A 3000 YEAR OLD NATIVE CAMPSITE AND TRADE CENTRE AT THE FORKS

Compiled by

Sid Kroker
Director, The Forks Public Archaeology Project

and

Pam Goundry
Quaternary Consultants Ltd.

Contributions by:

Pam Goundry
Barry B. Greco
Sid Kroker
T. Geoff Marr
Erik Nielsen
Lionel Robert and Terry A. Dick
C. T. Shay and D. M. Deck
Eric Simonds

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SYNOPSIS

The 1992 Public Archaeology Project at The Forks began on July 23 and continued until September 6, allowing 167 participants the opportunity to investigate Manitoba's archaeological heritage. A brief school program provided a hands-on program for 194 students and observatory programming for an additional 423 students. During the seven weeks of public programming, 37,291 visitors came to the site to observe, ask questions, tour the lab, and chat with the staff and participants.

The site was located in The Forks Renewal Corporation Archaeological Preserve, established on the north bank of the Assiniboine River. A tent protected the excavation site and on-site laboratory facilities were housed in a large trailer. The program employed eight archaeologists, a coordinator, and two site interpreters. Post-season analyses were carried out under contract arrangements.

During the project, an area encompassing 42 square meters was excavated. Two archaeological horizons were encountered, both dating to the Archaic Period. The upper occupation stratum (Zone 1) is tentatively dated to 2200 years ago and is seen as representative of a short-term occupation by a small group of people. Due to budgetary constraints, most of the 3000+ artifacts from this horizon remain unanalyzed at the time of publication. The second occupation stratum (Zone 3 and the disjunct Zone 3B) is tentatively dated to 3000 years ago. This horizon (the primary focus of the project) was quite dense and yielded 80,490 artifacts - 80% of which were fish remains.

The range of recoveries shed new light into the lifeways of the different groups who met, traded, fished, and hunted at The Forks. Diagnostic projectile points indicate that three different groups were present. The range of lithic materials indicates that these peoples had access to source areas in North Dakota, eastern Manitoba, western Manitoba, southwestern Manitoba, and the Lake Superior region. The recovered artifacts indicate that a range of activities occurred at the excavation location - boneworking, woodworking, shellworking, clothing manufacture, food preparation, and food processing. Even though a strong orientation toward fishing was evident in the faunal recoveries, many other species were part of a wide-ranging subsistence strategy.

Some artifacts, more than others, can provide a glimpse into the past and contribute to the understanding of the people who lived at this place so long ago. The shell beads, manufactured at the site, tell us that these people had the leisure time to make aesthetic artifacts for adornment. A unique bone toggling harpoon point was recovered. This artifact represents a degree of sophisticated fishing technology that had previously only been found to occur on ocean coasts. A great deal of effort, reflected in the superb workmanship, was spent during the manufacture of this harpoon point. One can sense that the fisherman had great pride in his tool-making skills.

However, even though certain artifacts can be singled out for special comment, it is the totality of the recoveries and the contextual associations that tell us most about the past and the people who stayed at The Forks. The artifact analyses provide information about the environment at the site and some of the activities that occurred there: the people fished and hunted, they dried or smoked the large quantities of fish for winter food supplies, they harvested plants and berries from the forest along the river banks, and they met and traded with people from other areas.

GOALS AND OBJECTIVES

The 1992 Public Archaeology Project had two distinct foci, each with its own specific goals and objectives. The primary focus was the investigation, through archaeological research, of the 3000 year Native occupation horizon that was located during the 1988 impact assessment. The secondary focus, that of public education, was carried out in conjunction with the archaeological research program and in such a manner that the scientific integrity of the research was maintained. In addition, the project was an interpretation vehicle, wherein members of the public and the school system participated in the "hows" and the "whys" of archaeology.

The goals of the research component of the project were:

1. to obtain artifactual and stratigraphic data that would provide evidence about interaction of different groups of Native peoples who met at The Forks;
2. to test the hypothesis that the campsite had been established as a trade centre;
3. to correlate 1992 artifact recoveries with those from the 1988 project and subsequent mitigative activities in 1990 to develop a more complete picture of the activities occurring at the site during this period of occupation;
4. to investigate the seasonality of the occupation site;
5. to obtain data about subsistence activities that had occurred at the occupation site;
6. to obtain data that would help clarify the complex soil stratigraphy at the site;
7. to facilitate interdisciplinary investigations into the natural history of The Forks.

The goals of the public component of the program were:

1. to fulfil the public mandate of heritage interpretation at The Forks for the community and visitors;
2. to demonstrate the role of archaeological fieldwork in the recovery and interpretation of heritage resources at The Forks;
3. to provide hands-on experience for interested members of the public who wished to participate in archaeological studies under supervision by professional researchers;
4. to obtain tangible historical evidence that The Forks was used as a meeting place and to provide a link between the past, present, and future;
5. to make the public aware of the significance of The Forks and its archaeological resources;
6. to provide an opportunity for school groups to use the project as part of their social science curriculum;
7. to involve the community-at-large in heritage programming at the site;
8. to help make downtown Winnipeg a focus of attention for residents and visitors.

FOREWORD AND ACKNOWLEDGEMENTS

The report on the 1992 Public Archaeology Project at The Forks is the culmination of considerable effort by many individuals. The format is a departure from that which was used in previous years. Due to the plethora of artifacts and the different areas of expertise required to undertake analysis of the various types of recoveries, this document is a thematic compilation of the analytic reports.

Each chapter, especially those which analyze and interpret classes of recoveries, is seen as a discrete component of the analytic process. Thus, each author's style is intact, with only syntactical editing. In many cases, these chapters could be 'stand alone' reports and are united by the commonality of the resource from which they derive.

The Project Director would like to acknowledge the assistance of many people throughout the duration of the project. First, the invaluable assistance of Pam Goundry (co-compiler) is acknowledged. She undertook the myriad minutiae that occur during the development of first draft reports into camera-ready copy - reviewing, editing, collating text and graphics, cross-checking, and formatting.

The able efforts of the analysts is appreciated. The contributors to this report have provided further understanding of the heritage at The Forks. Special thanks must be proffered to Erik Nielsen (Manitoba Energy and Mines) and Lionel Robert and Terry Dick (University of Manitoba, Zoology Department) who provided their services *pro bono*. The other analysts [Pam Goundry, Barry Greco, Geoff Marr, C. T. Shay and D. M. Deck, and Eric Simonds) made order from large quantities of data within a tight timeframe.

Appreciation is extended to all staff members of the 1992 project who coped admirably with inclement weather as well as with the normal exigencies of a public archaeology project. My thanks to Marti Brauner, Gilbert Chartrand, Catherine Flynn, Pam Goundry, Barry Greco, Zoë Kogan, Geoff Marr, Laura MacLean, Kate Peach, Eric Simonds, Lee-Anne Smith, and Paul Speidel.

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Thanks are also proffered to all the people who provided behind-the-scenes assistance. These include Nick Diakiw, Al Baronas, Marilyn Williams, Paul Jordan and the rest of the staff at The Forks Renewal Corporation; Mike Fay, Bill Fox, Mary Ann Tisdale, Liann Roberts and other staff of both the Archaeology Section - Prairie and Northern Region and The Forks National Historic Site of Canadian Parks Service; Gary Dickson and the staff at Historic Resources Branch, Manitoba Culture, Heritage and Citizenship; and Paul Melanson and the Board of Directors of The Forks Public Archaeological Association, Inc.

In acknowledgement of the support and appreciation of the members of the public, this document is dedicated to the participants of the 1992 Public Archaeology Project at The Forks.

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1.0 INTRODUCTION

by *Sid Kroker*

The Forks Public Archaeology Project was implemented as a large-scale participatory public archaeology program at The Forks in 1989 (Kroker, Goundry *et al.* 1990). At this time, it was a unique project for Manitoba and one of a few throughout North America.

Various types of public archaeology programs occur throughout the world. Most are predominately observatory, wherein members of the public are encouraged to watch professional archaeologists at work, while others are participatory. Many of the participatory projects have qualification requirements, either requiring prior experience or a lengthy time commitment, or both. In addition, they often charge a considerable fee. These projects are located in the United States, England, and Israel as well as other countries.

The Forks Public Archaeology Project, conducted in 1989, 1990, 1991, and 1992 at junction of the Red and Assiniboine Rivers in Winnipeg, has been accessible to the public in that prior experience was not required and that the registration fees were nominal. In addition, the project has maintained a seven-day cycle. Each of the two components, participatory and observatory, was operated on independent, over-lapping schedules. The participatory program operated five days per week (Thursday through Monday). This format was chosen to:

1. increase accessibility of the program for those individuals who work the standard week; and
2. provide a view of archaeology-in-action for the increased number of weekend visitors.

The observatory program was maintained on a seven-day schedule by staggering the Site Interpreters' work week. An interpreter was always present at the site, especially during the two mid-week days when the participatory program was not occurring. In addition, their work day continued into the early evening to accommodate visitors who attended the site after the excavations had ceased for the day.

During the four seasons of operation, more than 130,000 people have visited the project as observers. These visitors have included Canadians from every province and territory, Americans from more than 40 different states and international tourists from at least 60 countries. The hands-on programs have given members of the public and school students the opportunity to participate in the recovery of their history. Special lecture tours have been provided for students and other groups.

The influence of The Forks Public Archaeology Project is obvious. Several public-oriented archaeological projects have been undertaken in Manitoba since 1989: the annual continuation of the Public Program at The Forks (Kroker, Greco *et al.* 1990; Kroker *et al.* 1991; Kroker *et al.* 1992), a three year project at the Manitoba Glass Works near Beausejour (Spice 1991; D. McLeod 1991:pers. comm.; E. Simonds 1993:pers. comm.); and preliminary investigations for a public program focusing on Fur Trade and early Historic sites near Souris (Nieuwhof 1990). The demonstrated success of The Forks Public Archaeology program has resulted in a decision by Canadian Parks Service to develop similar public-accessible archaeology projects at Battleford and Fort Walsh, Saskatchewan (M. Fay 1991:pers. comm.).

1.1 Planning for the 1992 Project

As in 1991, the Public Archaeology Project was under the management of the Board of Directors of The Forks Public Archaeological Association. Under the aegis of the Operations Committee, which met with the 1991 Project Director (Sid Kroker) and representatives of the funding agencies, a workplan and budget for the 1992 project were developed. The details of the planning are discussed in Section 12.

The Operations Committee recommended that the 1992 project be located at the Archaeological Preserve, established by The Forks Renewal Corporation, on the north bank of the Assiniboine River adjacent to the Wall Through Time (Figure 1-1). The decision to relocate from the site of the previous three years of operation was based upon several factors. An extensive 3000 year old cultural horizon is known to occur at the Archaeological Preserve (Kroker 1989; Kroker and Goundry 1993). This horizon is considered to be a representation of a major trade centre and campsite used by different groups of people who met at The Forks. In addition, it was felt that the new focus would provide further information about the richness and duration of the Aboriginal presence at The Forks.

The 1992 project was funded by three agencies: Canadian Parks Service (CPS), The Forks Renewal Corporation (FRC), and Historic Resources Branch of Manitoba Culture, Heritage and Citizenship (HRB). Details of funding, project organization and project staffing are discussed in Section 9.

1.2 Scope of the 1992 Public Archaeology Program

The first day of public participation was July 23, 1992 and the school program ended on September 18, 1992. Thirty-five days were allocated for general public participation, with an additional six days for school programming. During the program, inclement weather and construction activities eliminated three days, resulting in 32 general public days. A total of 167 individuals and 194 students participated in the hands-on component. An additional 423 students received in-depth lecture programs (Appendix B). Throughout the project, 37,291 people visited the site to observe the operations, to listen to the interpreters, to pick up brochures detailing the project (available in Cree, Saulteaux, French, and English) and to talk with professional archaeologists. This number, occurring within the 53 days of on-site interpretation, reflects the high degree of interest among the general public concerning heritage and, more specifically, archaeological activities.

1.3 References

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment*. The Forks Renewal Corporation, Winnipeg.

Kroker, Sid and Pamela Goundry

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay*. The Forks Renewal Corporation, Winnipeg.

Kroker, Sid, Pamela Goundry, Leigh Hambly and Karen Lawlor

1990 *The Forks (1989) Pilot Public Archaeology Project: Administrative Report*. Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Kroker, Sid, Barry B. Greco, Arda Melikian and David K. Riddle

1990 *The Forks (1989) Pilot Public Archaeology Project: Research Report Excavations at 21K (Fort Gibraltar I)*. Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Kroker, Sid, Barry B. Greco and Kate Peach

1992 *1991 Investigations at Fort Gibraltar I: The Forks Public Archaeology Project*. The Forks Public Archaeological Association, Inc., Winnipeg.

Kroker, Sid, Barry B. Greco and Sharon Thomson

1991 *1990 Investigations at Fort Gibraltar I: The Forks Public Archaeology Project*. Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Nieuwhof, Peter

1990 "The Lauder Project." Manuscript on file with Manitoba Heritage Federation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Spice, Kevin

1991 "An Archaeological Investigation of the Manitoba Glass Works Historic Site, May - September, 1990." Manuscript on file with Manitoba Heritage Federation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

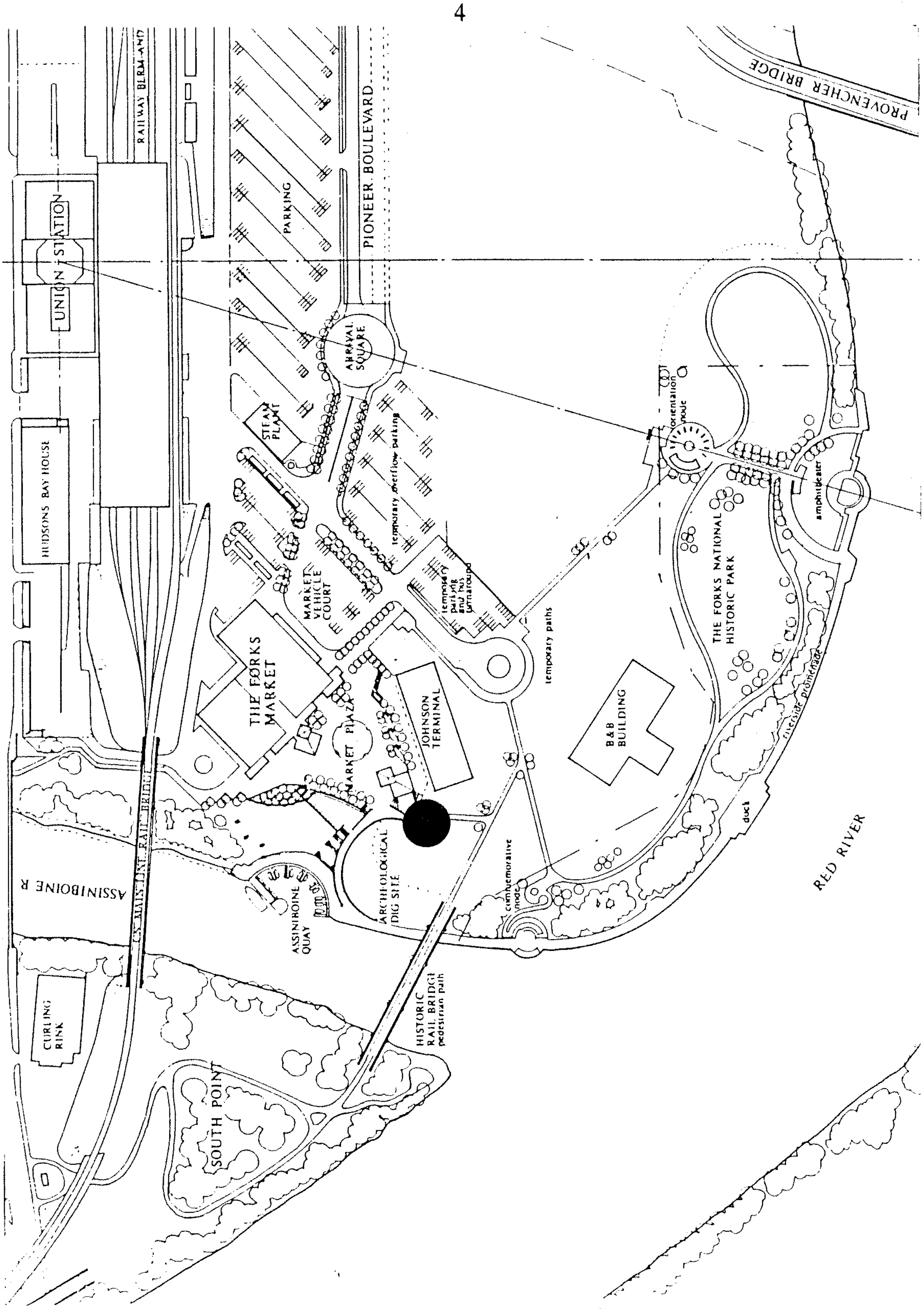


Figure 1-1: Map of The Forks
(Courtesy of The Forks Renewal Corporation)

2.0 HISTORICAL BACKGROUND

by *Sid Kroker*

The Forks became accessible for archaeological investigation in 1984 (Priess *et al.* 1986) during the planning phases for the creation of The Forks National Historic Site. Numerous archaeological projects have taken place at this site since 1988. Many of these projects resulted from development plans arising from the transfer of the East Yard from Canadian National Railway to The Forks Renewal Corporation and Canadian Parks Service. These projects have included impact assessments, mitigative operations, and research-oriented projects as well as the Public Archaeology Program.

This brief overview is presented to enable the reader to place the 1992 discoveries in a chronological framework. For those who are interested in additional reading, the references cited in this section provide a starting point. An extensive list of references can be found in *The Forks Archaeological Impact Assessment and Development Plan* (FRC 1988:Appendix C).

2.1 The First Inhabitants (8000 B.C. - A.D. 1737)

Archaeological investigations at The Forks have yielded some information on the earliest period of Manitoba history. Recent archaeological work at The Forks has shown that human occupation of the site area may date as far back as 6000 years ago (Kroker and Goundry 1990). While the quantity of data is still not large, it correlates with and confirms information derived from other parts of the province.

Approximately 9000-10000 years ago, Glacial Lake Agassiz drained from the Winnipeg area (Fenton *et al.* 1983; Last and Teller 1983; Teller and Thorleifson 1983). The region would have been colonized by both plants and animals and, subsequently, by people utilizing the new food sources. The first occupation of The Forks likely occurred shortly after the lake waters drained into Hudson Bay. The people were bison hunters, who followed the herds into this area from the south and the west (Pettipas and Buchner 1983:444).

The recession of the glacial waters was followed by a long-term warming trend known as the *Altithermal* (or *Hypsithermal*). The Altithermal has been variously dated: 7000-2500 B.C. with the maximum temperatures occurring at 3500 B.C. (Last and Teller 1983); 4000-1000 B.C. with a maximum at about 2000 B.C. (Ritchie 1983:167); and 6000-2000 B.C. with the warmest period about 5200 B.C. (Ashworth and Cvancara 1983; Webb *et al.* 1983:162). The variations in time periods are the result of research in different areas; not all locations experienced the same climatic shifts at the same time.

The Altithermal was characterized by drought conditions, which likely caused the bison herds to abandon the central prairies. With a change in the availability of bison, human populations would have had to rely on a more varied diet of small game, fish and plants. Habitation sites would have been close to permanent sources of water. During construction activities at The Forks, the remnants of two campfires were discovered on the north bank of the Assiniboine River. These campfires, containing charred fish bone, are estimated to be 6000 years old (4000 B.C.) (Kroker and Goundry 1990:162).

2.1.1 The Archaic Period

By 3000 B.C., distinctly different ways of life had been developed by groups of people who lived on the prairies and by those who lived in the Boreal Forest. The period, from 3000 B.C. to about A.D. 1, is archaeologically known as the *Archaic* Period. Places like The Forks became important locations where these different groups of people came to trade with others from different regions. In this way, products of the forest were available to people of the south and products of the prairies were accessible to the people of the south and west.

A major requirement for a trade centre campsite would be ease of access for the different groups. The Red and Assiniboine Rivers would have provided water transportation routes from the south, the north and the west. In addition, food resources would have had to be sufficient to provide for many people for a considerable period. At The Forks, the rivers would have provided fish, the gallery forest would have provided small game, herbs, berries, and nuts, and the plains to the west would have been the location of migrating bison herds.

A major occupation horizon of the Archaic period was discovered in 1988 (Kroker 1989). Other occupations of the same time period were located in 1989 and 1990 (Kroker and Goundry 1990, 1993). The initial recoveries suggested that the junction of the two rivers was an important meeting place, used by the Aboriginal peoples as a fishing location and a trade centre. Lithic materials from widespread source areas and a diagnostic projectile point provided evidence for the hypothesis that two or more groups of people would meet at The Forks on an annual basis (Kroker 1989). This report provides further details about the lifeways of these people, whose activities resulted in these cultural deposits at The Forks.

2.1.2 The Woodland Period

Post-A.D. 1, an important technological innovation was introduced into southern Manitoba from the east. A forest-adapted culture in southeastern Manitoba began making ceramic containers, primarily using the coil technique. These containers, distinguished by various decorative markings, have been archaeologically designated as *Laurel* (Manitoba Culture, Heritage and Recreation 1989). Evidence of peoples of this culture has been found throughout the southern Boreal Forest and from the Red River to the Manitoba/ Ontario border. In some areas, the Laurel culture lasted until A.D. 1000.

In southern Manitoba, a new pottery manufacturing technique with a different decorative style serves to denote the *Blackduck* culture. Sherds from vessels of this style are the earliest to be recovered at The Forks (Priess *et al.* 1986; Quaternary 1988, 1989, 1990; Kroker 1989; Kroker and Goundry 1990; Adams *et al.* 1990). Several radiocarbon dates have been obtained from charcoal and animal bone associated with these ceramics. These dates, published in the above reports, range from A.D. 510 to A.D. 1450. Current evidence indicates that Blackduck and subsequent ceramic traditions (Lenius and Olinyk 1990) continued until the advent of the Fur Trade.

Another ceramic tradition, the *Selkirk* tradition, developed in northern Manitoba around A.D. 1000 and expanded southward (McLeod 1987:48). Although the peoples of the Selkirk culture would have used The Forks, they lived primarily to the north and to the east of this area. Several sites in the Red River area have yielded Selkirk ceramics (FRC 1988:39).

Unfortunately, no firm information is available to link groups of the late Pre-Contact period with those groups who were in the area when the first recorded Europeans arrived in 1737. During the period immediately preceding the Fur Trade era, Cree, Ojibwa/Saulteaux and Assiniboine groups regarded the area of The Forks as their territory. The Sioux/Dakota oral tradition makes reference to visitations to The Forks.

2.2 *Contact Period (1737-1821)*

The Forks area was used during the 18th and early 19th centuries by several Native groups, by parties of explorers, by two major fur trading companies, and by independent traders. The visitations were usually temporary; few long-term occupations have been recorded and few descriptive records exist of these occupations.

La Verendrye, invited to The Forks by the Assiniboine nation, was the first known European to visit the area. During his first visit in 1737, two villages of Assiniboine occupied The Forks; in 1738 ten cabins of Cree were present. Fort Rouge was established in 1738 by M. de Louviere, a compatriot of La Verendrye (Guinn 1980a:33). The fort was abandoned by 1749. Disagreement exists as to whether this structure was located on the north bank or the south bank of the Assiniboine River (Coutts 1988:36).

Archival records indicate that the French explorer, Jacques de Saint Pierre, had a winter camp at The Forks in 1752-1753, perhaps at the ruins of Fort Rouge (Coutts 1988:38). Independent Montreal-based traders Bruce and Boyer established a winter camp (1781-1782) in the area. In 1793, McKay reported a camp of Nor'Westers present. Alexander Henry, a partner in the North West Company, reported members of that company made regular use of The Forks area from 1800 to 1808. Alexander Henry visited the location on numerous occasions and Louis Dorion over-wintered during 1803-1804 (Coutts 1988:76-77).

By the turn of the 19th century, despite fear of attacks by the Sioux, several Métis families had settled at The Forks. They worked as commercial buffalo hunters for the North West Company (Guinn 1980a:24; Coutts 1988:8).

2.2.1 Fort Gibraltar I (1810-1816)

Due to the fact that The Forks was becoming an important transfer point for the North West Company after 1800, the company appears to have had a semi-permanent presence at the junction of the Red and Assiniboine Rivers. The cargoes of trade goods from Montreal were broken into smaller shipments for transport to the inland posts, while the bales of fur, obtained by the wintering partners, were combined for shipment to the east.

During the summer of 1810, John Willis, a *bourgeois* with the North West Company began building Fort Gibraltar at The Forks as a central post to handle the transfer of goods and furs. In addition, Fort Gibraltar become the focal point of the pemmican industry, with supplies being brought here, stockpiled and then transported to the smaller posts.

The post, constructed with the assistance of craftsmen from the local Métis community, was finished by the following winter. One of the workers, Jean Baptiste Roi, described the establishment.

> *It was a wooden picketing, made of oak trees split in two, which formed its enclose. Within the said enclosure were built the house of the partner, 2 houses for the men, a store, two hangards or stores, a blacksmith's shop and a stable; there was also an ice-house with a watch-house (guerite) over it; these houses were good log houses, large and inhabited. In the house of the partner were his clerks and interpreters, and in the other house his engage (servants) to the number of eight or ten men; each of the houses could have contained twenty men* (Coutts 1988:79-80).

Another workman, Jean Baptiste Mennie, also provided a description of the fort:

> *We were employed a whole year building. In the winter there were twenty men there who were all employed. The fort was built by one Mr. Willis, who died there and was succeeded by Mr. Duncan Cameron. There were in the fort one house, sixty-four feet long, one of thirty, a kitchen of fifteen feet, another house twenty-eight feet, a store twenty-two feet and other buildings* (Coutts 1988:80).

