fourth Metatarsal	1				1	1
		Fifth Metatarsal	1				1	1
		Phalanx				1	1	1
White-tailed Jackrabbit	*Lepus townsendii*	Scapula	1				1	1
Microtid rodent	*Microtinae* sp.	Mandible	2	1			3	2
Mammal	Medium-Large Mammal	Proximal Phalanx				1	1	1
	Small Mammal	Maxilla	1				1	1
		Petrous Temporal	1				1	1

Rodent	Rodent sp.	Femur	1				1	1
		Incisor				1	1	1
		Mandible	1				1	1
		Vertebra			1		1	1
Freshwater clam	Unionidae	Shell				1	4	1

Cultural Level 5 Element Quantification: Non-bison								
Common Name	**Taxon**	**Element**	**Right**	**Left**	**Axial**	**Indeterminate**	**NISP**	**MNI**
Pronghorn	*Antilocapra americana*	Calcaneus		1			1	1
		Long Bone Frag				1	1	1
Canid	*Canis* sp.	Dentary		1			1	1
		Temporal		1			1	1
		Mandible, Condyle	2				2	2
		Calcaneus	2				2	2
		Third Metatarsal	1				1	1
		Proximal Phalanx				1	1	1
		Intermediate Phalanx				1	1	1
Cricetid rodent	Cricetinae	Mandible	1				1	1
Small rodent	Rodent sp.	Mandible, Molars In	1				1	1
		Humerus		1			1	1
		Femur	1				1	1
		Sacrum			1		1	1
Northern Pocket Gopher	*Thomomys talpoides*	Mandible		1			1	1
Freshwater clam	Unionidae	Shell				2	2	1