The first Selkirk Settlers arrived in 1812 and they became caught up in the conflict between the North West Company and the Hudson's Bay Company. The settlers and the HBC employees constructed Fort Douglas (also called the Colony Fort) in 1814. This post was located on Point Douglas, approximately 2.5 km downstream from Fort Gibraltar. In 1815, the Nor'Westers, after most of the Selkirk Settlers had left for eastern Canada or York Factory, destroyed the largely abandoned HBC establishment. The York Factory contingent of the Selkirk Settlers returned and rebuilt Fort Douglas during the winter of 1815-16. In the spring of 1816, Colin Robertson, Robert Semple and a group of HBC men and settlers, seized Fort Gibraltar. Robertson noted that the fort

> *...is certainly in an excellent state of defence; it has two good bastions at the two angles of the Square and the Square is formed with Oak Palisades, eighteen feet in height and these are proof against Musketry. This is not only a strong place but very comfortable lodgings, such as I have not been accustomed to for some time past* (Coutts 1988:81).

In June, "the greater part of the NWCo. House and buildings and stockades were pulled down and conveyed to Fort Douglas" (Guinn 1980a:52). Those parts of Fort Gibraltar that could not be used were burned, so as not to provide resources for the Nor'Westers. After the battle of Seven Oaks, the settlers and the HBC traders were forced to leave the colony and the NWC took possession of Fort Douglas. In January of 1817, the Des Meurons regiment, recruited by Lord Selkirk, captured Fort Douglas and the colonists returned. The conflict resulted in action by the Canadian administration and William Coltman was appointed to investigate. His report called for the restitution of all property and, consequently, the North West Company began the construction of the second Fort Gibraltar at The Forks (Guinn 1980a:54). With the amalgamation of the two companies in 1821, the era of fur trade competition came to an end.

2.3 The Transition Period (1821-1870)

The post-amalgamation period saw further developments to The Forks area. After its take-over by the Hudson's Bay Company, Fort Gibraltar II was renamed Fort Garry. Fort Garry declined in importance when Lower Fort Garry was built in 1832. However, the location of Lower Fort Garry, 30 km down the Red River, was not optimum. In 1835, work began on its replacement, Upper Fort Garry, a limestone-walled structure located to the west of the present FRC property (Loewen and Monks 1986: 23-26). Buildings at the first Fort Garry had suffered serious damage in the major flood of 1826. After further damage during the flood of 1852, the structures were abandoned (Guinn 1980a:87).

During this period, several attempts were made to establish an agricultural base at The Forks site. As early as 1808, Métis had established small farms along the banks of the rivers (Coutts 1988:78-79). In 1836, the Hudson's Bay Company commissioned Captain George Cary to establish an experimental farm for the rearing of "sheep and Black Cattle and for the growth of Flax and Hemp" (Guinn 1980a:68). The area under consideration was the "low ground on each side of the New Establishment at the Forks" (Guinn 1980a:68). The location has been described in an undated document in the Hudson's Bay Company Archives. The area extended

> *...from the north bank of the Assiniboine River immediately below George Thane's [lot], North 3° East, one hundred and fifty chains [3017 m], or thereby and then 65° East...to the Red River, from there round the shores of the Red and Assiniboine Rivers to the place of beginning (save and except the ground occupied by or required for Upper Fort Garry...)* (Guinn 1980a:178).

Barns and stables were constructed north of the river junction (Warkentin and Ruggles 1970:192-193). By 1838, only 20 acres were cultivated and by 1841 the farm was abandoned. Governor George Simpson reported that

> *The experimental Farm, which has not been productive of the benefits that were expected when it was established although attended with considerable outlay has been abandoned. Mr. Cary and the servants have been permitted to retire* (Guinn 1980a:69).

In 1848, a group of British Army veterans, the Chelsea Pensioners, were granted land adjacent to The Forks (Coutts 1988:129). Between 1846 and 1862, British Army troops were stationed at

Upper Fort Garry. During their stay, both groups may have used the now-abandoned gardens and fields of the Experimental Farm to grow crops for their own consumption.

A number of events occurred in the latter part of this period that would have major ramifications for the future of The Forks. In particular, the disappearance of the bison totally disrupted the lifeways of the Natives and Métis. This eventually led to political action by the Métis and the Confederation of Manitoba within Canada in 1870.

2.4 Industrialization and Immigration Period (1870-1888)

A major increase in immigration to western Canada occurred between 1870 and 1888. In 1872, two immigration sheds with detached cookhouses were built near the former location of Fort Gibraltar I. A shanty town developed on the flats between the west bank of the Red River and the Fort Gibraltar I area and along the north edge of the Hudson's Bay Preserve. The shanty town disappeared by 1884 and the immigration sheds by 1885 (FRC 1988:50).

Three industrial sites were constructed in The Forks area between 1870 and 1888. Two were Hudson's Bay Company developments. One of these was a warehouse complex (Steamboat Warehouse or Warehouse #4), built on the north bank of the Assiniboine River in 1872. In 1877, the structure was moved 120 feet back from the river and was demolished in 1895. The other company development was a large flour mill complex. The mill was built in 1874 and associated structures (sheds, warehouses) were added until the complex consisted of nine buildings. It was demolished in 1907 (Guinn 1980a:142-3). The Clarke and McLure Lumber Yard, located in the central portion of The Forks, operated from 1876 to 1890.

2.5 The Railway Period (1888-1988)

In 1888, a charter was granted to the Northern Pacific and Manitoba Railroad. That same year, the Hudson's Bay Company sold 20 acres of land to the railway for $10,000 (Guinn 1980a:135). The site of Fort Gibraltar I was located within these 20 acres. This property remained under railway control until the area was transferred to Canadian Parks Service and The Forks Renewal Corporation in 1988.

The Northern Pacific and Manitoba Railroad began construction of two buildings in 1889. A large repair shop and roundhouse were built north of the junction of the Red River (Guinn 1980b:4). The roundhouse was demolished in 1926 but the repair shop, known today as the B&B Building, still stands. This structure is located just to the southwest of the Fort Gibraltar I excavation areas.

For the past century, the railway has been the dominant industry at The Forks. The excavation area has been affected by this railway activity, either as an active area of railroad-related work or as a dumping ground for the by-products of railway activities (ash, cinders, and refuse). The use of large quantities of coal-derived cinders as landfill has provided a thick layer (up to two meters in some locations), which has served to protect heritage resources from disruption.

2.6 References

Adams, G., K. Lunn, M.A. Tisdale and P.J. Priess

1990 Archaeological Investigations at The Forks National Historic Site, Winnipeg: Mitigation of the North Point Development. Canadian Parks Service, *Research Bulletin* No. 283.

Ashworth, Allan C. and Alan M. Cvancara

1983 Paleoecology of the Southern Part of the Lake Agassiz Basin. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Coutts, R.

1988 *The Forks of The Red and Assiniboine: A History, 1734-1900.* Environment Canada, Canadian Parks Service.

Fenton, Mark M., S.R. Moran, James T. Teller and Lee Clayton

1983 Quaternary Stratigraphy and History in the Southern Part of the Lake Agassiz Basin. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Forks Renewal Corporation, The (FRC)

1988 *The Forks Archaeological Impact Assessment and Development Plan (The Forks Archaeological Plan).* The Forks Renewal Corporation, Winnipeg.

Guinn, Rodger

1980a The Red-Assiniboine Junction: A Land Use and Structural History, 1770-1980. Parks Canada, *Manuscript Report Series* No. 355.

1980b An Historical Assessment of Four Structures in the Canadian National Railways East Yards, Winnipeg, Manitoba. Parks Canada, *Research Bulletin* No. 126.

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation, Winnipeg.

Kroker, Sid and Pamela Goundry

1990 *Archaeological Monitoring of the Stage 1 Construction Program.* The Forks Renewal Corporation, Winnipeg.

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay.* The Forks Renewal Corporation, Winnipeg.

Last, William M. and James T. Teller

1983 Holocene Climate and Hydrology of the Lake Manitoba Basin. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Lenius, Brian J. and Dave M. Olinyk

1990 The Rainy River Composite: Revisions to Late Woodland Taxonomy. In The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson. Guy E. Gibbon (Ed.). University of Minnesota *Publications in Anthropology*, No. 4. Minneapolis, Minnesota.

Loewen, Brad and Gregory Monks

1986 A History of the Structures at Upper Fort Garry, Winnipeg, 1835-87. Environment Canada, Canadian Parks Service, *Microfiche Report Series* No. 330.

Manitoba Culture, Heritage and Recreation, Historic Resources Branch

1989 *A Glossary of Manitoba Prehistoric Archaeology.* Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

McLeod, K. David

1987 *Land Below the Forks: Archaeology, Prehistory and History of the Selkirk and District Planning Area.* Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Pettipas, Leo F. and Anthony P. Buchner

1983 Paleo-Indian Prehistory of the Glacial Lake Agassiz Region Southern Manitoba, 11500 to 6500 B.P. In *Glacial Lake Agassiz.* James Teller & Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Priess, Peter J., Sheila Bradford, S. Biron Ebell and P.W. Nieuwhof

1986 Archaeology at The Forks: An Initial Assessment. Environment Canada, Canadian Parks Service, *Microfiche Report Series* No. 375.

Quaternary Consultants Ltd.

1988 *North/South Access Road Archaeological Impact Assessment.* Quaternary Consultants Ltd., Winnipeg. Report on file with Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

1989 *Provencher Bridge Project Archaeological Impact Assessment.* Quaternary Consultants Ltd., Winnipeg. Report on file with Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

1990 *St. Mary Archaeological Recovery: Interim Report.* Quaternary Consultants Ltd., Winnipeg. Report on file with City of Winnipeg and Manitoba Culture, Heritage and Citizenship, Historic Resources Branch, Winnipeg.

Ritchie, J.C.

1983 The Paleoecology of the Central and Northern Parts of the Glacial Lake Agassiz Basin. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Teller, James T. and L. Harry Thorleifson

1983 The Lake Agassiz-Lake Superior Connection. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Warkentin, John & Richard L. Ruggles

1970 *Historical Atlas of Manitoba 1612 - 1969.* Manitoba Historical Society, Winnipeg.

Webb, T. III, E.J. Cushing and H.E. Wright, Jr.

1983 Holocene Changes in the Vegetation of the Midwest. In *Late-Quaternary Environments of the United States; Volume 2: The Holocene,* H.E. Wright, Jr. (Ed.). University of Minnesota Press, Minneapolis.

3.0 OPERATIONS

by *Sid Kroker*

3.1 Introduction

Since the 1988 land transfer from the Canadian National Railway Company to The Forks Renewal Corporation and Canadian Parks Service, major changes to The Forks area have occurred. There has been building refurbishment, infrastructure development, and landscaping. In the process of these activities, archaeological resource management has been an overriding concern. Impact assessments, construction monitoring, and mitigative actions have been a major component of every program. The 1988 archaeological impact assessment for the Assiniboine Riverfront Quay uncovered the first evidence of the major Archaic campsite and trade centre horizon (Kroker 1989) that was the focus of the 1992 project.

3.2 Project Location

As a result of the discoveries of the 1988 impact assessment, The Forks Renewal Corporation dedicated the land between the Johnston Terminal, the Low Line Bridge,, and the north bank of the Assiniboine River as an Archaeological Preserve. Implicit in this dedication was the intention that the location would be the site of future public archaeology programs (FRC 1988:127-128).

During the past century, the majority of The Forks area had been an active railway yard. Portions of the site had been used as a dumping ground. The railways first used fill to level the area and raise it above annual flood level, and later to disperse the tonnes of ash and cinders produced by coal-fired steam generated power. The depth of this overburden at the Archaeological Preserve was found to range between 0.80 m and 1.25 m.

The first step of the 1992 Forks Public Archaeological Project was to obtain a Heritage Permit from Historic Resources Branch (Appendix A). On site, the project began with the relocation of the investigation trenches of the 1988 impact assessment. The Archaic horizon had been encountered in Trench 1, Trench 2, Trench 6 and Trench 8 at depths of three meters (Kroker 1989:177). As the trenches had been surveyed using The Forks Archaeological Grid, it was an easy task to relocate where they had been. Using a transit, on loan from Historic Resources Branch, the archaeological staff set up on the geographical bench marker on the Low Line Bridge and surveyed the site of the 1992 excavations. Figure 3-1 shows the location of the 1992 project in relation to some of the relevant landmarks of the site.

3.3 1992 Project Set-up

3.3.1 Excavation Site Preparation

The location and parameters of the 1992 excavation site were cleared with River and Streams Authority of the City of Winnipeg (Appendix A). Permission was received to stockpile the excavated overburden in an area adjacent to the project, in order to facilitate infill of the excavation at the completion of the project. In addition, arrangements were initiated to obtain occupancy permits for the two trailers which would house the field laboratory, coordinator's office, kiosk, and field equipment storage.

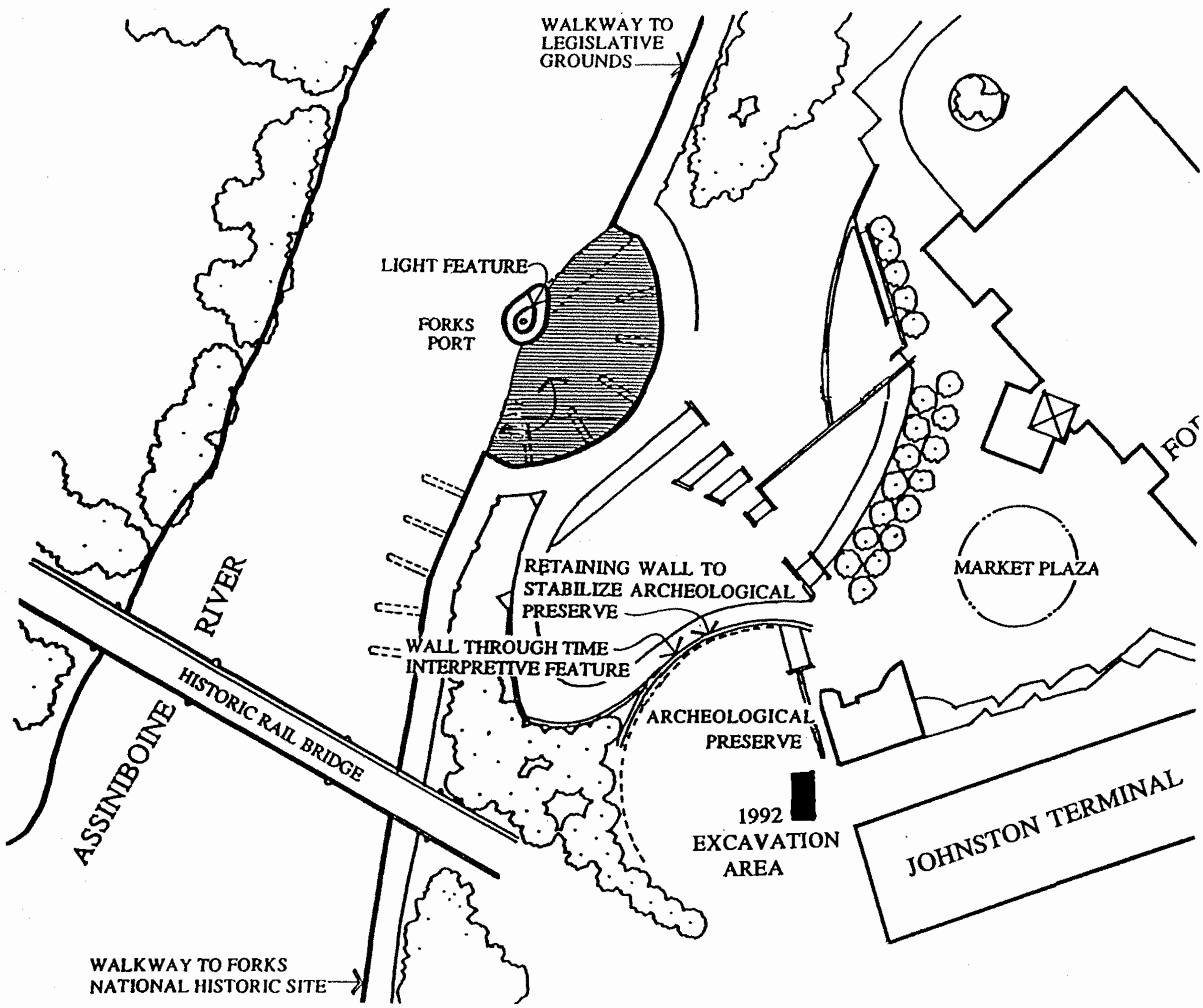


Figure 3-1: Map of The Forks showing 1992 Excavation Area

A backhoe with a flat bucket blade was contracted to remove the overburden above the archaeological horizons. Due to the possibility of encountering unexpected cultural horizons above the known Archaic level, the entire operation was closely monitored by the staff archaeologists.

The upper material consisted of cinders, clinkers, and coal that had been deposited through the Railway Era. At the base of the cinder deposits, fragments of broken and burned structural material, which related to the Hudson's Bay Company Flour Mill, were found. This flour mill complex had existed from 1872 until it was demolished in 1907 (Guinn 1980a:142-143; FRC

1988:52; Kroker 1989:165-170). Below the Industrial Period deposits, undisturbed riverine layers were encountered. The most notable horizons were the sand layer of the 1826 Flood and the Double A soil zone (Kroker 1989:174). All soil layers were culturally sterile until the depth of 250 cm was reached. At this point, a thin (less than 1 cm) soil horizon containing charcoal and fish bone was encountered. Testing with a hand auger indicated that the major Archaic horizon lay 40 to 60 cm below this upper cultural layer. Initial field assessment was that this upper horizon may be related to the cultural horizon excavated at Ramp Site A, during the Assiniboine Riverfront Quay project (Kroker and Goundry 1993). The backhoe levelled the floor of the excavation area about five cm above the upper cultural layer. The resultant floor area was rectangular, six meters by ten meters.

The walls of the excavation area were straightened and shoring was erected. The shoring consisted of 4" x 4" and 6" x 8" timbers, driven at least one and a half meters below the floor of the excavation area. These vertical timbers, spaced four to six feet apart, held 3/4" plywood panels in place. The plywood panels were then nailed to the vertical timbers, with horizontal 2" x 6" planks nailed to the verticals and the plywood panels at the junction of the panels. A carpenter was contracted to construct a set of stairs from the surface to the excavation area floor. These stairs were built in the northeast corner of the excavation unit and nailed to the vertical timbers to provide a stable structure.

During the construction of the stairs, the archaeological staff used ladders to enter the excavation area to smooth the floor with shovels and trowels. Excavated soil was removed by a bucket brigade and wheelbarrows and was dumped into the fill stockpile area. After the area was cleaned, the floor was gridded into excavation units that were ½ meter (N-S) by 1 meter (E-W) (Figure 3-2). The active excavation area was six meters by seven meters, with the eastern portion of the floor area set aside for the stairs and personnel movement. This area would also permit expansion of the excavation area, should operations complete the recovery of the gridded area.

Concurrent with the sub-surface preparation of the site, the crew erected a 30 foot x 40 foot, free-standing, Fiesta tent over the excavation area. The tent had been purchased, in 1991, through a grant from the Manitoba Heritage Federation. Placing a tent over the site was considered vital for several reasons. The site was to be excavated by staff-assisted participants who had registered for short, specific periods of time. Most of the available positions had been booked very early in the project, and it would not always be possible to reallocate individuals to another time slot if weather precluded operations. Thus, participants had to take advantage of their registered times or they would lose the opportunity to participate until the following field season. Also, it was important that no working days be lost due to poor weather. Finally, with the tent covering the site, extreme weather conditions (excessive heat, rain, wind, or snow) were less of a problem.

Since the tent protected the site from the elements, it was unnecessary to uncover and cover the excavation area each day. This allowed the area to be left open for viewing during off hours when no crew were available. The tent and the open excavation area allowed the site interpreters to provide information and tours to visitors who came by when archaeological staff and participants were not present. The tent was closed and secured at the end of each day.

Some minor vandalism occurred early in the season, when individuals entered the tent and walked around the excavation floor area. No artifacts were removed although some unit walls in the central portion of the site were damaged. Increased night-time security on the part of The Forks Renewal Corporation eliminated the problem.

The platforms and walkways, constructed in 1989, had been dismantled at the end of the 1991 project and stored near the B&B Building. These were towed and carried to the new site and put into place. The railings were removed from storage and rebolted to this base structure. The viewing platform and the wheelchair-accessible ramp were situated at the west side of the site, adjacent to the steps leading from the Market Plaza to the Archaeological Preserve. The railed walkway ran along the south side of the excavation, just outside the tent. Visitors were encouraged to view the site from these vantage points. The northeast corner of the tent was the main entrance to the excavation area and participants required unobstructed access.

The platform and the interior walkway permitted 40 to 60 visitors to watch the crew at work and allowed the interpretation and excavation staff an excellent venue to explain their work. Some visitors spent several hours at various stages of the excavation leaning on the railings of this walkway.

The water screening area was established on the former railroad track leading from the Low Line Bridge. The gravel substrate and land slope allowed water runoff to move away from the excavation area. Screens, placed in storage at the end of the 1991 field season, were retrieved, cleaned, and repaired. Wooden pallets were placed on either side of the screens in order to provide an elevated, less muddy surface for participants to stand on while water screening. Water run-off channels were created to direct water away from the screening area and a constant effort was made to keep these channels open.

By using the track bed as the water screening area, the activities of the project were visible from the North Point Node in The Forks National Historic Site. This enhanced interactive interpretive efforts between the Canadian Parks Service personnel and the staff of the Public Archaeology Project. Visitors coming from the park would come to the waterscreening area and then proceed to the field laboratory trailers and to the dig site itself, while other visitors, beginning at the excavation tent, would proceed in the opposite direction.

People generally viewed the waterscreening from the drier areas, rather than crowd around the screens. The excavation crew, one of the experienced participants, or one of the site interpreters would explain the process of, and reasons for, screening. Recovered artifacts were taken to the visitors rather than having the visitors come to the screens.

3.3.2 Laboratory and Kiosk Facilities

Two trailers from B & B Rentals Inc. were rented and placed adjacent to the excavation tent. One 10 foot x 24 foot trailer was used as field equipment storage space as well as a lunch/coffee space for participants and staff.

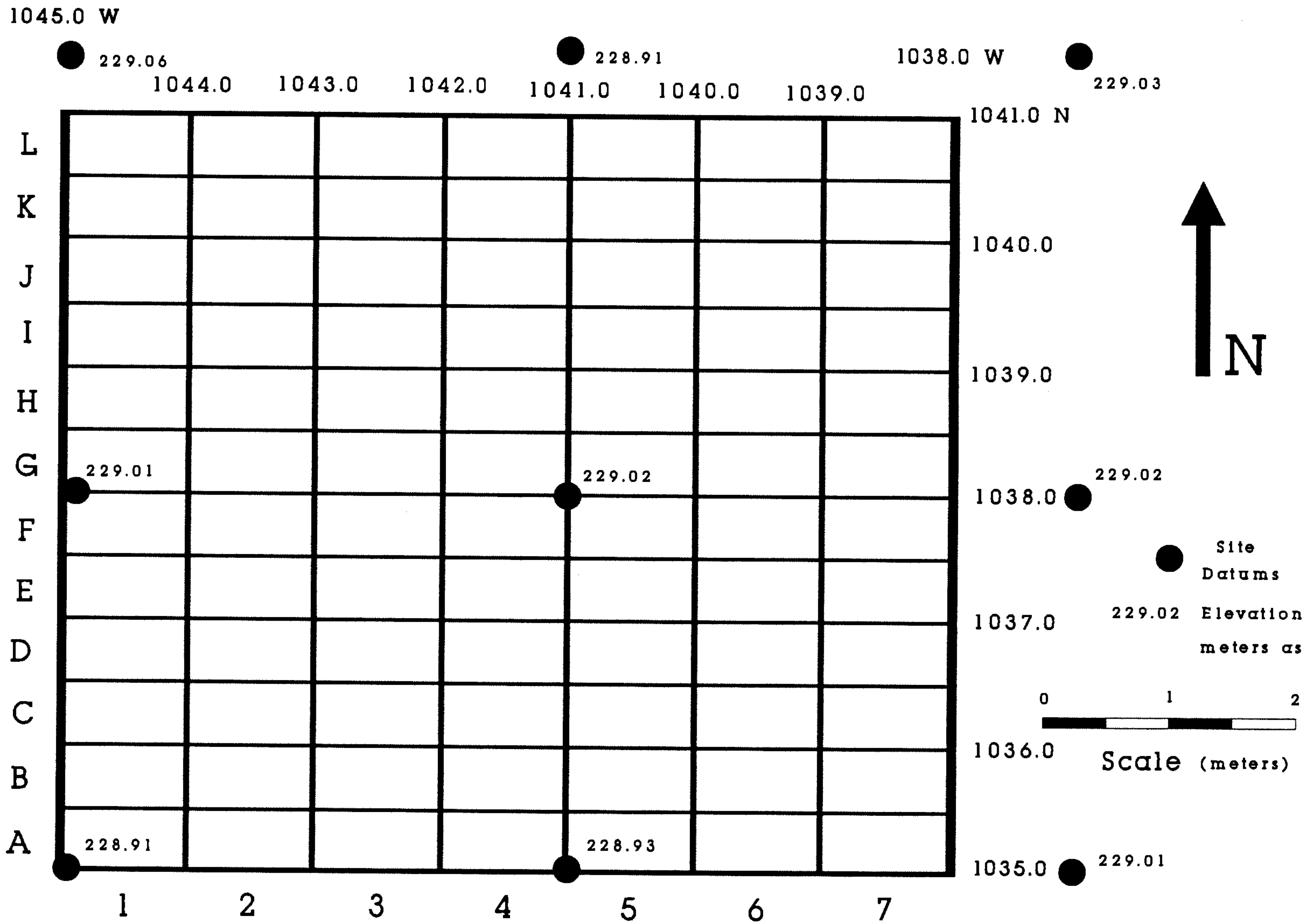


Figure 3-2: 1992 Excavation Floor Plan

The second trailer (12 foot x 60 foot) housed all of the other components of the project. One end of the trailer was used as the site office of the Participant Coordinator, with a portion of that area used as the display section for the Kiosk component of the project. The materials for sale consisted of T-shirts, caps, buttons, and publications provided by The Forks Public Archaeology Association, The Forks Renewal Corporation, and the Manitoba Archaeological Society. The operation of the Kiosk is described in Section 12.

The other end of the trailer housed the laboratory facilities. This portion was used to store artifacts before processing as well as space for the drying racks. It also included several tables which were the working space for the participants, lab staff, and school groups. The computer was set up in this area for use by the lab staff and the Participant Coordinator. Bookshelves housed an ever-increasing number of references, available for artifact research by staff and participants. A stereoscope microscope, for artifact identification and analysis, and an electronic digital scale were used by staff and participants.

As part of the interpretive aspect of the project, a display of artifacts, from previous excavations at The Forks, was situated in the lab trailer. This was popular with the participants as well as with the general public. On some days, the lab was extremely busy with public visitors and considerable interaction between staff, participants, and the visitors occurred. While the field crew could rely on the site interpreters to explain the project and the operations, in the lab, staff and participants fulfilled this role.

3.4 Methodology and Procedures

3.4.1 Excavation Methodology

The archaeological methodology used at The Forks Public Archaeology Project in 1992 followed conventional techniques of data retrieval from a multi-strata site area. The site was excavated in natural levels. This excavation technique and appropriate recording procedures allow for all aspects of a cultural horizon to be excavated and analyzed as a unit. Thus, the floor of an excavation unit follows the contours of the original soil surface, upon which the cultural deposits occur.

Using this methodology, all recoveries (artifacts, soil samples, etc.) are recorded in terms of site designation (DlLg-33:92A), the individual excavation units (e.g., B5), and the level (Level 7). Three dimensional proveniences were recorded for significant artifacts, where location of the specimen was measured from the south and east walls of the excavation unit, as well as the depth below the excavation area floor. Features were defined as identified, and designators were assigned to discrete portions of the site which showed evidence of specific activities, e.g., a hearth.

The 1992 excavation area was divided into four sectors. Each of the four field assistants was assigned to a sector to ensure familiarity with the type of cultural deposits in their sector.

Several site datum points were surveyed into the excavation area (Figure 3-2). They were established from the City of Winnipeg bench mark, situated on the north end of the Low Line

Bridge (87R548), which has an elevation of 232.253 m asl(above sea level). The datums were used for recording three dimensional provenience of artifacts recovered *in situ*. Vertical depth measurements were taken from the closest datum to the artifact. Horizontal measurements for the artifact were taken south and west from the northeast corner of the unit. The datums were also used to record the depths of soil layers on profile drawings.

All excavated soils were waterscreened using ordinary metal window screening, with a 1.5 mm mesh, and a pressurized hose system. This maximized the retrieval of artifacts, including tiny lithic flakes, gastropod shells, seeds, and small bone fragments.

All artifacts were placed in field collection bags which were labelled with the date, excavation unit, and cultural horizon. The artifacts were then taken to the on-site laboratory and processed. Colour and black and white photographs were taken of work in progress, exposed cultural horizons, and features.

3.4.2 Laboratory Procedures

In 1992, as in previous years, all laboratory facilities were combined in the larger trailer. This enabled participants and lab staff to work consistently side by side, with supervisors always on hand to answer questions and demonstrate lab procedures.

The procedures for processing artifacts in 1992 were similar to those of the previous seasons. Large unit bags, each labelled with the provenience corresponding to a single excavation unit, were placed in the lab trailer. Artifacts from each unit were brought in from the excavation in labelled field bags and placed in the corresponding unit bags. Depending on the material, the artifacts were then washed or dry-brushed. Most bone and lithic materials were washed, whereas charcoal and poorly preserved bone were carefully picked clean with tweezers. Some lithic artifacts were left unwashed so that protein, carbohydrate, and blood tests could potentially be performed - funding permitting. To ensure that small artifacts were not lost in the cleaning process, all field bags were emptied into fine mesh sieves prior to cleaning. The cleaned artifacts were placed on styrofoam meat trays, which were labelled with the provenience and excavation date. The trays were then placed onto drying racks.

After the artifacts had dried, participants sorted them into material classes: lithic, floral, and faunal. Artifacts of each class were then placed into plastic artifact bags. Participants recorded class, quantity, weight, and provenience information on a card and placed the card into this artifact bag. This initial stage of analysis is called primary sorting.

Primary sorting was followed by secondary sorting. At this stage, with the assistance of the lab staff, further processing was carried out by the participants. Artifacts that had previously been lumped together under a single class during primary sorting were separated, examined individually and identified. For participants who wished to try their hand at detailed artifact identification, a wide range of reference manuals and a microscope were available.

The lithic material was identified as tools (projectile points, bifaces, scrapers, etc.), flakes, and fire-cracked rock. With the use of a reference collection provided by Quaternary Consultants Ltd., preliminary identification of the types of stone material was undertaken. The floral material was identified as seeds or charcoal. Faunal remains were identified to class (mammal, fish, or shellfish) and, where possible, the part of the skeleton was identified. Reference specimens, on loan from the Manitoba Museum of Man and Nature and Quaternary Consultants Ltd., helped in the field identification.

The final step of the secondary sorting procedure was to weigh each artifact, or group of similar artifacts. All information was recorded on paper tags, placed in the plastic bag with the artifact. The information was checked by lab staff prior to computer data entry, the final stage of on-site artifact analysis. Data entry was performed by lab staff. This provided a final checkpoint to identify and correct any errors that may have been made. At this time, a sequential inventory number was assigned to each artifact, prefixed by both the Borden site designation (DlLg-33) and a suffix (92A) which indicates that this was the first project during 1992 at The Forks.

The data management system utilized was the CHIN (Canadian Heritage Inventory Network) computer cataloguing program (Manitoba Museum of Man and Nature 1986; FRC 1988:110, 171). This program was developed by Brian Lenius, based upon **DBASE3**, for use on personal computers. The project used an IBM AT clone computer with a 40 megabyte hard drive and a dot matrix printer for the generation of individual artifact catalogue cards on fanfold 3" x 5" cards. These cards were then placed into the plastic bag along with the artifact. After the field processing, the artifacts were stored at Quaternary Consultants Ltd., awaiting further analysis after the end of the field season.

3.5 Site Orientation of Participants

The Forks Public Archaeology Project is a continual learning experience for the professional archaeologists as well as for the public. As in the previous years, the challenge is twofold: to conduct an excavation that would maintain professional standards and to provide participants with a training session in archaeological theory and procedure that was both educational and enjoyable.

Six of the archaeologists had been employed during previous field seasons, including three individuals who have been with the project since it began in 1989. These returnees provided continuity to the project and were able to help the new personnel become acquainted with daily operations.

Many of the participants had worked at the projects in 1989, 1990, and 1991. Others had little experience in archaeology and it was necessary to familiarize these new participants not only with site specifics but with all other aspects of archaeological work. A short lecture session provided the basics of archaeological theory and procedure and was augmented with on-the-job instruction. Returning individuals were paired with new participants and they would share their experiences with them. The archaeologists worked with two (occasionally three) participants. This ratio allowed for the maintenance of high standards of excavation and tended to engender a close relationship between the archaeologists and the participants. All the participants were apt students and demonstrated intense concentration while excavating.

The program followed the same format each day. Participants worked from 9 a.m. to 4 p.m., with coffee breaks and a lunch break. They were met on-site by the Participant Coordinator, who gave them name tags, explained the daily schedule of activities, and escorted them to the trailers. They were shown where they could store personal belongings and offered a cup of coffee prior to the orientation session. The Project Director began the orientation session with a welcome to the site, explaining the purpose and importance of archaeology as well as the goals of the project. Following this, the staff archaeologists, on a rotating basis, explained how to use the various tools in the excavation and the laboratory. They presented a brief history of The Forks and a general history of Manitoba. Participants were encouraged to ask questions. All participants were then taken to the excavation area, where they were shown how to move about in the pits without disturbing surfaces, walls of the units or dividing markers. Stratigraphy and current features were described to the participants along with some of the more recently recovered artifacts. Those scheduled to work in the laboratory returned there and received more specific instructions on cleaning and processing artifacts. All participants paid close attention to the rules of the site and were very careful when in the excavation area.

The keys to the teaching program were (a) taking the time to explain why a procedure was necessary and (b) explaining in detail why the procedure had to be done in a certain manner. Every participant was shown which tools to use in various situations and why certain actions were applicable in some cases and not in others. The participants were also shown how to record the information they recovered. Using prepared summary forms, they noted details about the artifacts they had recovered and the soil layers they had encountered. Staff members were always present to provide assistance.

Although many participants' time at The Forks may be the only archaeological experience they will ever have, alumni will be welcome returnees to future excavations. One of the program's primary goals is to give the participants a positive, fulfilling experience and to further develop their interests in heritage and archaeological concerns.

3.6 Visitor Services

Two site interpreters were hired to explain the excavation and the processes being undertaken. At times, especially on weekends, hundreds of visitors attended the site and talked with the staff, picked up brochures, and toured the lab and kiosk trailers. As with the participants, most visitors expressed a genuine interest in viewing and asking questions about the work being done. All staff readily provided assistance, giving short lectures and answering questions on an impromptu basis, in the middle of other activities. Many visitors returned to the site throughout the field season to see what new features and artifacts had been recovered. A visitors' guest book was available for comments.

3.7 Noteworthy Occurrences During the Project

Every archaeological project experiences events which, while being disruptive or traumatic, provide learning experiences and/or the source of great stories after the fact. The 1992 field season was no exception.

3.7.1 Workplace Safety Stop Work Order

Prior to excavation, discussions were held with a representative of Workplace Safety and Support Services Division of Manitoba Labour. The estimated depth of excavation was 2.3 meters and the projected shoring was deemed to be adequate, inasmuch as the Act (Regulation 189/85, Section 126(1)) does not require any shoring in an open excavation which does not exceed 2.4 meters. The shoring consisted of 1/2" and 3/4" plywood panels held in place behind 4" x 4" and 6" x 8" timbers.

The surface elevation, at the excavation site, had been ascertained during the NANA project to be 230.9 meters above sea level (asl). The Archaic horizons, during the North Assiniboine Node Assessment and Assiniboine Riverfront Quay Project, were measured at elevations ranging from 227.9 to 228.6 meters asl. Based upon these data, it was projected that the base of excavations would be approximately 2.3 meters below grade. However, this projection was based upon the assumptions that the stratigraphy would be relatively uniform (i.e., horizontal) and that the surface elevation had not been altered during the landscaping activities on the Archaeological Preserve. It turned out that both assumptions were not valid: the surface elevation was 231.67 meters and the floor of the excavation unit, at Zone 1 cultural horizon, was at 229.06 meters - resulting in an excavation depth of 2.61 meters.

The excavation was inspected by Workplace Safety and Health on Thursday, July 30 and the depth was found to exceed the limits of the relevant section of the regulations by 7 1/2 inches. As the depth was greater than that permitted for an unshored excavation, the inspector required that shoring support be installed which was designed by a professional engineer. He also stated that the final depth of excavation be taken into consideration while determining mitigative measures. The inspector's suggestion was to use structural steel and 2" x 12" planking (estimated cost $25,000 to $30,000). While sympathetic to the fact that such an expenditure would eliminate four weeks of an eight week project, the inspector required that the operations cease until the situation was addressed. Accordingly, a Stop Work Order was issued at 2:15 P.M. and all personnel (staff and participants) were directed to leave the excavation area. The Participant Coordinator telephoned all participants scheduled for Friday and made arrangements for them to re-schedule their day.

Immediate contact was made with an engineer from Boge & Boge and discussions about remedial actions were held. Given that the project could not afford the cost and time of installation (about one week) of a structural steel shoring system, alternative mechanisms were explored. Based upon Section 126(1)c, the engineer and the Project Director, proposed that edges of the excavation be cut down to a sufficient depth (70 cm deep by 70 cm wide) in order that the vertical face of the excavation would be less than 2.4 meters above the base of the final excavation floor. This proposal was faxed to Workplace Safety that evening and approval was obtained at 8:30 A.M., July 31. The crew began site preparations prior to the arrival of a backhoe to cut down the edges of the excavation unit: dismantle the tent, disconnect the railings, and move the walkways and platforms. A rubbermount backhoe and operator, provided by Dart Enterprises, arrived to excavate 70 cm on the south and west sides of the excavation unit. These areas had to be wide enough (1.3 meters) for the placement of the walkways and platforms at the new level. The weight of the heavy machine at the edge of the excavation wall caused some collapse and required installation of new shoring after stabilization. As viewing access was not required on the east side, this wall was sloped at an angle away from the excavation. Due to the placement of trailers, the north wall could not be accessed by the backhoe and the remedial excavation was done by hand over the next two days. After the ground modifications, the walkways and railings were relocated into the new levels adjacent to the excavation unit and anchored by 10:45 P.M. As the crews (project staff and construction firm) had been working since early morning, the tent moving, back over the excavation unit, was postponed until the next morning. The area had been secured earlier by installing snow fence attached to rebar around the work area as visitors were coming into the area to investigate the activity. Since tourists and construction equipment do not mix, especially after dark, a perimeter was established at dusk.

The crew arrived early and the tent was relocated over the unit. When the participants came on-site, the operation was ready to proceed. All staff, who were not working with the participants, continued on the site modifications - repairing the wheelchair access ramp, stabilizing and shoring the soil wall at the back of the walkways, erecting appropriate signage cautioning about steps down to the walkways, excavating the north wall cut, etc. While the final details required a couple of days, the fortitude of the staff and the crew from Dart Enterprises enabled the entire remedial operation to be completed in one day, albeit a very long, tiring day. The final result was approved by Workplace Safety and the project was given a clean bill. Other ramifications came to light as the summer progressed.

3.7.2 Inclement Weather (or Where are My Hip Waders?)

The project was bedeviled with floods; due to the depth of excavation, the presence of the 1988 (NANA) excavation trenches, the sand horizons in the upper soil layers, and the water catchment area caused by the lowering of the excavation walls. Severe thunderstorms resulted in large amounts of precipitation which percolated through the ground and flowed along the aquifers (1988 trenches and sand layers), erupting into the excavation unit like a horizontal artesian well. Also, water pouring down the sides of the tent subsequently ran down the walls of the excavation area, carrying silt and clay with it. The results were flooded excavation units and deposition of clay and silt over cleaned excavation floors, thereby necessitating additional cleaning for photography, mapping, and visitor viewing. The first major flood occurred during the night of August 16 and was a harbinger of things to come. On the afternoon of August 22, severe thunderstorms, with buckets of water and pea-sized hail, flooded the entire area. The participants were re-booked and sent home, while the crew, with the aid of a sump pump, attempted to restore the site to working capability. Continued rain overnight and on the 23rd caused some water seepage through the soil layers, but this was controllable and work continued. Some flooding occurred during the evening of August 29 and during the day of August 30. The next severe flooding occurred overnight on September 3 and the area had to be pumped dry, with participants rotating between field and lab as the crew prepared units in the excavation area for them to work upon. The final floods, necessitating baling and pumping, occurred during the day and evening of September 9 (a scheduled day-off). The start of the school program was postponed one day to allow the area to dry out. The rest of the school program and the final close-down period of excavation did not suffer flooding, although cold (in two instances, freezing) days were the norm.

3.7.3 Adjacent Construction Activities (or Who's Got a Bullhorn?)

For the majority of the field season, the Public Archaeology Project was the next-door neighbour to the Johnston Building Refurbishment construction project. The construction project was separated from the archaeology area by a snowfence to prevent unauthorized visitors from inadvertently walking into a hard hat area. Both operations had minimal effect upon the other until the latter part of the season. During the school program, the construction project's schedule required the driving of concrete pilings. This required a few days of continual pile-driver operation. Fortunately, part of the operation occurred during project off-days. The most disruptive part of the construction foundation component was the use of jack-hammers to level the extruding portions of the piles. As this occurred during the school program, it became a major challenge to be able to deliver in-depth tour lectures to the students and project one's voice over the sound of the jack-hammers.

This was alleviated to a certain extent by using the Wall Through Time as the backdrop for the lecture program. A great plan - which lasted two days, until the beginning of the remedial construction work on the Assiniboine Riverfront Quay. Now, we had jack-hammers to the north of us, jack-hammers to the south of us and concrete trucks using the Wall Through Time ramp as a delivery route. The challenge became one of trying to complete portions of a lecture during hiatuses of sound and then moving to another location when the noise would drown out the lecturer's voice.

3.8 Site Closure

The shoring timbers and plywood panels were removed and stored in the B&B Building. The walkways, stairs, and railings were dismantled and stored with the shoring. The original fill, which had been stockpiled nearby, was dumped into the excavation hole. A front-end loader was used to spread the fill over the excavation hole and level it to original ground surface.

At the close of the field season, the tent was dismantled and, along with the field equipment, was stored at Quaternary Consultants Ltd. The rented trailers were emptied and cleaned. Equipment and retail products were returned to their sources. The computer, artifacts, and laboratory supplies were transported to Quaternary, in preparation for the analysis of the recovered artifacts.

3.9 Post-Season Activities

At the end of the field season, the budget was assessed and, due to the cost overrun resulting from the implementation of the school program, it was decided that no staff would be retained to conduct the detailed analysis of the recovered artifacts. Rather, it was decided that each of the various classes of material would be tendered for analysis: lithic artifacts, floral material (seeds and charcoal), and faunal remains. As a result of the large quantities of faunal recoveries, the assemblage was split into three groups - shellfish, fish, and remaining fauna, which was largely mammal. The material was also sub-divided by Zones, with a series of Zone 1 artifacts and a second series of combined Zone 3 and Zone 3B artifacts.

The tender process consisted of advertising the ten analytical components to staff members, other archaeologists, the Anthropology Departments of the University of Winnipeg and University of Manitoba, the Zoology Department of the University of Manitoba and the Biological Sciences Department of the University of Winnipeg. Each tender component was described in terms of quantities of artifacts. Bidders were asked to submit a methodology, a brief resume, a time of completion estimate, and a budget. Successful bidders were chosen based upon budget, methodology and qualifications. They were notified and analytical work on the recoveries began.

Upon receipt of the tenders, it became obvious that the project budget could not stretch to include the analysis of the entire artifact assemblage. Inasmuch as the major focus of the summer's project had been the 3000 year old trade centre/campsite, the Project Director recommended to the Board of Directors of The Forks Public Archaeology Association that the analysis of most of the Zone 1 recoveries be held in abeyance until additional funding could be developed. Analysis of the floral and shellfish recoveries from Zone 1 were done as they were included as part of the Zone 3 tender bids. Secondly, it was decided that the lack of funds precluded the possibility of obtaining radiocarbon dates in this budget year.

As the analysis of each component was a specific research project, it was decided that the reports of the researchers should retain their integrity and be published as a discrete entity, rather than being incorporated into a committee-written report. Accordingly, each report - presented here as a chapter - carries the byline of the author(s).

3.10 References

Forks Renewal Corporation, The

1988 *The Forks Archaeological Impact Assessment and Development Plan (The Forks Archaeological Plan).* The Forks Renewal Corporation, Winnipeg.

Guinn, Rodger

1980a The Red-Assiniboine Junction: A Land Use and Structural History, 1770-1980. Parks Canada, *Manuscript Report Series* No. 355.

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation, Winnipeg.

Kroker, Sid and Pamela Goundry

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay.* The Forks Renewal Corporation, Winnipeg.

Manitoba Museum of Man and Nature

1986 *Guides and Manuals for Processing Archaeological Materials.* E.L. Syms (Ed.). Winnipeg, Manitoba.

4.0 STRATIGRAPHY AND FEATURES

by *Sid Kroker* and *Barry B. Greco*

4.1 Stratigraphy

The generalized stratigraphy of the upper portion of the excavation area (above the cultural levels) is similar to that which has been depicted in the *North Assiniboine Node Assessment* report (Kroker 1989). The upper meter consisted of cinder and gravel deposits relating to the railroad activities at the location (post 1888). A grey-brown silty clay level below this showed some evidence of disturbance and probably reflects the original soil level at the time of the construction of the Hudson's Bay Company Flour Mill. A sand horizon, occurring beneath the silty clay - ten centimeters thick on the east wall and effectively absent on the west wall - is stratigraphically equivalent to the 1826 flood. Alternating layers of clay, silty clay, silt, and sandy silt were encountered during the excavation. Traces of juvenile soil horizons occurred at irregular intervals, indicating periods of soil formation between flood deposition episodes. Notably absent were the 'Double A' horizon (Kroker 1989:Figure 17, Kroker and Goundry 1990:148-153) and the sand horizon deriving from the 750 Year Flood (Kroker and Goundry 1990:143, 148).

Mechanized excavation was terminated when traces of a cultural horizon was observed at a depth of 261 cm, at an average elevation of 229.0 meters above sea level. The backhoe levelled the floor of the excavation approximately five to ten centimeters above this stratum. The remaining layers over the horizon consisted of the basal portion of a relatively thick layer of laminated sandy silt and a clayey silt stratum with flecks of marl (Figure 4-1). The thin cultural stratum (1 cm) was designated as Zone 1 and contained charcoal, some lithic material, and a quantity of faunal remains -predominately fish. The stratum rested upon a second marl-flecked clayey silt layer. A thick (25 to 30 centimeter) layer of cross-bedded silts and sands occurred below. This layer is grey-brown, although the sands at the base are irregularly stained orange. The stratum contains occasional silty clay lenses and shows evidence of extensive rodent disturbance. It appears to be the result of a single event and would indicate moderately high velocity flooding.

Below the bedded sands, a five centimeter stratum of layered silty clay overlies the extensive Archaic occupation horizon (Zone 3). The cultural deposits range in depth from thin (less than 1 cm) to moderately thick (6 cm) and rest upon a silty clay stratum. In the southwest portions of the excavation area, a thin cultural deposit (Zone 3B) was recorded 3 cm below Zone 3. This horizon was very thin and appeared to disappear across the majority of the excavation area. Zone 3B contained considerable charcoal and moderate quantities of faunal remains, with slight representation of lithic materials.

The marginal location and ultimate disappearance of Zone 3B in the main excavation area may indicate that the stratum represents an occupation site whose main area lies to the south and west of the excavation area. Subtle indications of micro-stratigraphy within the Zone 3 stratum, particularly in the northeast quadrant, may indicate that the stratigraphy has collapsed and that Zone

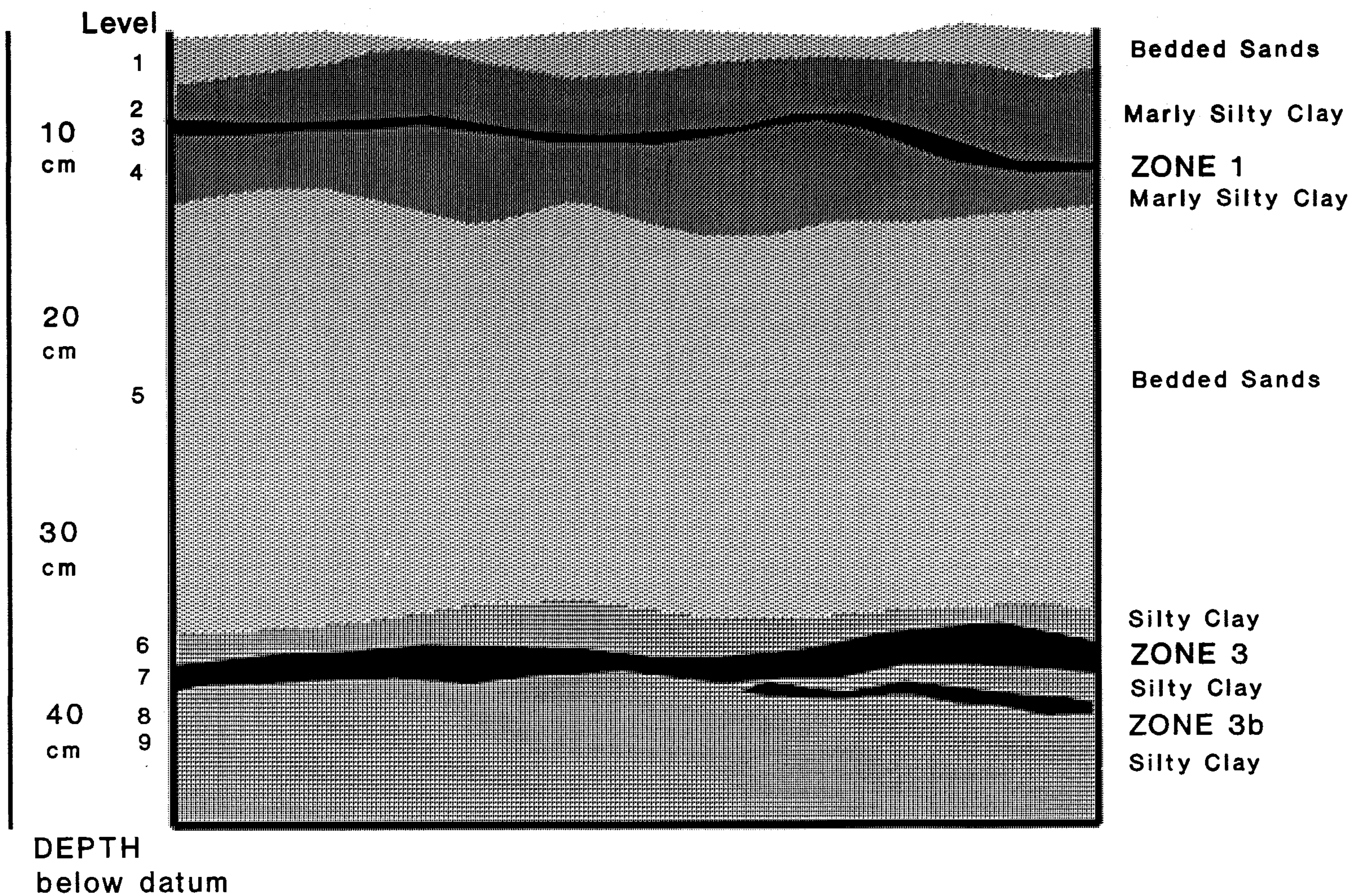


Figure 4-1: Generalized Stratigraphy of Archaic Strata

3B occurs as the lower component of Zone 3 across the majority of the excavation area. In either case, it would appear that the occupations represented by Zone 3 and Zone 3B are distinct events.

The following is a tentative reconstruction of the sequence of events which could have resulted in the observed stratigraphy. A group of people arrived at The Forks and cleared a campsite location. The evidence of their activities - fishing, food preparation, etc. - are preserved as Zone 3B. This event could have occurred in the very early spring, prior to thawing conditions. As a result of the thaw, waters in the river rose slowly and partially inundated the location. Because of the presence of the silty clay layer above the cultural deposits, we can assume that this was not a vigorous flood with high velocity water. Later that year, people returned to the location and established a campsite at the same location, albeit slightly to the north. The activities of the latter occupation resulted in deposition of cultural material (Zone 3) directly onto the unflooded northern portion of the first occupation site and onto the silty clay deposit which overlay the first occupation (Zone 3B) in the southwestern section.

The scenario suggests less than a year between the two occupations. Alternatively, the Zone 3B occupation could have occurred after the spring thaw, in which case, the silty clay deposition could have occurred the following spring, with the Zone 3 occupation being after the flood. There may well have been a hiatus of one to several years between the flood deposition which covered Zone 3B and the subsequent revisitation to the site as evidenced by the presence of Zone 3. The variations in thickness of the cultural deposits of the Archaic horizons could indicate horizontal as well as vertical stratigraphy. The evidence from the 1988 impact assessment showed a thick deposit (Kroker 1989) as did the Ramp C location, during the Assiniboine River Quay project (Kroker and Goundry 1993). Other Archaic horizons, such as River Cut - Stage I (Kroker and Goundry 1990), East Hill and Stairwell (Kroker and Goundry 1993), were much thinner. These variations may indicate horizontal stratigraphy as well as vertical stratigraphy. It has been hypothesized that the area was revisited on a recurrent basis (Kroker 1989:176) and it is improbable that each subsequent campsite location would exactly overlap the previous occupations.

At some point after the Zone 3 occupation, a large-scale, three-stage flood occurred. The initial rise of the silt-laden waters deposited the thin silty clay stratum above Zone 3 (Figure 4-1:Level 6). The intensity and flow of the flood increased substantially, resulting in the transport of heavier sands, which were deposited (Level 5) when the waters slowed - probably due to a downstream ice-jam. As the flood waters were impounded, the lighter silty clay settled out, resulting in the deposition of Level 4.

4.2 Features

The excavation area did not contain many distinct features. The recorded features (Figure 4-2) consisted of intrusive pilings related to the Hudson's Bay Company flour mill complex, two hearths in Zone 3, and one stratigraphic feature which appears to be post-occupation.

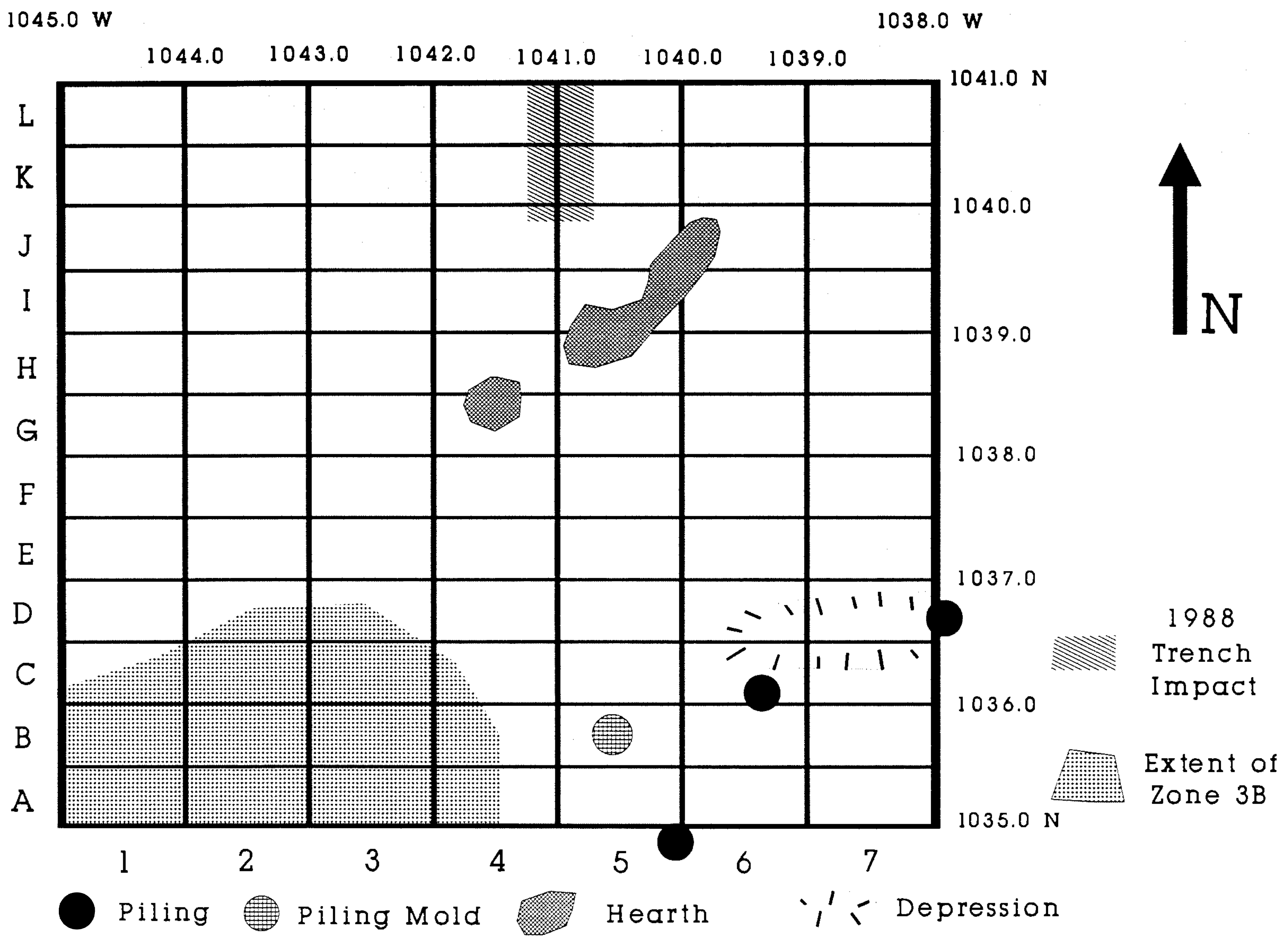


Figure 4-2: Map of Recorded Features

Although not a feature *per se*, the Zone 3 occupation floor in the north-central portion of the excavation area was sufficiently distinct to deserve specific notation. The area consisted of an dense mix of fire-cracked rock and faunal remains. However, no specific pattern could be deduced and the occupation floor may be the result of overlapping, sequential occupations.

4.2.1 Intrusive Pilings

During the North Assiniboine Node Assessment, three building support pilings were recorded in Trench 6 (Kroker 1989:Figure 16). The placement of the 1992 excavation area overlapped this trench and six pilings were encountered during the mechanized preparation of the site, four within the excavation area (Figure 4-2) and two to the east. One piling, in Unit B5, was removed during the backhoe operation but the mold of the piling was readily observed. Downward distortion of original sediments were observed extended around all pilings that were in or adjacent to the excavation area - Units A5, A6, B6, C6, and D7. Analytical samples were taken from the piling in Unit D7 (Plate 4-1) and from the removed piling (Section 5). The piling abutting Unit A5 was left *in situ*, as were the two pilings east of the excavation area.

4.2.2 Hearths

Two discrete hearths were recorded. The hearth in Units G4 and H4 was a circular feature composed of ash and charcoal. The diameter was approximately 110 cm. In cross-section (Figure 4-3), the hearth extended to a depth of 10 cm below original surface, where the former clay surface had been discoloured orange due to the heat of the fire. The rounded shape of the sub-surface portion (Plate 4-2) suggests that a hemispherical pit was excavated to contain the fire. No fire-cracked rocks were located at the perimeter of the hearth, although one fire-cracked rock was present in the southwest corner of Unit H4.

Units G4 and H4 which contained the hearth, and the surrounding units F3, F4, G3, H3, I3, and I4, produced over half (52.9%) of the flaking debris from the site. Most of the raw material types are represented. The favoured raw materials at this locus appear to have been Swan River chert and agate, as the recoveries included 349 (57.1%) Swan River chert flakes and 137 (54.8%) agate flakes. Four agate cores were also recovered from this area suggesting that core reduction occurred. Nine tools, including five scrapers, two bifaces, and two utilized flakes, were found in this portion of the excavation. Five of the nine tools, three scrapers and the two bifaces, are either agate or Swan River chert.

The pattern indicates that tool manufacture took place in the hearth vicinity and the resultant flakes were scattered outward from the hearth. The density of flakes decreases considerably in units immediately east of the hearth, i.e., F5, G5, H5, and I5. This could indicate 1) less lithic activity occurred in this area; 2) the individuals engaged in flaking sat facing west; or 3) the flakes were swept from the area.

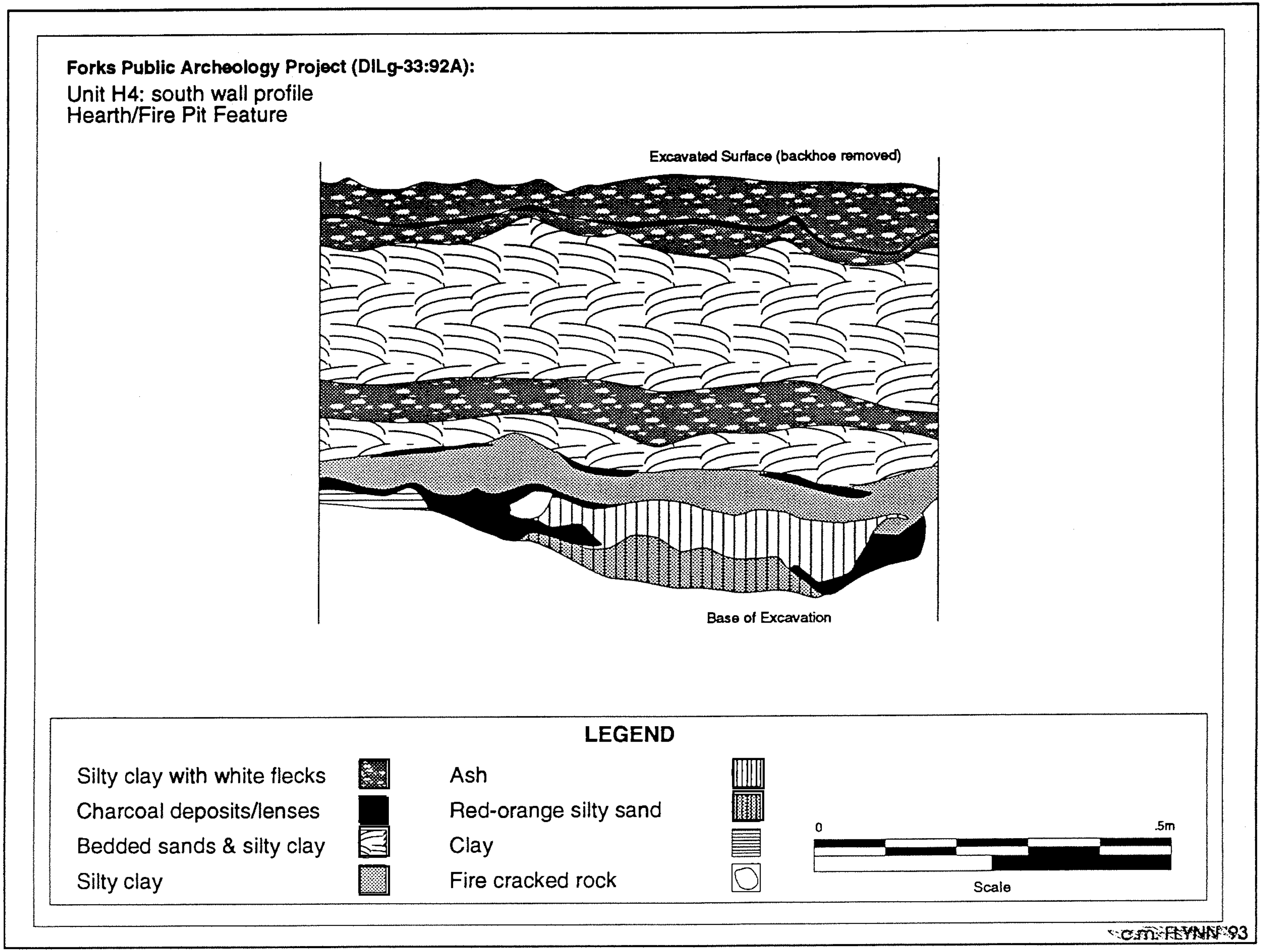


Figure 4-3: Profile of Circular Hearth

The density of faunal remains, both fish and mammalian, is not as concentrated around this hearth as it is further to the north and west. However, the south periphery of the hearth does have a strongly defined secondary fish remains deposition node. In addition, the densest concentration of burned mammalian bone was recovered from Unit G4 (Figure 8-9). Two shell beads, a graver and worked bone scrap were also present in the immediate vicinity.

The second hearth was not well-defined by the location of artifacts, ash, or charcoal within the cultural stratum. After the mapping and removal of artifacts from Units H4, H5, I5, J5, and J6, a linear orange stain was evident in the clay at the base of the cultural stratum (Plate 4-3). The dimensions of this irregular, elongate stain are 180 to 200 cm long by 30 to 35 cm wide. The orientation, northeast to southwest, does not appear to be related to the circular hearth.

As in the case with the circular hearth, no evidence of the use of rocks as a hearth perimeter could be observed nor was there any indication of adjacent post molds. Post molds were considered to be potential, due to the linear shape of the heat-altered clay. A linear fire would probably be a heat source under drying racks, where it would provide more even heating than a series of circular fires. Also, the presence of a hearth and probable drying racks could account for the lack of evidence of lithic manufacturing activity in this portion of the excavation.

4.2.3 Occupation Floor

The occupation floor in the north-central portion of the excavation area (Units I4 to K5) was densely covered with a variety of artifacts (Figure 4-4). The distribution of lithic detritus (Figure 6-3), fire-cracked rock (Figure 6-10), mammal bone (Figures 8-9 and 8-10), and fish (Figure 9-6) indicate that several activities took place at this location. Inasmuch as all stones would have been transported to the site by people, it is probable that sequential occupations resulted in the re-use of hearth stones or radiant heat stones (Section 6.5). Thus, the location of rocks, placed as a hearth perimeter during an early occupation, would be disrupted by subsequent use as radiant heat or boiling stones. Given that the deposition of Level 6 indicates an initial moderate flood stage, relocation of the larger faunal elements and the lithic artifacts is unlikely.

4.2.4 Post-occupation Disturbance

The southeastern portion of the excavation area (Units B6 to D7), demonstrated that an event disturbed the stratigraphic complacency of this portion of the site. The intrusive placement of the pilings resulted in a downward warping of the sediments immediately adjacent to the piling (Plate 4-1). However, the placement of the pilings would not have produced a downward displacement in the form of a trench, as occurred in Units C5 to D7. The artifacts from Zone 3 were not clumped in the base of the trench, as would have occurred if the trench were present during the occupation period. It would appear that there was localized subsidence in this vicinity after the occupation that resulted in the deposition of Zone 3 and before or during the flood/high water event that deposited the bedded sands and silts of Level 5. The deposit of layered silts, which overlies Zone 3, is much thicker in this location and would suggest that during the initial slow rise of silt-laden water, a thicker layer of sediment was deposited in this trench than over the rest of the occupation area. The subsequent high-water phase, with fast-moving, sand-carrying waters, resulted in the deposition of bedded sands and silts to a uniform depth across the site.

Based upon the narrowness of the trench and the fact that the artifacts have not been relocated, i.e., they are still in what appears to be their original location of deposition, it would appear that the disruptive event had to have been sub-surface. Surface activity, by humans excavating a shallow trench or by bison creating a dust wallow, would have resulted in an area with few, if any, artifacts. The most probable explanation is the collapse of an underground tunnel. This would have produced a trench at the surface but would not have resulted in major relocation of artifacts. The size of the trench suggests that the sub-surface tunnel would have been larger than that produced by ground squirrels. The most likely candidate is a fox den, although some badger holes can be quite large.

4.3 References

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation, Winnipeg.

Kroker, Sid and Pamela Goundry

1990 *Archaeological Monitoring of the Stage 1 Construction Program.* The Forks Renewal Corporation, Winnipeg.

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay.* The Forks Renewal Corporation, Winnipeg.

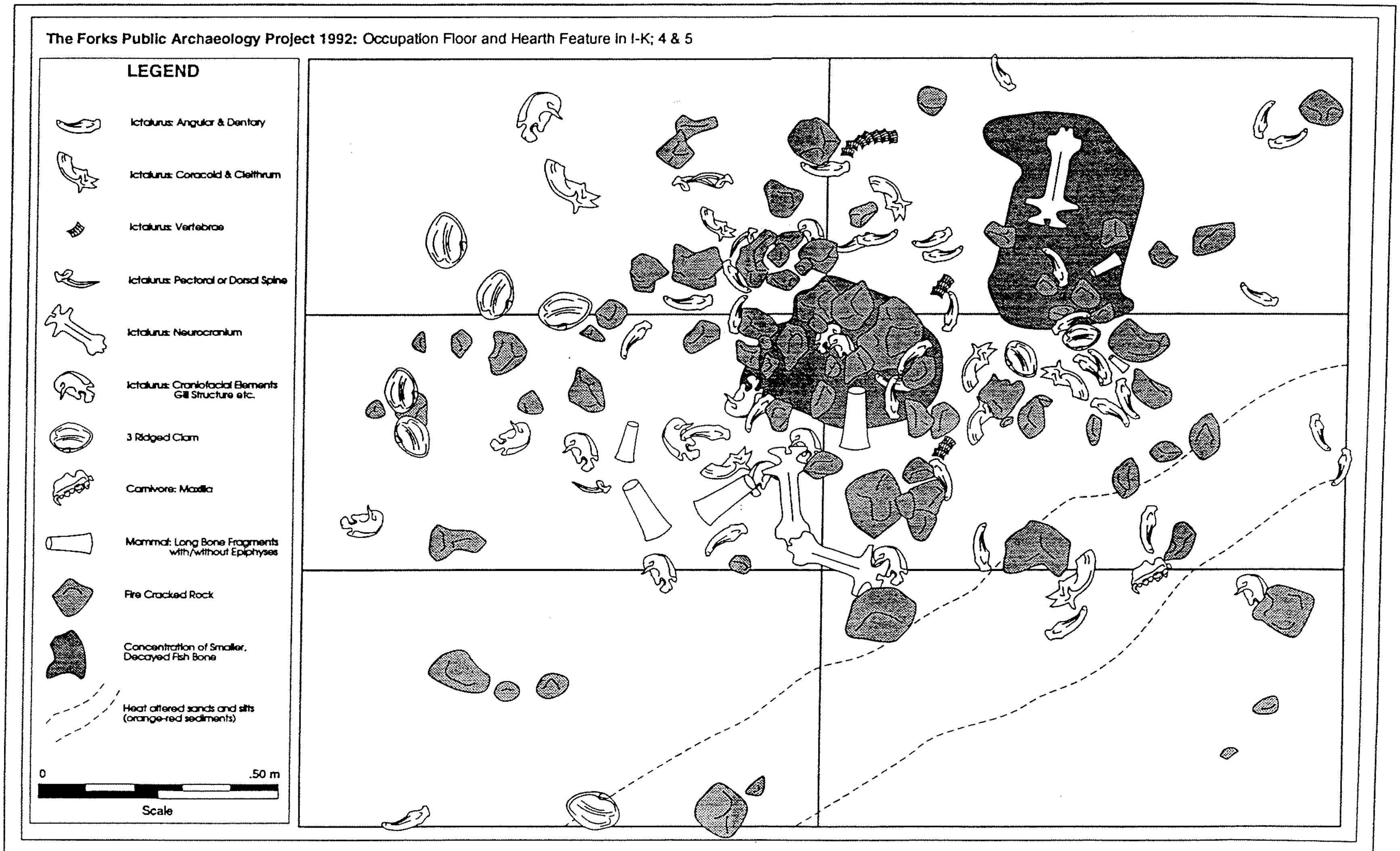


Figure 4-4: Computer Map of Occupation Floor

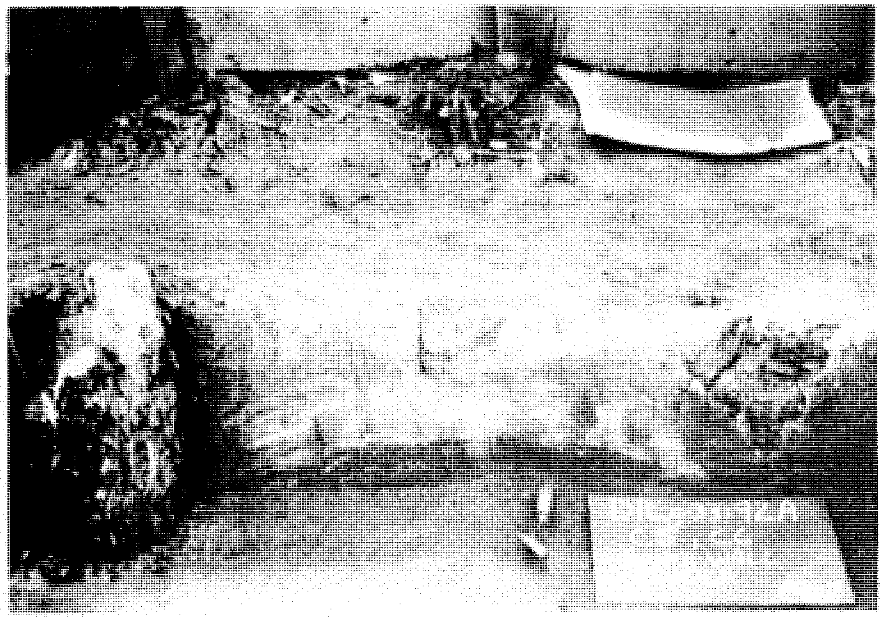


Plate 4-1: Pilings

Plate 4-2: Circular Hearth

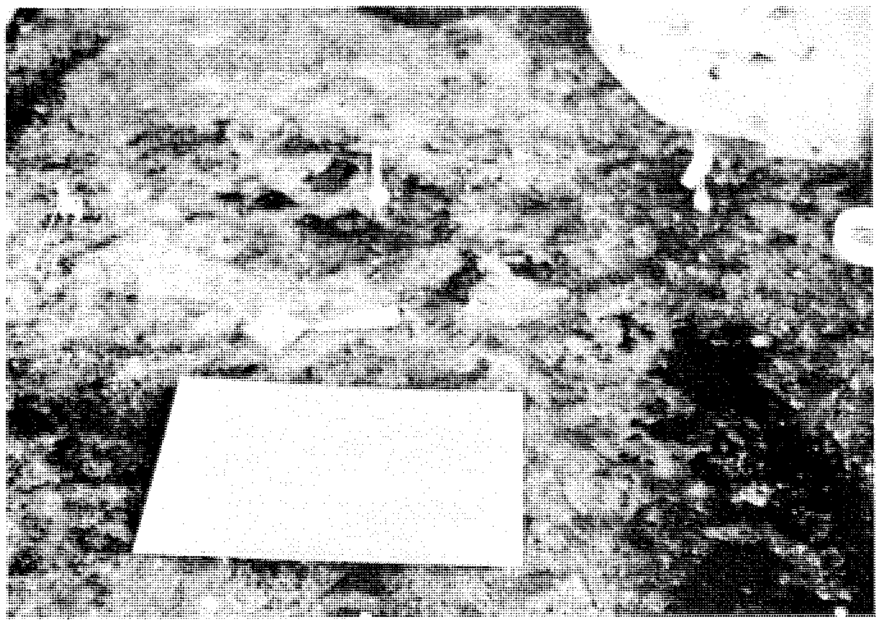


Plate 4-3: Linear Hearth

Plate 4-4: Occupation Floor

5.0 DENDROCHRONOLOGICAL ANALYSIS OF TWO HISTORIC OAK PILINGS

by *Erik Nielsen*

5.1 Introduction

Two moderately large oak discs from The Forks were submitted for dendrochronological analysis. One specimen (Forks-92-1) was cut from an *in situ* piling at the archaeological site whereas the other specimen (Forks-92-2) was cut from a piling pulled from the ground during overburden stripping. This section summarizes the results of tree-ring analysis of the two samples and provides a preliminary date for the cutting of the two trees.

5.2 Methodology

The logs were prepared using standard procedures outlined by Fritts (1976). Each disc was cut to a thickness of approximately 8 cm and sanded with belt and palm sanders using sandpaper of varying grit between 60 and 600. Measurements of the annual ring widths were made to an accuracy of 0.02 mm along three radii at approximately 120° to each other. The three sets of measurements were averaged for each disc to give a single set of tree-ring widths for each log.

5.3 Description

The first specimen (Forks-92-1) is approximately round and measures 33 cm in diameter. Decomposition on one side has reduced the diameter of part of the log to 28 cm. The pith is near the centre of the log and there are no significant distortions of the rings. Although the bark is missing, the smooth outer surface indicates the disc is complete and the outer ring represents the last growth year of the tree. The last few rings were, however, found to be punky and could not be measured so the age estimate for this log is probably two years short of the true age. The three measured radii have 180, 177, and 170 rings.

The second specimen (Forks-92-2) is approximately oval in shape and measures 32 cm by 27 cm. The pith is off-set slightly towards the bulbus end of the disc. There are no distortions of the rings anywhere on the disc. The three radii vary considerably in length. The longest radii terminates at the bark and contains 186 rings whereas the other two radii have only 160 and 155 rings. These shorter radii are due to rotting of the outer part of the log. The outer 11 rings of the long radii are punky indicating this is probably sapwood which tends to decompose more rapidly than the inner heartwood. Otherwise there is no evidence of sapwood.

5.4 Probable Age

A fourth order polynomial equation was used to detrend the tree-ring curves for the two specimens using the methods outlined by Parker *et al.* (1984). The resulting curves are plotted in Figure 5-1. Indexing of the curves using a high order polynomial equation has the effect of removing much of the low frequency variation, thus making cross-dating of the resultant curves by visual inspection easier.

Inspection of the resultant curves indicates the two specimens are readily cross-dated. Several marker rings are common to both curves as is much of the remaining low frequency variation. The curves indicate that Forks-92-1 was felled seven years before Forks-92-2 allowing for the two lost rings at the edge of Forks-92-1 mentioned previously.

Cross-dating of the two curves with a master curve for Winnipeg, constructed using ten modern oak trees anchored in 1990, indicated Forks-92-1 was probably cut in 1881 and Forks-92-2 was cut after the 1888 growing season. The building which was constructed on the piles can therefore not be older than 1888.

5.5 References

Fritts, H.C.

1976 *Tree Rings and Climate.* Academic Press, New York.

Parker, M.L., L.A. Jozsa, S.G. Johnson, and P.A. Bramhall

1984 Tree-ring Dating in Canada and the Western U. S. In *Quaternary Dating Methods.* W.C. Mahaney (Ed.), pp. 211-225. Elsevier, New York.

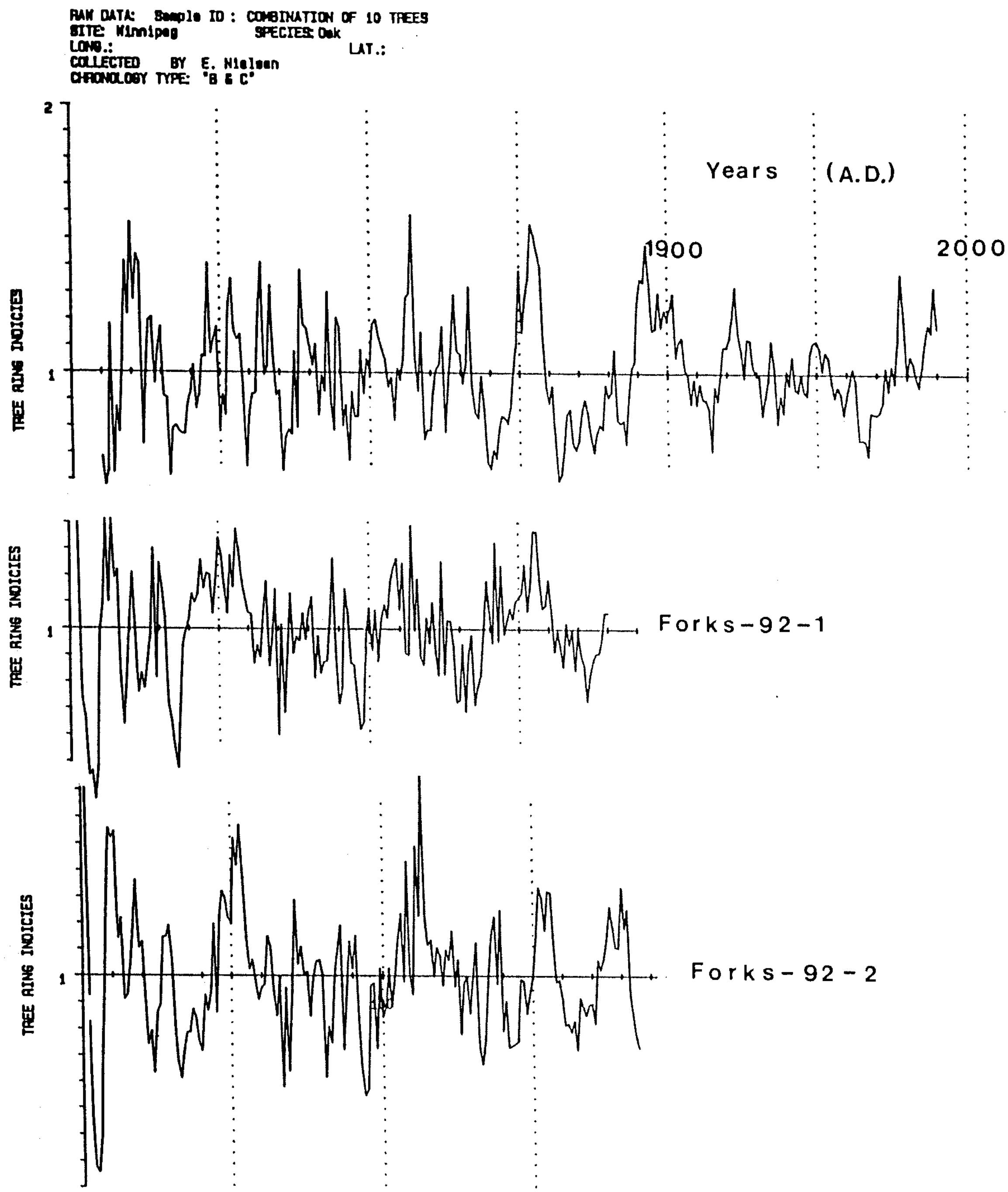


Figure 5-1: Tree Ring Growth Curves - Baseline and Samples

6.0 LITHIC ARTIFACTS

by *Barry B. Greco*

Prior to discussing the types of tools and detritus present at the site, it is necessary to have an understanding of how lithic artifacts are produced. Cobbles and pebbles of a desired raw material and shape are searched for at a quarry site. These rocks become cores once flakes are struck from them during tool manufacture. These flakes are removed by hitting the core with a hammerstone (Figure 6-1). This initial stage of core reduction produces decortication flakes which have some amount of cortex (the outer rind of the raw material) on the dorsal surface and a bulb of percussion on the ventral surface. These flakes can be used directly as chopping tools and as flake knives (MacDonald 1985:67).

The core is further reduced by using the hard percussion technique where a stone flaker such as an oval pebble is used to remove additional flakes to produce a tool preform. This produces reduction flakes which have no cortex and possess a bulb of percussion (Darlington 1980:10). Next a soft percussion technique using a billet is employed to thin and shape the preform. A billet is defined by Young and Bonnichsen (1984:32) as "a blunt, relatively resilient tool, such as antler or wood, used in percussion work" (Figure 6-1). This technique provides better control allowing for the removal of thinner and broader flakes (MacDonald 1985:68).

Once the desired tool shape is achieved, pressure flaking is utilized to give the tool its final appearance. A pointed implement of antler or ivory known as a flaker is used to remove small flakes to straighten an edge or to make notches for hafting (Figure 6-1). This technique is also used to resharpen a tool edge which has been dulled during use. The flakes produced from this method are known as retouch flakes. Another means of thinning tools for hafting is called indirect percussion. This involves using a hammerstone to strike a wood or antler punch in order to precisely remove flakes.

During these stages of core reduction, usable flakes are often produced. If these flakes are used as tools, without further modification, they are known as utilized flakes. Evidence of use can be determined by close examination of the flake edges. Use will produce minor scratches known as striae and minuscule flake scars caused by pressure while cutting. Inspection with a hand lens (10X) or under a microscope (10X to 50X) is required to determine whether or not use has occurred. Sometimes these flakes are retouched and also employed as tools. Large, thick flakes can be further reduced into tools such as scrapers and knives. Projectile points are also made from flakes.

Pebbles and core fragments which are too small to be worked by the hard percussion method are reduced through bipolar percussion. This involves using a hard stone hammer to smash the pebble or nodule which is resting on a stone anvil. The core can then be used as a tool, such as a knife, a wedge or a pièce esquillée, because sharp edges are produced.

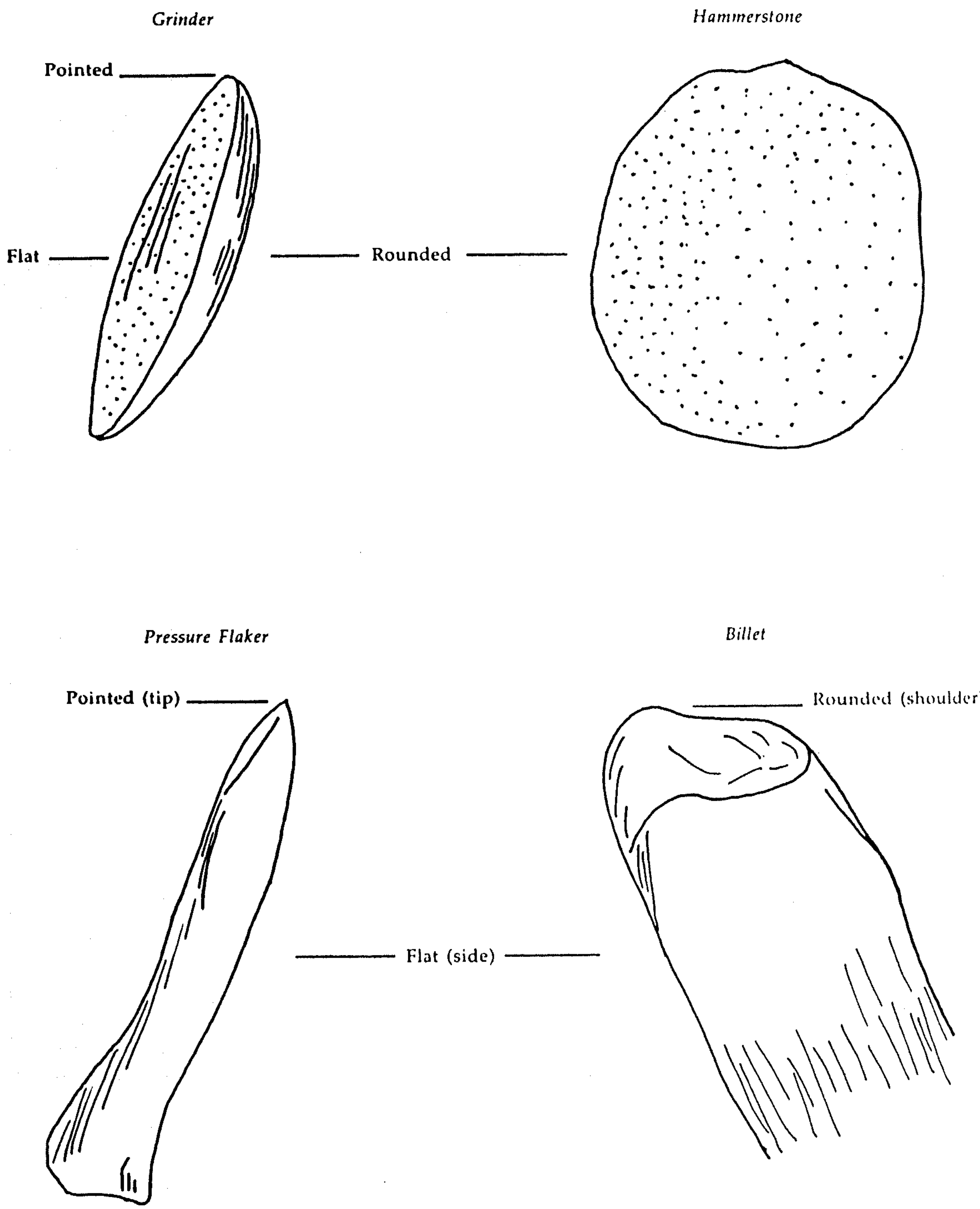


Figure 6-1: Lithic Technology Implements (from Young and Bonnichsen 1984)

6.1 Lithic Debitage

A total of 1318 flakes from lithic tool manufacture were recovered from Zone 3 during the 1992 Forks Public Archaeology Program. The specimens are very small with an average weight of 0.6 gm per flake. Most were likely produced during the final stages of tool manufacture, while others resulted from tool resharpening. Table 6-1 shows the quantity and weight of flakes by raw material type. Swan River chert predominates accounting for almost half of the total (46.5%). Other common material types are agate (19.0%), undifferentiated chert (10.8%), Selkirk chert (5.6%), and quartzite (5.4%).

LITHIC MATERIAL TYPE	QTY	%	WEIGHT	%
Swan River Chert	613	46.5	98.1	30.5
Agate	250	19.0	58.1	18.0
Chert (Undifferentiated)	143	10.8	38.5	12.0
Selkirk Chert	74	5.6	32.3	10.0
Quartzite	71	5.4	17.0	5.3
Jasper	33	2.5	7.5	2.3
Chalcedony	32	2.4	8.2	2.5
Knife River Flint	20	1.5	7.2	2.2
Jasper Taconite	20	1.5	1.9	0.6
Tongue River Silicified Sediment	18	1.4	8.9	2.8
Porcellanite	8	0.6	2.0	0.6
Silicified Sediment	6	0.5	8.0	2.5
Bird River Rhyolite	6	0.5	2.1	0.7
Cathead Chert	5	0.4	11.7	3.6
Souris Chert	4	0.3	3.2	1.0
Petrified Wood	4	0.3	7.0	2.2
Rhyolite	4	0.3	4.5	1.4
Lake of the Woods Rhyolite	3	0.2	0.1	0.0
Quartz	2	0.2	0.8	0.2
Limestone	1	0.1	4.7	1.5
Bird River Quartzite	1	0.1	0.3	0.1
TOTALS	1318	100.1	322.1	100.0

Table 6-1: Quantity of Flakes by Lithic Material Type

The source areas for these raw materials are: the Upper Assiniboine River area for Swan River chert, Souris gravel pits near Brandon for agate, the Lockport area for Selkirk chert, while chert and quartzite were available locally (Figure 6-2). The remaining 16 material types comprise 12.7% of the total flaking debris. These materials came from a variety of sources throughout Manitoba as well as northwestern Ontario and the Dakotas.

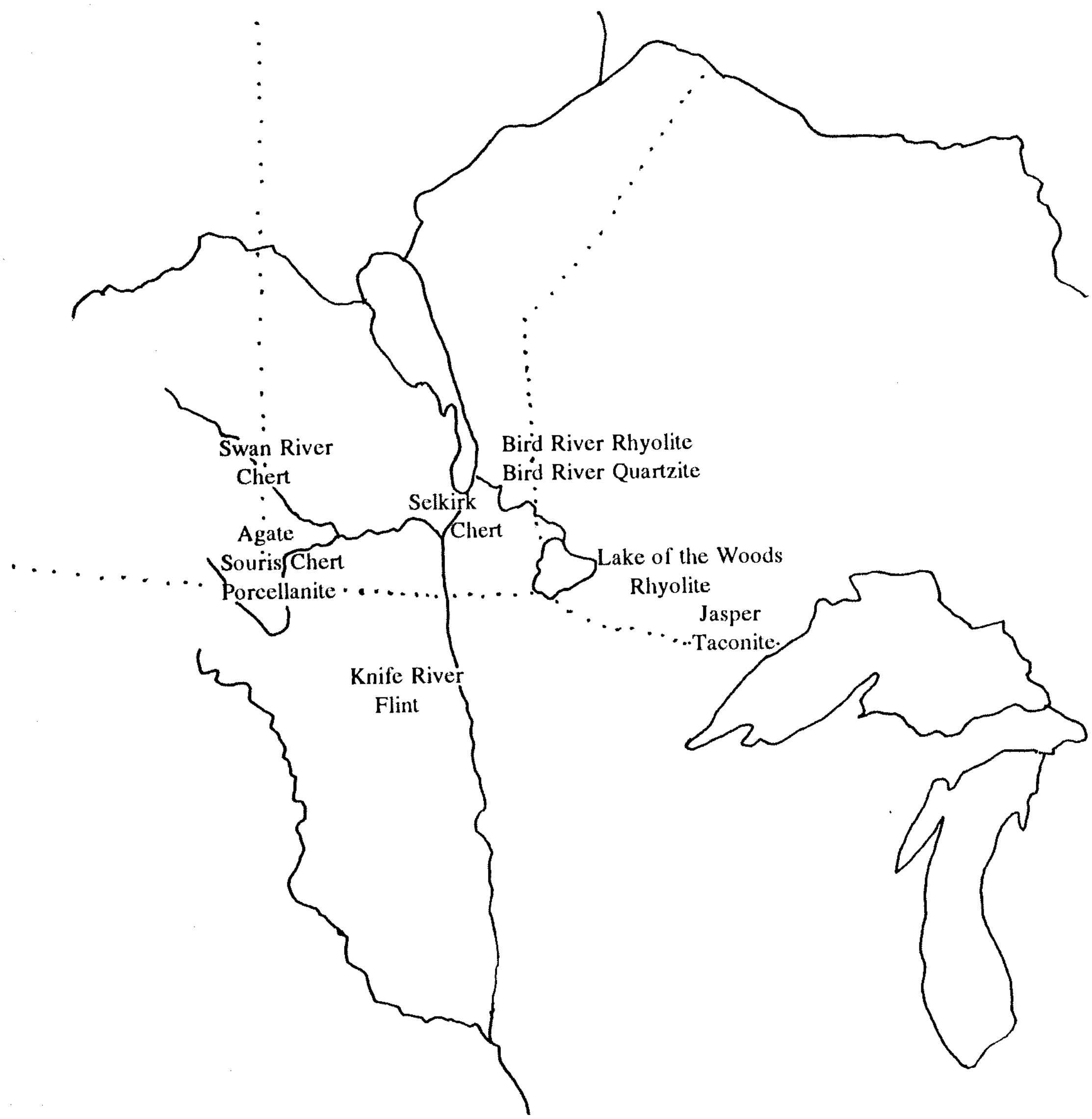


Figure 6-2: Map showing Lithic Source Areas

Twelve lithic cores were recovered from the site. Seven are agate, three are chert, and two are chalcedony. The specimens are small and range in weight from 1.1 gm to 15.9 gm with a mean of 6.1 gm per core. The paucity of cores indicates that large unmodified flakes, tool blanks, and previously finished tools were brought to the site. The flakes and blanks were made into tools on-site, with the resultant flaking debris left behind.

Swan River chert, for example, is coarse-grained, more difficult to flake than other materials and, when quarried, breaks off in large chunks. It would have been easier to reduce these chunks into workable sizes before leaving the quarry area. This could account for the absence of Swan River chert cores and the high percentage of flakes of this material at The Forks excavation. Conversely, agate is commonly found as small nodules that would have been easily transported to the site, where tools were made from them. The average size of the seven agate cores found at the site is only 3.6 gm. Alternatively, the chert and chalcedony cores average 9.5 gm. in weight.

Figure 6-3 shows the distribution of flakes. Figure 6-4 shows their quantity and weight by material type. These quantities and weights are generally similar for each lithic material type with the exception of larger, denser flakes of sedimentary rock: silicified sediment, Cathead chert, Selkirk chert, chert, and limestone. The highest area of concentration of flakes is from the hearth and its vicinity. Four of the cores (all agate) were found in this region (Figure 6-5). This indicates that lithic-working probably occurred around the fire, and flakes were scattered outward from it. Due to post-deposition flooding of the site, no patterns within the lithic flake types could be discerned.

6.2 Lithic Tools

Forty-one lithic tools were recovered during the 1992 excavations. Table 6-2 lists the ten types of tools present. The sixteen scrapers and nine utilized flakes account for 61% of the total. A variety of raw materials were used in tool manufacture with chert, Swan River chert, and chalcedony being the most common (Table 6-3). Recovered tools are composed of thirteen of the 21 lithic raw material types identified among the lithic debitage. The tools will be discussed under the broad categories of unifacial and bifacial. Figure 6-6 shows the distribution of tools by type at the site.

6.2.1 Unifacial Tools

Unifacial tools are those which have had flakes removed from one face. Tools from this category found at the site include scrapers, utilized flakes, retouched flakes, the chitho, and the uniface.

6.2.1.1 Scrapers

Sixteen scrapers were recovered during the excavation, including five end scrapers, six side scrapers, and five side-end scrapers. Chert, agate, and chalcedony are the most common of the eight lithic material types used. The measurements of the scrapers are listed in Table 6-4. Figure 6-7 shows where working edge measurements were taken. Scrapers are generally associated with hide-processing and clothing manufacture. However, given the preponderance of fish remains at the site, these tools could have been used for removing fish scales.

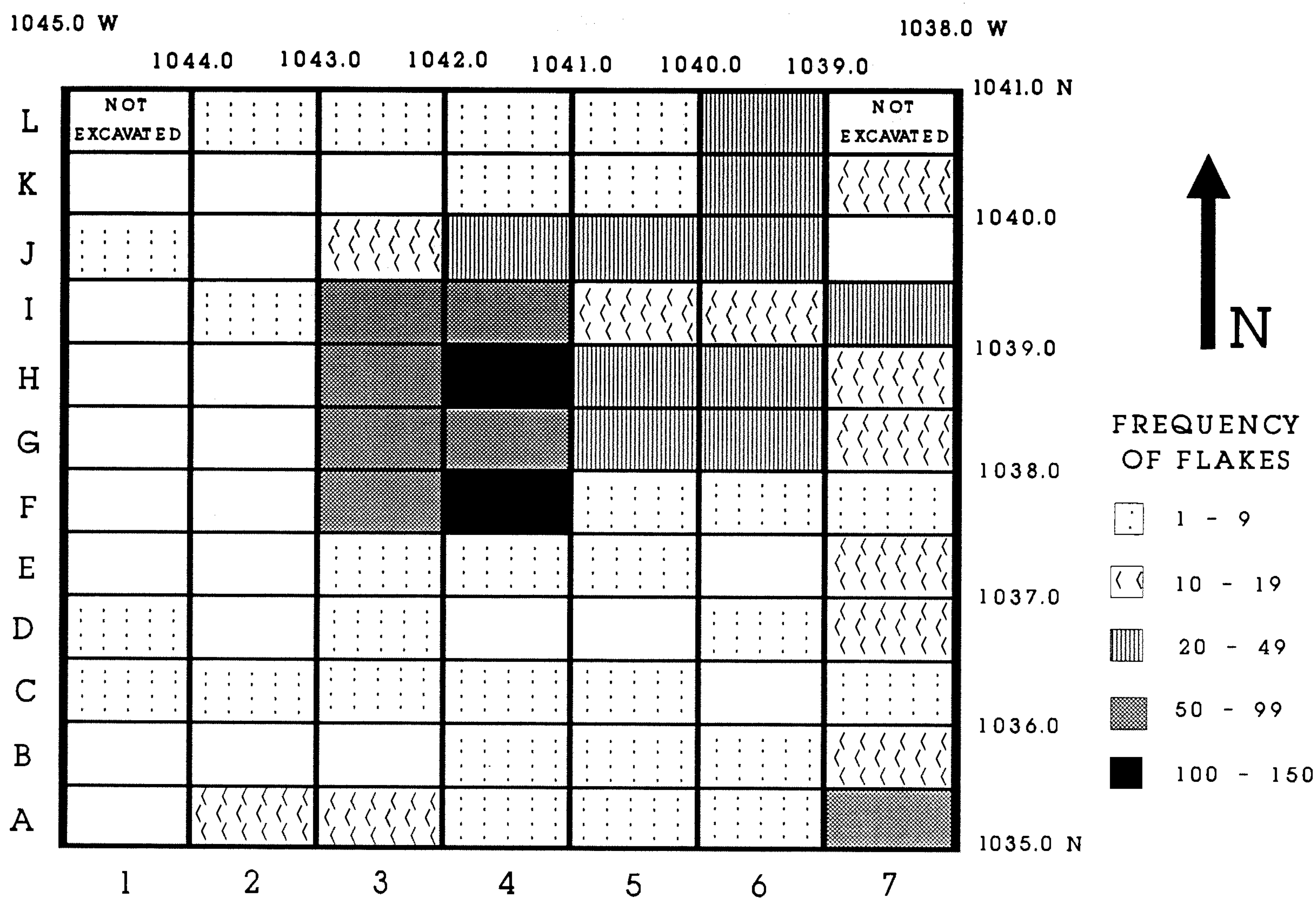


Figure 6-3: Distribution of Flakes

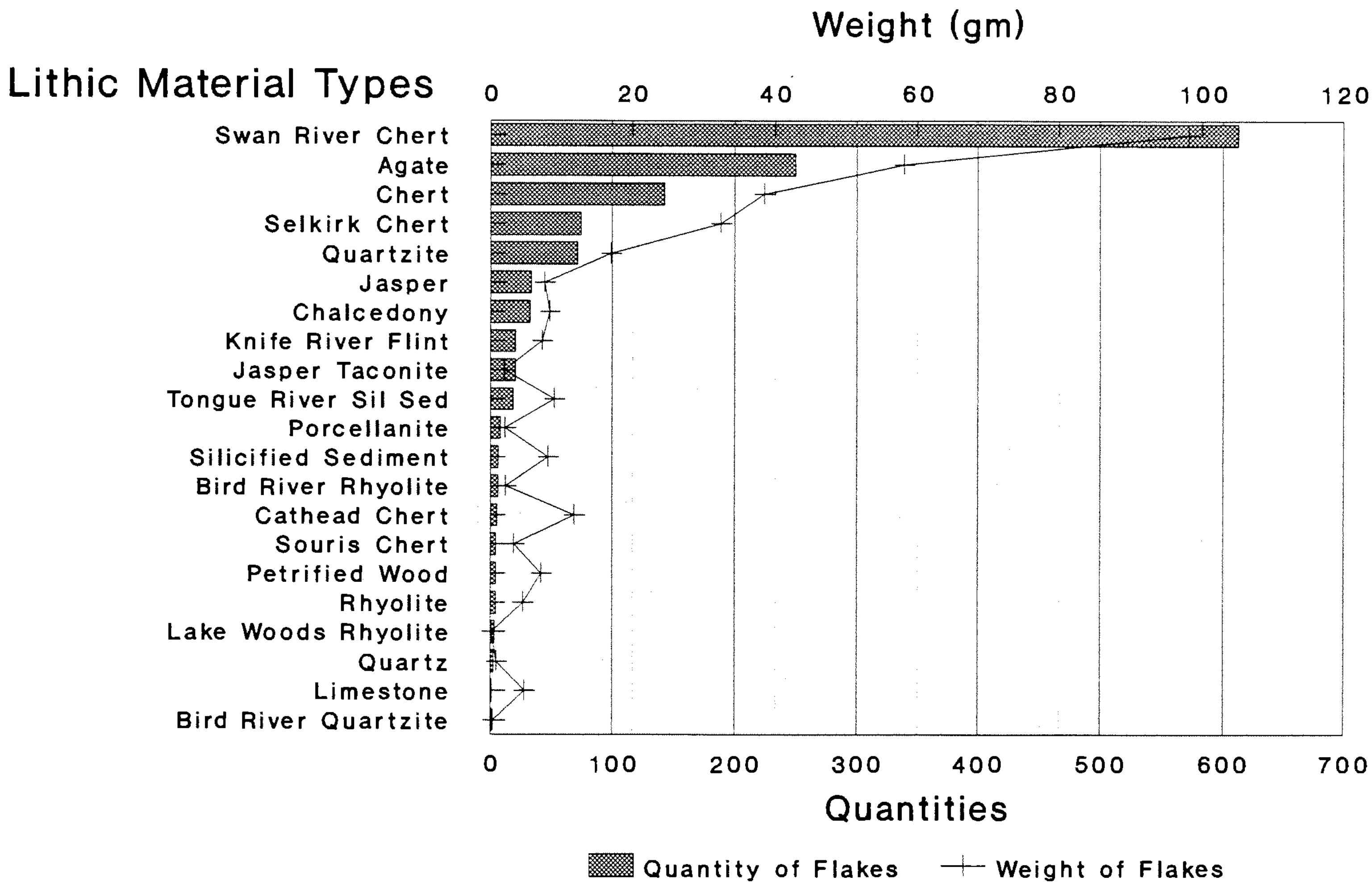


Figure 6-4: Frequency of Lithic Materials

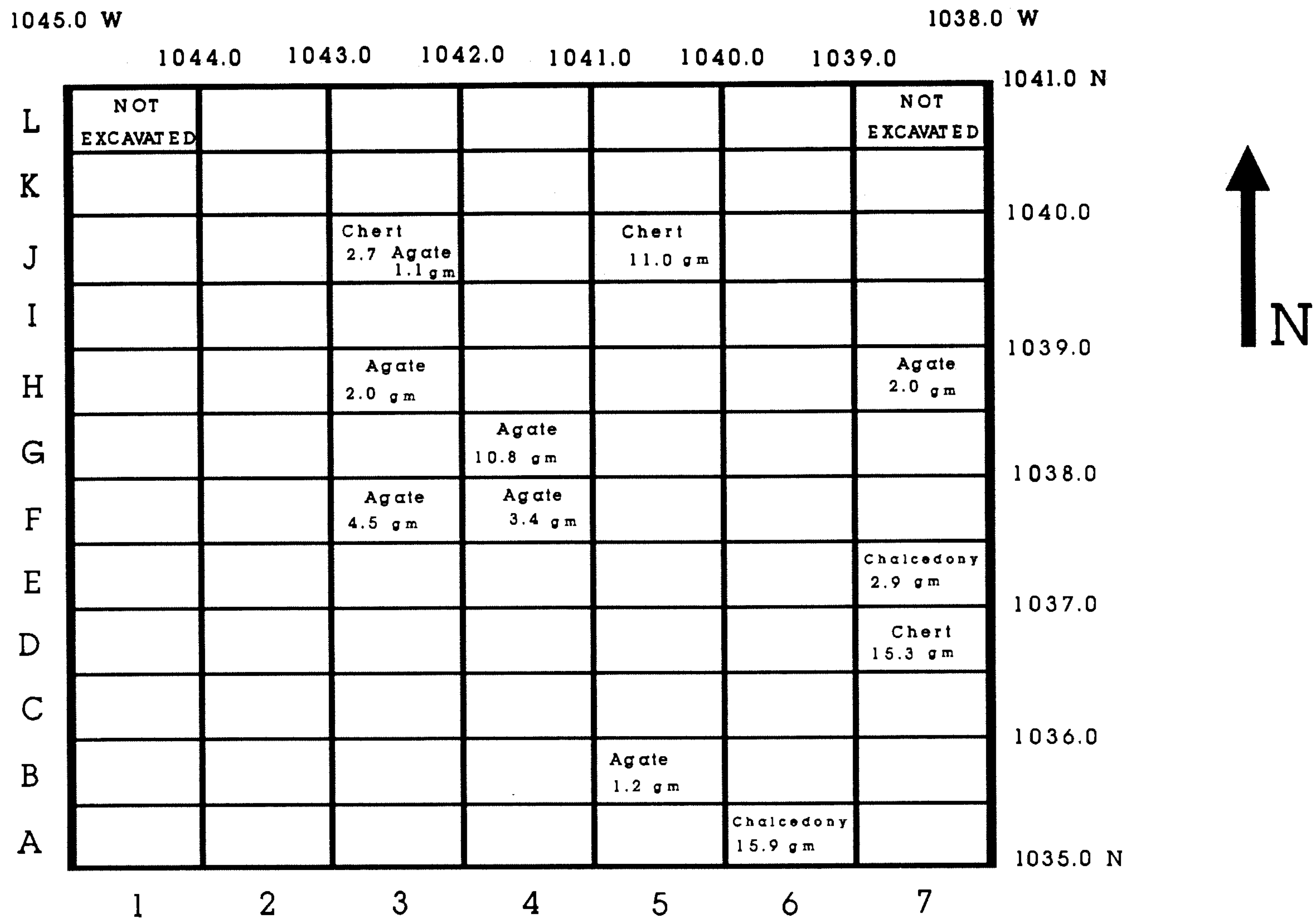


Figure 6-5: Distribution of Lithic Cores

LITHIC TOOL TYPE	QUANTITY	FREQUENCY
Scraper	16	39.0
Utilized Flake	9	22.0
Projectile Point	4	9.8
Biface	3	7.3
Retouched Flake	2	4.9
Wedge	2	4.9
Pièce Esquillée	2	4.9
Uniface	1	2.4
Chopper	1	2.4
Chitho	1	2.4
TOTALS	41	100.0

Table 6-2: Lithic Tool Types

LITHIC MATERIAL TYPE	QUANTITY	FREQUENCY
Chert	7	17.1
Swan River Chert	6	14.6
Chalcedony	6	14.6
Agate	5	12.2
Porcellanite	4	9.8
Knife River Flint	3	7.3
Quartzite	3	7.3
Rhyolite	2	4.9
Bird River Rhyolite	1	2.4
Petrified Wood	1	2.4
Silicified Sediment	1	2.4
Jasper Taconite	1	2.4
Gneiss	1	2.4
TOTALS	41	99.8

Table 6-3: Lithic Materials for Tools

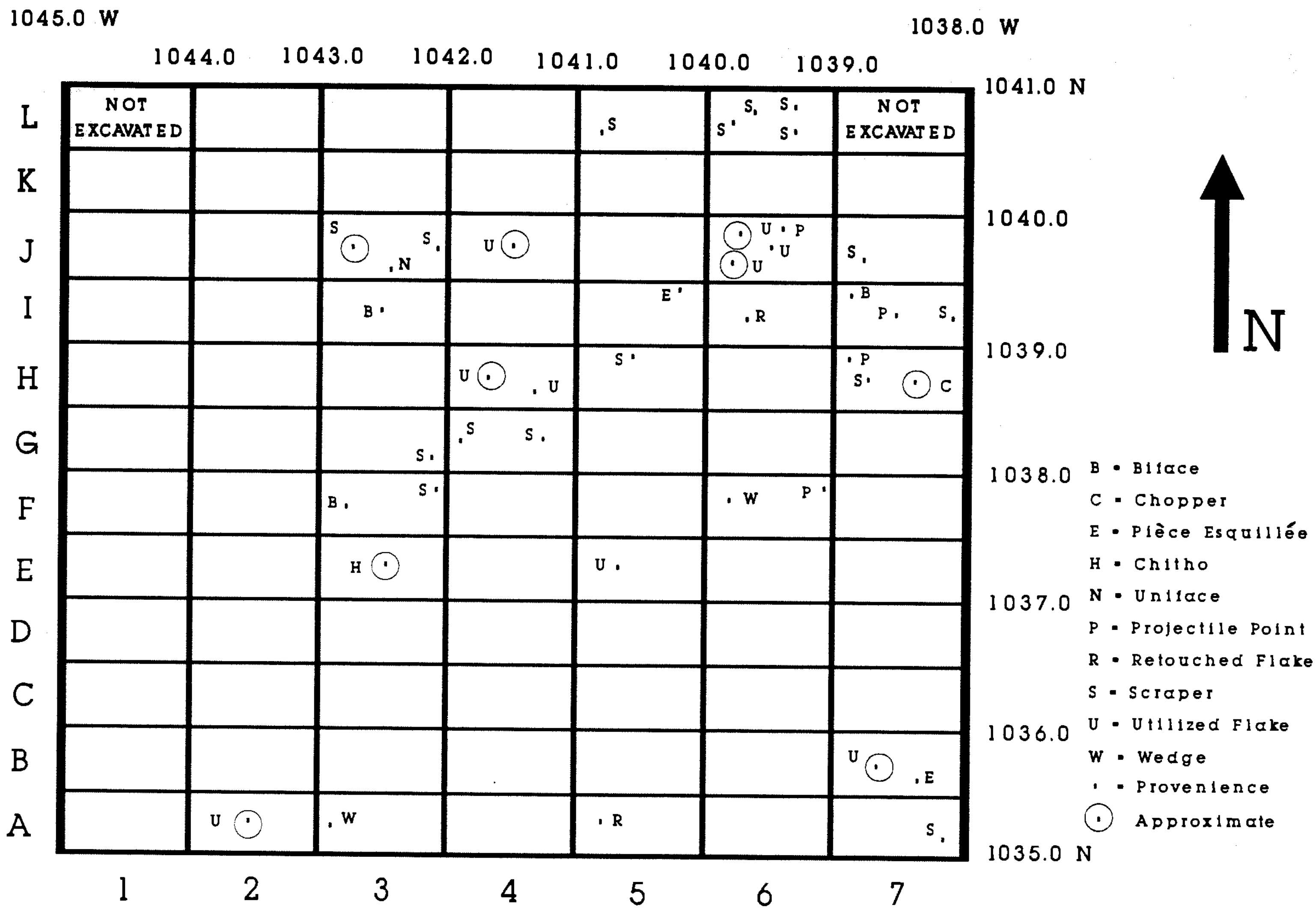


Figure 6-6: Distribution of Lithic Tools

CAT NO.	TOOL TYPE (Plate #)	ARTIFACT MEASUREMENTS LENGTH	ARTIFACT MEASUREMENTS WIDTH	ARTIFACT MEASUREMENTS THICK	WORKING EDGE MEASUREMENTS WIDTH	WORKING EDGE MEASUREMENTS LENGTH	WORKING EDGE MEASUREMENTS ANGLE
5157	End Scraper (a)	20.5	15.8	5.3	12.5	3.6	85
6716	End Scraper (b)	19.8	16.6	7.0	14.4	7.3	80
6717	End Scraper (c)	19.1	16.9	6.3	20.1	6.5	75-80
9407	End Scraper (d)	22.7	19.6	6.3	28.1	12.2	68
9503	End Scraper (e)	22.5	9.5	5.5	11.1	2.9	55-60
1181	Side Scraper (f)	32.3	21.2	5.7	L 27.8	2.2	54
					R 22.8	1.1	50
1827	Side Scraper (g)	27.3	20.1	6.9	22.1	3.8	60
3556	Side Scraper (h)	24.3	17.5	5.4	21.5	5.0	63
8925	Side Scraper (i)	19.7	11.4	4.7	21.6	6.2	57-65
9336	Side Scraper (j)	21.5	19.0	7.4	15.4	2.2	60
1807	Side Scraper (k)	26.4	18.0	5.9	22.2	3.5	60-65
2928	Side - End (l)	23.3	15.5	7.6	L 20.0	5.9	60
					R 9.5	3.8	67
					E 12.4	3.5	65
3090	Side - End (m)	20.2	19.4	4.1	R 18.0	3.1	40
					E 7.7	1.2	55
5135	Side - End (n)	23.2	18.0	7.4	L 17.3	2.6	63
					E 18.0	8.3	68
8080	Side - End (o)	19.3	12.7	4.0	L 14.4	1.4	45
					R 10.3	3.5	47
					E 10.9	1.8	50
8679	Side - End (p)	26.2	18.4	5.0	R 26.2	1.7	45
					E 16.1	1.9	45

Table 6-4: Measurements of Scrapers

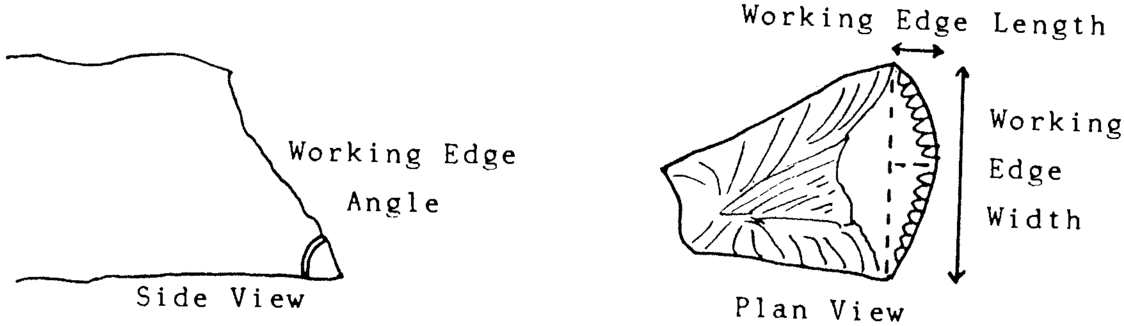


Figure 6-7: Scraper Measurement Landmarks (from MacLaren/Quaternary 1988)

6.2.1.1.1 End Scrapers

These unifacial tools are characterized by a steep cutting edge which is convex or occasionally straight in outline (Plate 6-1:a-e). They were made on flakes with striking platforms at the proximal end and have been marginally trimmed to facilitate hafting. They are triangular in shape and taper evenly from the widest point, which is at the working edge, to the base. The specimens are similar in size, ranging in length from 19.1 mm to 22.7 mm for an average of 20.9 mm (Table 6-4). The steep working edges vary from ca 60 to 85 degrees.

6.2.1.1.2 Side Scrapers

Five of the six side scrapers have steep working edges on one lateral margin (Plate 6-1:f-k). Only one scraper (DlLg-33:92A-1181) has evidence of use along both lateral edges. The specimens are rectangular in outline and no evidence of hafting exists. The working edge angles are less than those of the end scrapers, ranging from 50 to 65 degrees (Table 6-4).

6.2.1.1.3 Side-End Scrapers

Scrapers with working edges at an end and one or both sides are termed side-end scrapers. Four artifacts have one lateral working edge, while DlLg:92A-8080 has been worked along both sides (Plate 6-1:l-p). The working edge angles vary from 40 to 75 degrees (Table 6-4).

6.2.1.2 Chitho

A large gneiss artifact 96.2 mm long and 58.1 mm wide was used along 83.0 mm of the left edge (Plate 6-2). The chitho (DlLg-33:92A-5570) has a plano-convex cross-section and the right side of the artifact is broken. It has a steep edge angle of 70 to 80 degrees and was likely used as a hand-held hide scraping tool. The friability of the stone type allows for the use of very heavy pressure. The edge of the tool will crumble rather than cut the hide which is being processed.

6.2.1.3 Utilized Flakes

Nine utilized flakes were recovered from the site. These tools are flakes which were used for a short time and then discarded. They could have been produced either during the manufacture of another tool or through the intentional striking of a cobble or pebble to produce a usable flake. Many of the specimens (DlLg-33:92A-2076, 3783, 6822, 6900, and 7245) have a portion of cortex remaining on them.

The utilized flakes from the site are various sizes (Plate 6-3:a-i) ranging in length from 9.5 mm to 44.7 mm with working edges 7.0 mm to 24.4 mm wide (Table 6-5). The flakes are made of a variety of lithic materials including chert (3), porcellanite (2), Swan River chert (1), Knife River flint (1), Bird River rhyolite (1), and silicified sediment (1). Working edge angles range from 30 to 80 degrees, averaging ca 50 degrees. Two of the tools (DlLg-33:92A-3093, 4118) have working edge angles of 30 degrees and were probably used as cutting implements to process plants and animals. The remaining seven artifacts have angles greater than 40 degrees and could have been used for descaling fish or to further modify bone or wood tools which had been shaped using the wedges and pièce esquillées.

CAT NO.	TOOL TYPE (Plate #)	ARTIFACT MEASUREMENTS			WORKING EDGE MEASUREMENTS		
		LENGTH	WIDTH	THICK	WIDTH	LENGTH	ANGLE
1886	Utilized Flake (a)	44.7	31.0	8.6	24.4	2.7	55
2076	Utilized Flake (b)	31.6	18.8	10.8	13.1	1.3	55
2077	Utilized Flake (c)	9.6	12.5	1.9	8.1	0.4	50
3093	Utilized Flake (d)	16.5	12.2	1.1	15.6	1.8	30
3783	Utilized Flake (e)	21.0	15.4	7.3	10.4	3.3	40
4118	Utilized Flake (f)	9.5	5.1	1.5	8.5	1.3	30
6822	Utilized Flake (g)	26.7	20.6	4.2	7.0	1.3	45
6900	Utilized Flake (h)	19.9	20.7	5.5	18.7	1.4	50
7245	Utilized Flake (i)	28.1	14.1	6.7	10.4	0.6	80
4428	Retouched Flake (j)	24.0	20.9	4.5	9.4	2.8	50
9203	Retouched Flake (k)	22.1	12.9	8.0	9.2	1.2	40
9002	Uniface (l)	33.3	23.1	6.7	L 12.7	2.2	50
					R 32.7	4.3	65
					E 9.5	1.8	50
5570	Chitho	96.2	58.1	11.8	83.0	6.7	75

Table 6-5: Measurements of Unifacial Tools (Excluding Scrapers)

6.2.1.4 Retouched Flakes

Two flakes were marginally retouched to produce a better working edge. One (DlLg-33:92A-4428) is a whitish chalcedony and the other (DlLg-33:92A-9203) is a thick agate specimen with cortex (Plate 6-3:j-k). They have working edge angles of 50 degrees and 40 degrees respectively (Table 6-5). Their function was probably the same as the steeper-edged utilized flakes.

6.2.1.5 Uniface

A grey, porcellanite tool (DlLg-33:92A-9002) with two utilized lateral edges and a scraper-like proximal end was found (Plate 6-3:l). It is 33.3 mm long, 23.1 mm wide, and 6.7 mm thick (Table 6-5).

6.2.2 Bifacial Tools

Bifacial tools have had flakes removed from both surfaces and include projectile points, bifaces, choppers, wedges, and pièce esquillées.

6.2.2.1 Projectile Points

One of the most diagnostic and easily distinguished artifact types to be found at an archaeological site is the projectile point. Four specimens were recovered from the 1992 Forks Public Archaeology excavation. Table 6-6 provides measurements of the points and Figure 6-8 illustrates where these measurements are taken. For comparison, measurements are included in Table 6-6 for the projectile point recovered from the 1988 excavation. DlLg-33/88D-1345 has similar dimensions to the complete points found in 1992, but differs in that it is side-notched, has a convex base, and is made of Swan River chert (Kroker 1989:154). It is considered to be characteristic of projectile points of the Shield Archaic tradition (Plate 6-4:e).

Three of the 1992 projectile points are complete and one (DlLg-33:92A-1349) is the tip and mid-section of an incomplete point (Plate 6-4:d). Made from a dark green-black rhyolite, it may have broken during manufacture as the tip is considerably rounded and one lateral edge has a small notch while the other lateral edge bulges out toward the break. Alternatively, the complete point could have been broken during use.

CATALOG NUMBER	MATERIAL TYPE	POINT LENGTH	ARTIFACT WIDTH	THICKNESS	BASE WIDTH	HAFT WIDTH	BASE LENGTH	NOTCH LENGTH	NOTCH DEPTH	NOTCH ANGLE	SHOULDER ANGLE	TIP ANGLE
		LE	WI	TH	BWI	HFTWI	BLE	NOL	NOD	NOA	SHA	TIPA
1348	Chalcedony	36.4	22.6	7.3	16.9	14.9	11.1	L 9.6 R 10.5	5.2 3.6	125 140	62 70	64
1713	Quartzite	44.0	23.0	6.8	15.1	13.2	11.8	L 8.6 R 8.5	3.7 3.6	132 122	93 99	57
6104	Quartzite	49.3	20.0	7.9	13.9	12.3	10.5	L 5.5 R 7.3	3.4 2.5	123 127	110 127	60
1349	Rhyolite	30.8	21.1	5.8	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.	Inc.
88D-1345	Swan River Chert	38.3	20.6	7.0	15.7	N/A	10.6	13.5	N/A	120	N/A	30

Table 6-6: Measurements of Projectile Points

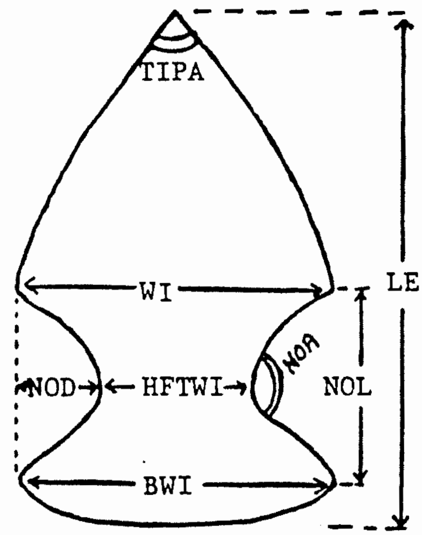


FIGURE 1: Landmark measurements taken on a side-notched point.

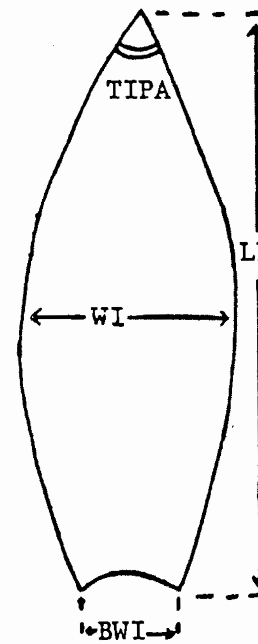


FIGURE 2: Landmark measurements on a stemmed projectile point.

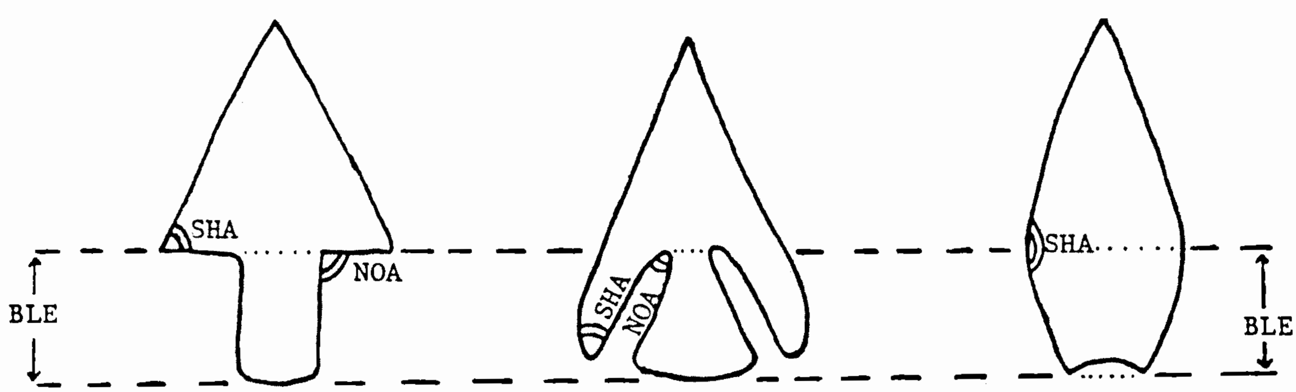


FIGURE 3: Determination of Base Length (BLE), Shoulder Angle (SHA) and Notch Angle (NOA) on various types of projectile points.

Figure 6-8: Measurement Landmarks on Projectile Points (MMMN 1986)

The most finely manufactured of the projectile points is DlLg-33:92A-1348 (Plate 6-4:a). It is made from a light brown chalcedony and cortex is present on the base of one face. It is corner-notched, has straight sides, and the blade is triangular in shape. The base is straight and has been thinned on both sides to facilitate hafting. The point was bifacially flaked as evidenced by the presence of long lamellar flake scars, as illustrated in Figure 6-9, which also depicts the various types of flaking and retouch commonly present on projectile points. Flakes were removed from the edges toward the centre of the point, creating a slight medial ridge. The point is similar to Late Archaic Period types from western Manitoba (Badertscher 1982), Alberta (Brumley 1975:163), Montana and Wyoming (Frison 1978:Figure 5.41a,b). It most resembles the Hanna type, which is commonly found on western Plains sites. The primary difference is that the base of DlLg-33:92A-1348 is convex, while the defined Hanna type has a slightly concave base. The point also has some general characteristics of points from southern Ontario and Michigan on sites dating from ca 3350 to 2600 B.P. (Ellis *et al.* 1990:108,109).

DlLg-33:92A-1713, made from grey-brown quartzite (Plate 6-4:b), has a similar shape to DlLg-33:92A-1348 except for a longer blade and a somewhat narrower base, which is straight and thinned. It is corner-notched, slightly asymmetric and the lateral edges have been retouched in a random pattern, unlike the lamellar flaking of the point described above (Figure 6-9). A whitish-grey patina is present on one face near the base, and the tip of a blade corner is broken off. One face is fairly flat and it appears the point was made from a flake. This style of point is also similar to the Hanna type from western Manitoba, Alberta, Montana, and Wyoming.

The remaining projectile point (DlLg-33:92A-6104) is highly encrusted with carbon, indicating that it was exposed to heat and probably remained in the ashes for a time. Made of the same grey-brown quartzite as DlLg-33:92A-1713, it is stylistically different from the other points, having a longer, narrower blade and a short base (Plate 6-4:c). It is plano-convex in cross-section and was likely manufactured from a flake. It is not as well made as the other complete specimens and little attempt was made to thin its blade. The base is straight and has been thinned. The left lateral edge has a continuous retouch, while the right edge has a discontinuous retouch. This projectile point has similarities to Pelican Lake specimens from southwestern Manitoba (Reeves 1970:Plate 22-#17), and to types in Montana and Wyoming (Frison 1978). It has some resemblance to Boreal Forest and Shield Archaic types from Manitoba and northwestern Ontario.

6.2.2.2 Bifacial Knives

Three bifacial knives, all made of Swan River chert, were found at the site. The dimensions of the bifaces are provided in Table 6-7. The complete specimen (DlLg-33:92A-3608) has an ovate shape and a concavo-convex cross-section (Plate 6-5a). It was probably made from a large primary flake as a small portion of cortex remains at the proximal end where the striking platform was. It measures 85.0 mm long by 32.4 mm wide and is 15.4 mm thick. The biface has been shaped through the removal of flakes from along the edges and the working edges exhibit retouch.

The two other bifaces are incomplete. DlLg-33:92A-9337 is an end portion of an artifact which, if complete, would probably have been larger than the complete biface (Plate 6-5b). The end is

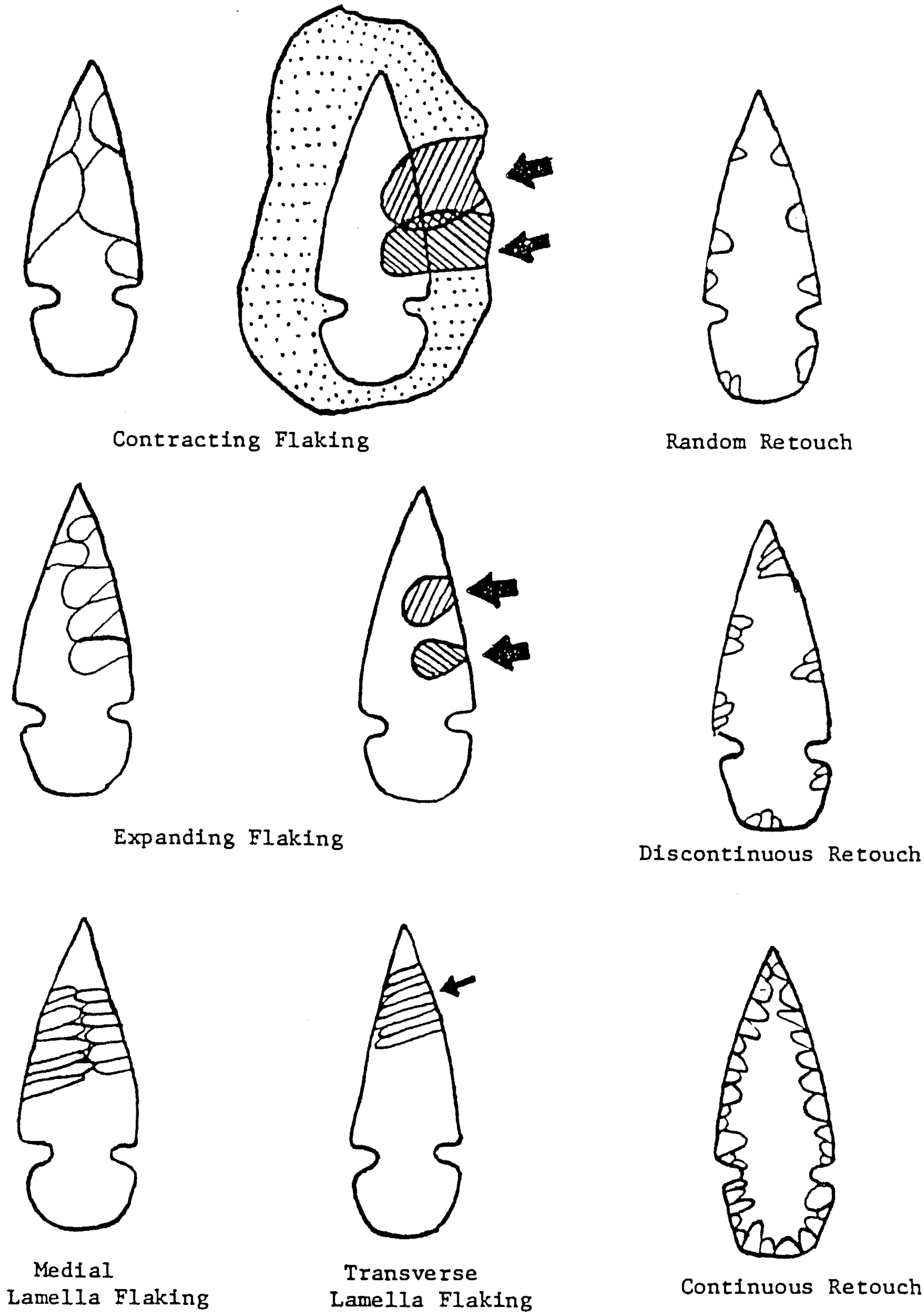


Figure 6-9: Types of Flaking (MMMN 1986)

more rounded and the edges are not as finely flaked. The other biface (DlLg-33:92A-2931) is represented by part of a side 34.6 mm long and there is secondary flaking on the working edge (Plate 6-5c). It is difficult to determine if the biface broke while in use or when it was being fashioned into a projectile point.

CAT NO.	TOOL TYPE	ARTIFACT MEASUREMENTS			WORKING EDGE MEASUREMENTS		
		LENGTH	WIDTH	THICK	WIDTH	LENGTH	ANGLE
2931	Biface	34.6	9.4	5.6	Inc.	Inc.	55
3608	Biface	85.0	32.4	15.4	L 84.8	11.6	65
					R 93.9	10.4	60
9337	Biface	27.3	34.9	13.3	L Inc.	Inc.	70
					R Inc.	Inc.	55
6944	Chopper	48.2	49.0	17.1	L Inc.	Inc.	60
					R Inc.	Inc.	60
1328	Wedge	29.7	26.4	5.9	15.8	-	33
6106	Wedge	27.8	25.2	8.2	22.7	-	57
1263	Pièce Esquillée	20.3	18.0	8.9	T 8.0	-	35
					B 9.5	-	50
7337	Pièce Esquillée	24.1	17.1	6.1	T 9.4	-	55
					B 8.7	-	58

Table 6-7: Measurements of Bifacial Tools (excluding Projectile Points)

6.2.2.3 Chopper

A large incomplete Swan River chert biface (DlLg-33:92A-6944) was recovered during the excavations (Plate 6-6). The working edges have had primary flakes removed from them and there is no evidence of secondary flaking or retouch. The artifact was probably used as a chopping tool instead of a cutting implement, perhaps to butcher animals or to work wood.

6.2.2.4 Wedges

Two quartzite wedges were discovered at the site. Wright (1970:37) notes that these tools were made by placing a thick flake on an anvil and gently tapping on one edge with a hammerstone or a soft-hammer. This resulted in flakes being removed from the struck edge and from the end in contact with the anvilstone. If a hard hammer was used, the edge is subject to crushing, while this crushing is absent if a soft-hammer was used (Keeley 1980:40). Both edges can have a crushed appearance and numerous stepped flake scars extend down from the edges. These tools were likely used as gouges or chisels to split wood, bone or antler to produce other implements.

DlLg-33:92A-1328 is a dark, reddish-coloured, thin cortical flake almost square in outline (Plate 6-7:a). The other wedge (DlLg-33:92A-6106) has a blocky shape with thinned ends (Plate 6-7:b).

A considerable amount of cortex is present on one face and the tool could have been made from a shatter flake. One end of both tools is battered from being struck with a stone hammer and the other end exhibits battering from the item being worked on. Measurements of the wedges are provided in Table 6-7.

6.2.2.5 Pièce Esquillées

A distinctive type of artifact is the pièce esquillée (literal translation: scaled piece). These artifacts were first recognized in Old World archaeological sites in the early 1900s, but were not extensively discussed in North America until the study of the Debert Paleo-Indian site in 1968 (MacDonald 1985:85-90). They are generally squarish to circular in outline with extensive battering on at least two opposing edges or ends (Ellis and Ferris 1990:109). Their function has been interpreted to be that of wedges. One end is struck with a hammer and the other end becomes battered from contact with the wood or bone item being split. Battering on several edges occurs from constantly rotating the pièce esquillée during use.

The pièce esquillées recovered from the site are both made of chalcedony. DlLg-33:92A-1263 has a blocky shape (Plate 6-7:c) being 20.3 mm long, 18.0 mm wide, and 8.9 mm thick (Table 6-7). The working edge widths on the opposing ends are 9.5 mm and 8.0 mm. Cortex is present along a lateral edge. The other specimen (DlLg-33:92A-7337) is rectangular in outline (Plate 6-7:d) measuring 24.1 mm in length, 17.1 mm in width and 6.1 mm in thickness (Table 6-7). It has a plano-convex cross-section and has working edge widths of 9.4 mm and 8.7 mm.

6.3 Other Lithic Objects

Other lithic objects which have no evidence of cultural modification were present at the site. This group includes pebbles (2), cobbles (3), and spalls (5). The pebbles are chert and agate, the cobbles are limestone and chert, while the spalls are limestone, granite, and gabbro. These items were likely brought to the site from areas such as the nearby river's edge in the case of limestone and perhaps from the Souris gravel pits for the agate pebble. The large size of the chert cobble (1207.5 gm) may indicate that it was collected near the site.

This chert cobble and the agate pebble could represent items brought to the site with the intent of using them as raw materials for tools. For some reason they were deposited without being modified. The two limestone cobbles could have served as boiling stones in animal processing pits. Boiling stones are stones heated in a very hot fire and then placed in a pit filled with water along with the animal remains to be processed. The water boils and the animal remains get cooked. Once their purpose was complete, the stones would have been dumped out of the pits.

6.4 Zone 3B Lithics

Lithic artifacts from Zone 3B are represented by 19 flakes. Table 6-8 lists the quantity of flakes by raw material type. Nine types are present, with quartzite the most common. Six flakes are made of this material. The 19 flakes were recovered from the southwest quadrant of the excavation where

Zone 3B was observable. Eight of the flakes, representing six of the eight lithic types, are from Unit B2. The other flakes are from Units B3, C3, D3, and E3, immediately north of Unit B2, and from Unit A4 to the northwest. This distribution appears to indicate that Zone 3B lithic activity occurred at this part of the site.

PROVENIENCE	LITHIC MATERIAL	QUANTITY	%	WEIGHT	%
B2, D3, E3	Quartzite	6	31.6	2.9	27.6
B2	Chert	2	10.5	0.2	1.9
B3	Chalcedony	2	10.5	0.9	8.6
B3, E3	Silicified Sediment	2	10.5	2.5	23.8
B2, C3	Petrified Wood	2	10.5	1.7	16.2
A4, B2	Knife River Flint	2	10.5	1.4	13.3
B2	Swan River Chert	1	5.3	0.1	1.0
B2	Agate	1	5.3	0.2	1.9
B2	Rhyolite	1	5.3	0.6	5.7
TOTALS		19	100.0	10.5	100.0

Table 6-8: Lithic Flakes Recovered from Zone 3B

6.5 Fire-cracked Rock

The final category of lithic recoveries consists of stone material which has evidence of being subjected to intense heat. Depending upon the structure of the rock, extreme temperature variations causes different results. Fine-grained homogenous lithic cobbles, such as limestone and gneiss, will spall and shatter into angular fragments, while coarse-grained granitic rocks will tend to decompose into small granular fragments of the different parent materials, i.e., feldspar, quartz, biotite, etc.

Fire-cracked rock was recovered from all but 14 of the excavation units, with the densest concentrations occurring in the north-central portion of the excavation area (Figure 6-10). Three main types of lithic material were identified: limestone (which may include dolomite), granitic rock (which includes granite, granodiorite, and diorite), and gneiss. One specimen of feldspar and one specimen of schist were recovered. In terms of frequency, the granitic specimens accounted for the most specimens as well as the greatest weight (Table 6-9).

However, if the frequency by weight is compared with that by quantity, it becomes apparent that the granitic specimens are greatly over-represented in terms of numbers of recoveries. Two explanations are possible. The first possibility is that the granitic specimens were subjected to more instances of heat, thereby increasing the degree of decomposition. This would be the case if the specimens were used as hearth stones. The second possibility, and the more probable explanation, is that the degree of fragmentation is a reflection of the internal structure of the rock. A fine-grained homogenous stone would be more cohesive than one which is coarse-grained and composed of several types of distinct crystals. The average weight of specimens tends to reflect the second

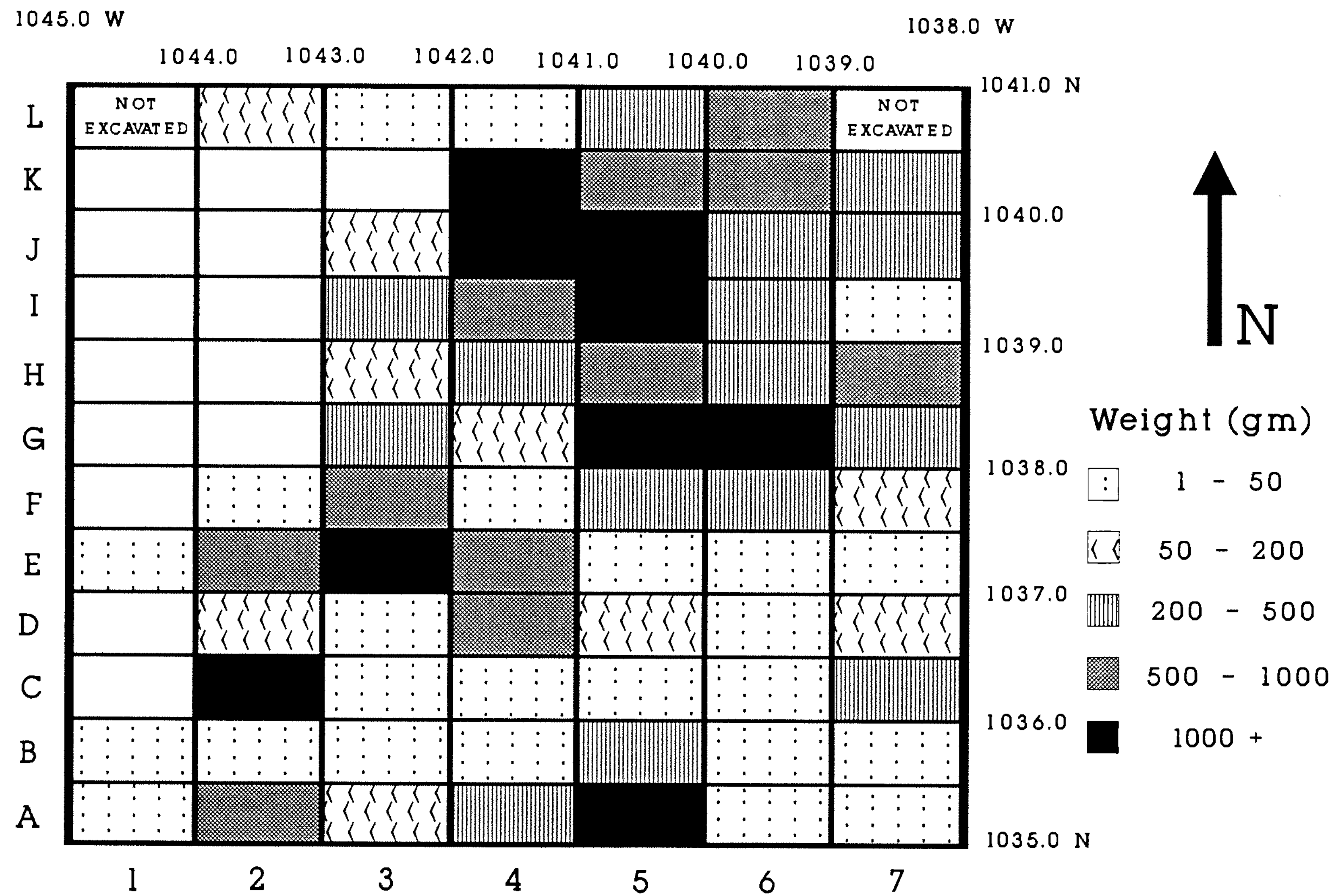


Figure 6-10: Density of Fire-cracked Rock

possibility, i.e., limestone (36.1 gm/specimen), gneiss (31.9 gm/specimen), and granite (6.9 gm/specimen). The distribution maps of limestone (Figure 6-11) and granitic (Figure 6-12) specimens by weight/specimen show different patterns. However, neither pattern is readily interpretable. The smaller granitic specimens are more uniformly spread across the excavation area, while the limestone seems to be more centrally located.

LITHIC MATERIAL	NUMBER OF SPECIMENS	PER CENT	WEIGHT OF SPECIMENS	PER CENT
Feldspar	1	< 0.1	0.6	< 0.1
Gneiss	73	2.4	2325.8	7.7
Granite	2724	89.4	18829.0	62.6
Limestone	247	8.1	8923.8	29.7
Schist	1	< 0.1	0.4	< 0.1
TOTALS	3046	99.9	30079.6	100.0

Table 6-9: Frequency of Types of Fire-cracked Rock

As the entire north bank of the Assiniboine River has developed through sediment deposition by the two rivers, cobbles are not present in the area. Thus, all specimens would have had to have been transported to the site by the occupants. Because human activity is involved, examination of the artifacts may enable the determination of the selection criteria which the peoples employed.

There are a limited number of purposes which limestone, gneiss, and granitic stones can fulfil, one of which is as raw material for tool manufacture. Granitic cobbles can be shaped, by pecking and grinding, into hammerstones. The granular nature of the stone precludes the manufacture of cutting implements, although tabular granitic spalls can be shaped into chithos. Both limestone and gneiss have erratic fracture and are not usually selected for tool manufacture, although coarsely flaked choppers can be made from both. In addition, the relative softness of limestone means that a cutting tool would wear out quite quickly. Often, chert nodules are embedded in limestone deposits and limestone cobbles could have been collected for chert recovery. Treating the limestone cobble by subjecting it to intense heat prior to shattering for chert recovery, would have resulted in fractures passing around the nodule rather than through it; thereby resulting in a higher frequency of usable chert for tool manufacture.

Stones composed of all three materials could be used as boiling stones. Ethnographic literature records the use of heated stones to cook soups and stews. The liquid food, in a hide, basket or ceramic container, is gradually heated to boiling point by the addition of stones which have been heated in the adjacent fire. The documentation does not record if certain types of stone were preferred or if it was a case of using what was available. Intuitively, one would suspect that the hot stones which would produce small granular spalls upon suffering thermal shock, when submerged in cold liquid, would not be the optimum choice. If this supposition is valid, perhaps the limestone and gneiss stones were brought to the site for use as boiling stones.

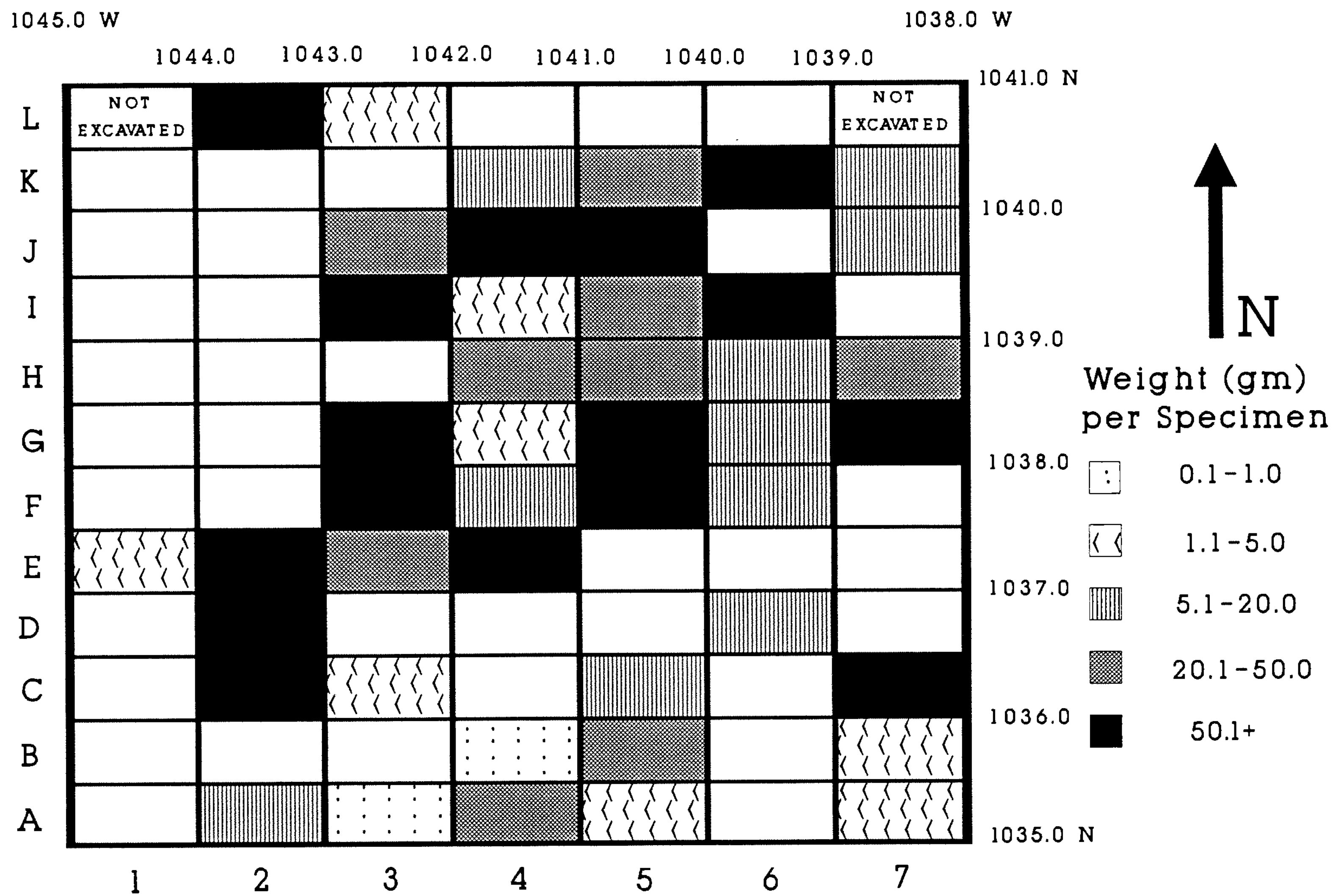


Figure 6-11: Distribution of Limestone Specimens

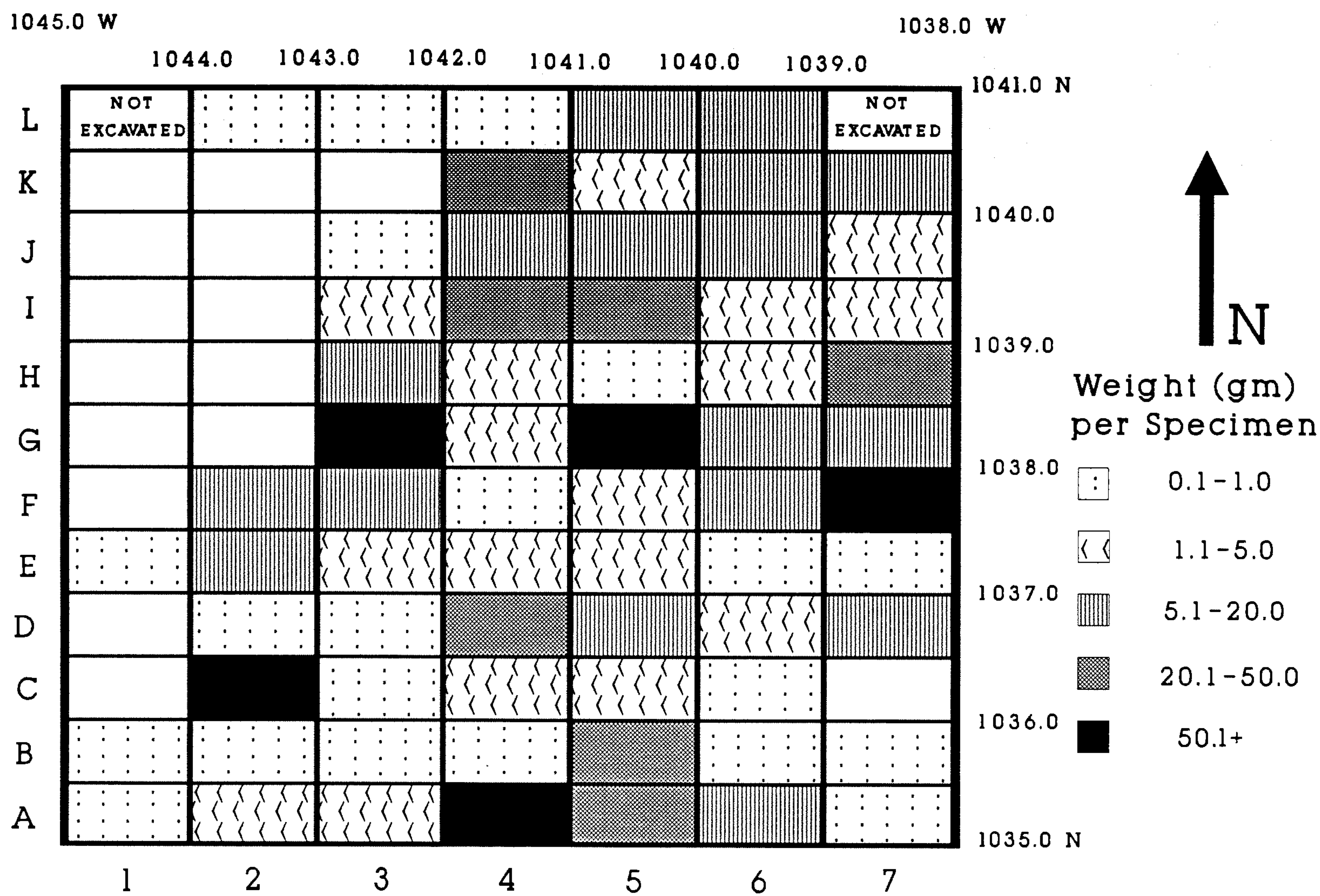


Figure 6-12: Distribution of Granitic Specimens

The third use for cobbles and stones which would be indicated by thermal alteration is that of hearth stones. Rocks are often placed around the perimeter of a fire as a containment mechanism. These perimeter stones often serve a secondary purpose in that they provide a resting place for containers which are being heated. As a corollary, heated stones will slowly radiate the heat that they have absorbed and thus may be used to bake vegetable food or maintain a constant heat beneath fish or meat drying racks.

Given the presence of a very distinct hearth in Unit H4 and appearances of relatively amorphous ash deposits in the north central area of the excavation area, it is probable that the fire-cracked rock was used in conjunction with heat sources, rather than as raw material for tool manufacture. At the present state of knowledge, it is not possible to determine if they were used as boiling stones, hearth stones, or radiant heat sources.

6.6 References

Badertscher, Patricia M.

1982 Archaeological Investigations at EjMg-2, Childs Lake, Duck Mountain Provincial Park. Department of Cultural Affairs and Historical Resources. *Papers in Manitoba Archaeology, Final Report* No. 14. Winnipeg.

Brumley, John H.

1975 The Cactus Flower Site In Southeastern Alberta: 1972-1974 Excavations. National Museum of Man, Archaeological Survey of Canada, *Mercury Series* No. 46. Ottawa.

Darlington, David

1980 The Analysis of the Use-Wear Patterns On Artifacts From 48 FR 440, The Bison Basin Site, Fremont County, Wyoming. *The Wyoming Archaeologist*, Vol. 23, No.2.

Ellis, Chris J., Ian T. Kenyon and Michael Spence

1990 The Archaic. In The Archaeology of Southern Ontario To A.D. 1650. Chris J. Ellis and Neal Ferris (Eds.). Ontario Archaeological Society, *Occasional Publication of the London Chapter*, No. 5.

Frison, George C.

1978 *Prehistoric Hunters of the High Plains*. Academic Press, New York.

Keeley, Lawrence H.

1980 *Experimental Determination of Stone Tool Uses*. The University of Chicago Press, Chicago.

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation, Winnipeg.

MacDonald, George W.

1985 Debert: A Paleo-Indian Site in Central Nova Scotia. National Museum of Canada, *Anthropological Papers* No. 16. [Original Publication - 1968].

MacLaren Plansearch Inc./Quaternary Consultants Ltd.

1988 Mitigation of Limestone Project Impacts on Heritage Resources: Phase III Report. On file with Manitoba Hydro and Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Manitoba Museum of Man and Nature

1986 *Guides and Manuals for Processing Archaeological Materials.* E.L. Syms (Ed.). Winnipeg, Manitoba.

Reeves, Brian

1970 Culture Dynamics In The Manitoba Grasslands 1000 B.C.-A.D. 700. In *Ten Thousand Years. Archaeology in Manitoba*, W. Hlady (Ed.), pp. 153 - 174. D.W. Friesen and Sons. Ltd., Altona.

Wright, J.V.

1970 The Shield Archaic In Manitoba - A Preliminary Statement. In *Ten Thousand Years. Archaeology in Manitoba*, W. Hlady (Ed.), pp. 29 - 45. D.W. Friesen and Sons. Ltd., Altona.

Young, David E. and Robson Bonnichsen

1984 *Understanding Stone Tools: A Cognitive Approach.* University of Maine at Orono, Centre for the Study of Early Man. *Peopling of the Americas, Process Series*, Volume 1.

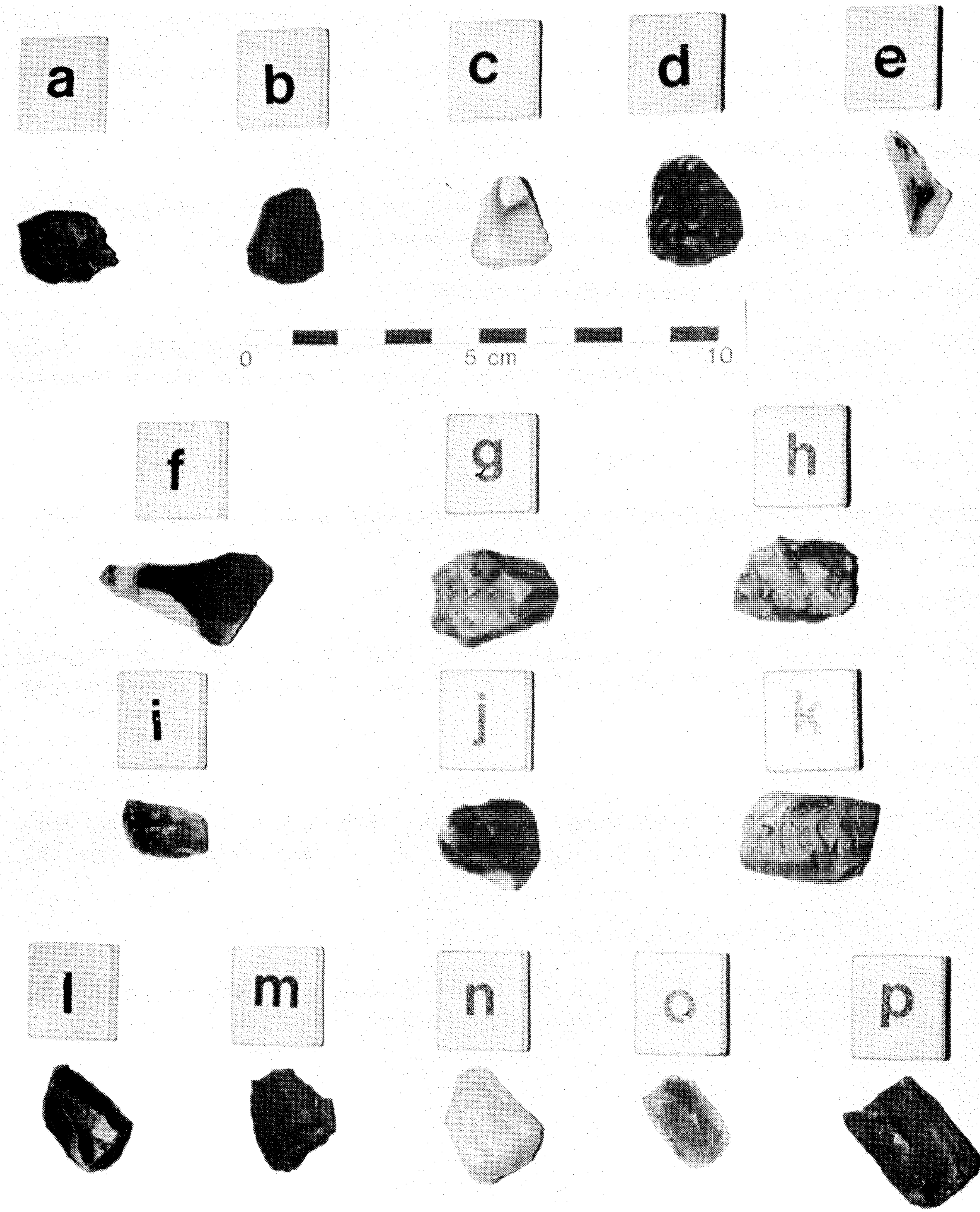


Plate 6-1: Scrapers

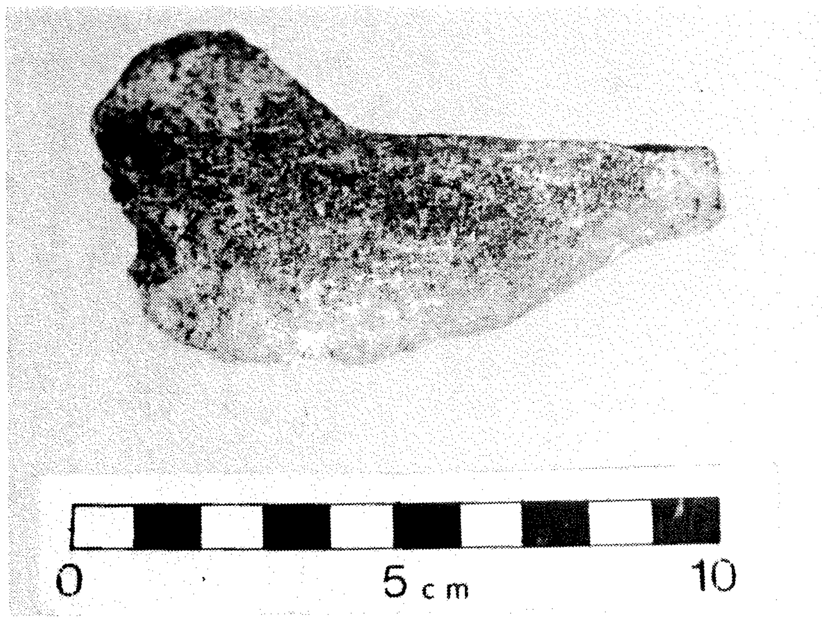


Plate 6-2: Chitho

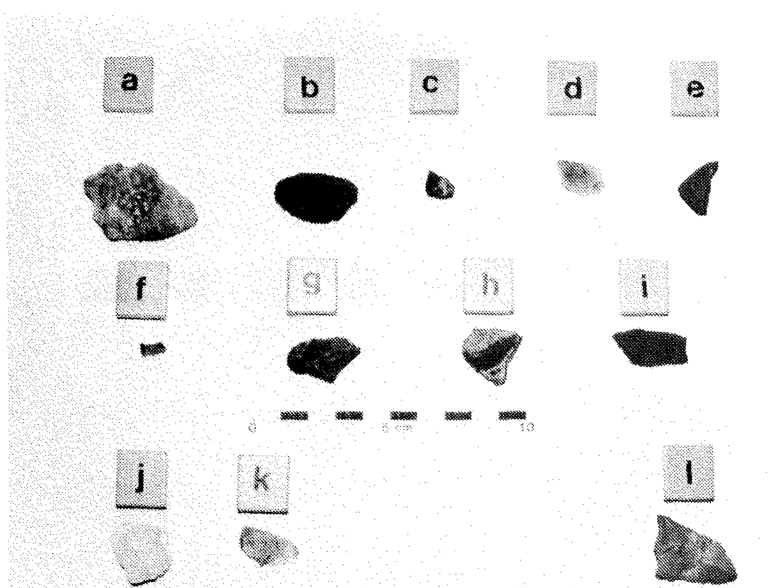


Plate 6-3: Unifacial Tools

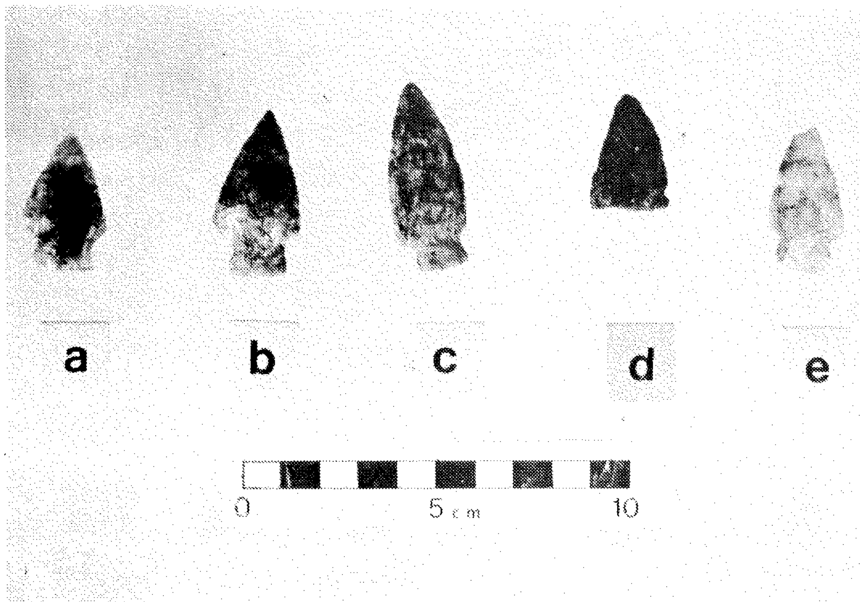


Plate 6-4: Projectile Points

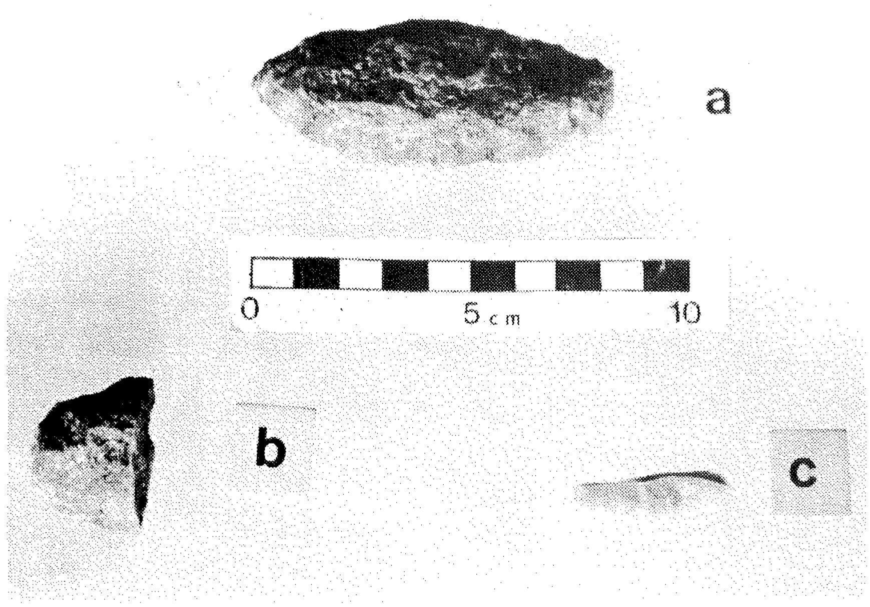


Plate 6-5: Bifaces

Plate 6-6: Chopper

Plate 6-7: Wedges and Pièce Esquillées

7.0 CHARCOAL AND SEED ANALYSIS

by *C. T. Shay and D. M. Deck*

7.1 Summary

The 1992 Public Archaeology Project at The Forks in Winnipeg excavated several deeply-buried horizons (Zones 1, 3, 3B) estimated to be 2200-3000 years old. Among the remains analyzed were nearly 500 pieces of wood charcoal and a few charred seeds. Ash (*Fraxinus*) charcoal was by far the most abundant followed by that of elm (*Ulmus*), oak (*Quercus*), willow (*Salix*), and maple (*Acer*). The few charred seeds included five specimens of red osier dogwood (*Cornus stolonifera*) and a fragment of goosefoot (*Chenopodium*). The charcoal, presumably the remains of firewood, occurred throughout much of the excavated area as well as in a hearth feature in Zone 3. The predominance of ash charcoal does not necessarily imply that ash wood was favoured over other woods as trees of green ash (*Fraxinus pennsylvanica*) are found in abundance in some forest communities along the Red River today. Red osier dogwood is a common shrub in these forest communities while goosefoot is usually found in disturbed areas. Dogwood berries are edible although not very palatable while the protein-rich seeds of goosefoot were widely used as food during Precontact times.

7.2 Introduction

7.2.1 Overview

The junction of two great rivers, the Red and Assiniboine, popularly known as The Forks has always been attractive to humans. The area was attractive because the river valleys provided a source of food, water, shelter and were convenient travel corridors. Recent archaeological studies at The Forks have investigated the nature of early occupation of this strategic crossroads in attempts to reconstruct the sequence of habitation and how various groups in the past lived. Most of these studies have covered only the last 1,500 years although the 1992 Public Archaeology Project excavated an Archaic site with levels estimated at 2220 and 3000 B.P. The remains from these two occupations shed light on the nature of early environment, subsistence, and technology. In addition, comparisons can be made between these Archaic horizons and those of later occupations.

As a contribution to these studies, the following research focuses on how past peoples used the plant resources of the area. What plant communities may have existed at the junction and what plants were selected for food, fuel and other purposes? In pursuit of these questions we analyzed the charcoal, seeds and other organic remains from the 1992 excavations.

7.2.2 The Deposition and Preservation of Seeds and Charcoal

Sediment layers at The Forks are interspersed with dark organic rich lenses that mark the dry intervals when soil began to form between major floods. While the soils were developing, litter from the surrounding vegetation accumulated. Unless charred in a hearth or occasional forest fire, these organic remains decayed into humus and provided a habitat for land snails and other tiny organisms. The indices of these dry intervals include fungal sclerotia, formed by fungi parasitic on plants, shells and eggs of land snails and small spheroidal objects tentatively identified as the cocoons of flatworms, small soil-living organisms. The land snails may suggest habitats such as moist forest, but direct evidence of the local vegetation comes from the charred seeds and charcoal in the organic-rich layers.

There is abundant archaeological evidence for long-term occupation of the area, particularly over the last several thousand years. This is in the form of pottery, stone tools and quantities of butchered animal bones, some associated with discrete concentrations of charcoal, presumed to be precontact hearths. Plant and other remains from these and other charcoal-rich concentrations help to indicate the kinds of plants used for food and other purposes.

The probability of a plant food becoming charred depends upon how it is processed. Seeds that are parched or roasted over a fire are more likely to become charred than those used without such treatment. Fruits such as chokecherry may be pounded but the resulting fragments, even if charred, would not easily be identified. The small seeds of other fleshy fruits such as strawberry most likely would be ingested and later passed in feces (Bryant 1974). Plants sought for their sap, leaves, flowers or underground parts would have little chance of becoming charred. Even if charred, these soft tissues would be easily fragmented and difficult to recover and identify.

Human activities are not the only source of seeds. The natural seed rain from vegetation may become concentrated in the soil. For example, seed concentration in upland prairie, pasture and fallow fields in Saskatchewan ranged up to 180 seeds per litre (Archibold 1981; Archibold and Hume 1983). Those accidentally charred might mistakenly be attributed to human use. Another complication is that, once deposited, seeds may be moved within the soil by frost action, desiccation and burrowing animals (Miksicek 1987).

Charcoal found in an archaeological site may also derive from human and natural sources. Being easily fragmented and buoyant, charcoal can be scattered by human trampling as well as transported by water (Blong and Gillespie 1978). Conversely, charcoal produced by natural fires can become incorporated into archaeological deposits through erosion and deposition. Fragmentation of pieces may also lead to biases in representation such that weaker woods would be under-represented. (Zalucha 1981; Deck 1989).

Given the importance of both human and natural sources for seeds and charcoal, it is vital to analyze numerous samples from a wide variety of contexts and evaluate evidence bearing upon their deposition before drawing conclusions.

7.3 Methodology

7.3.1 Field

Charcoal remains were collected from 1.6 mm-mesh waterscreens from Zones 1, 3 and 3B during excavation. The fragments ranged in size from approximately 3 mm to 1 cm. Seed remains were also collected from Zones 1 and 3 in the same manner. These remains were picked from the screens by participants under the supervision of trained archaeologists. In addition, two soil samples of 4 - 5 litres were taken from Zone 3 for flotation.

7.3.2 Laboratory

7.3.2.1 Flotation of Soil Samples

Samples were processed in a flotation tank indoors at the University of Manitoba. A small soil sample was set aside for texture and/or chemical analysis. The light residue was captured in a stack of soil sieves with meshes of 4, 2, 1, 0.5, 0.35 and 0.25 mm. The heavy fraction accumulated on a 1.6 mm mesh screen at the bottom of the flotation tank. In the laboratory, the remains were re-sieved and weighed to the nearest 0.01 gram. Fractions that were too large to sort efficiently were subdivided in a sample splitter and only a portion examined. Remains such as seeds, charcoal, shell, and bone were sorted by fraction size under a binocular microscope and placed by type in a separate vial and labelled with the site name, provenience, and tentative identity. In enumeration, whole seeds were counted as 1, seed fragments were counted as 0.5. The weights of charcoal, shell and bone (burnt, unburnt) from the heavy, 4 mm., and 2 mm. fractions and counts of lithics, fish scales, fungal sclerotia, snail eggs and flatworm cocoons were also recorded in some fractions (Appendix 7-B:Table 1). Totals from sub-sampled sieve fractions were adjusted using a correction factor (initial sample weight/sub-sample weight). Density per litre was estimated by dividing counts or weights by the sample volume.

7.3.2.2 Seed Analysis

Final identifications were made using the reference collections in the Department of Botany. Where possible, identifications were made to the species level. Specimens resembling a known taxon but differing slightly in size, shape and/or surface texture were assigned cf. (compare).

7.3.2.3 Charcoal Analysis

The cellular structure of wood charcoal is usually preserved, sometimes allowing for the identification to species. The cellular structure was viewed by snapping a specimen along three planes: transverse, tangential, or radial. The specimen is mounted in plasticine on a microscope slide and viewed using a *Wild Heerbrugg* binocular microscope (magnifications up to 100x). Each analyzed specimen was placed in a labelled plastic bag. Specimens of the same type from the same provenience were placed in the same bag. Identifications were verified by reference material including comparative specimens and illustrations.

The charcoal remains were identified to genus. Specimens that could not be so identified were classified to a higher taxonomic level including diffuse porous, conifer, hardwood, and bark. The term unidentifiable refers to specimens that were charred to the degree that the cellular structure was destroyed or the piece was extremely fragile and easily crushed, obliterating detail. Charcoal was quantified by abundance (number of pieces) and occurrence (frequency or the number of samples in which a type occurred).

For Zones 1 and 3B a maximum of five fragments of charcoal per sample were randomly selected for identification using a table of random numbers. For Zone 3 a maximum of five fragments of charcoal were analyzed per unit instead of per sample (Appendix 7-A:Table 1; Appendix 7-A:Figure 1). A table of random numbers was used to choose a sample from the units in Zone 3 that had more than one sample with more than five fragments of charcoal per sample. All of the samples were analyzed from a unit if the unit had one or more samples totalling five or less pieces of charcoal. Numbers in the random table were interpreted as: 1-2 represented sample 1, 3-4 represented sample 2, 5-6 represented sample 3, 7-8 represented sample 4, and 9-0 represented sample 5. Once a sample was chosen, a second table of random numbers was used to select five fragments of charcoal for identification.

A larger sample size was used for the flotation samples, in part because wood taxa may be represented by different sizes of charcoal fragments due to a variety of conditions including species characteristics, use, preservation, and collection technique such that for example, weak woods may be under-represented. Thus, to account for any size bias in the samples, 15 fragments from each of the 4.00 and 2.00 mm flotation fractions were analyzed per sample.

7.4 Results and Discussion

7.4.1 Charcoal

In total, Zone 1 was comprised of 40 samples or 287 fragments of charcoal, Zone 3 had 151 samples or 3143 fragments (excluding the 2 flotation samples) and Zone 3B had 8 samples or 241 fragments. A total of 120 samples or 438 pieces of charcoal were identified from the waterscreens (Table 7-1) and 60 pieces in the two flotation samples (Table 7-2). The results will be referred to below by occurrence or presence within the samples instead of by abundance or number of pieces. Overall, the most frequent taxon from the 1992 excavations was ash (*Fraxinus*), followed by the occasional occurrence of elm (*Ulmus*) and oak (*Quercus*), and the rare occurrence of maple (*Acer*) and willow (*Salix*) (Table 7-3).

Zone 1. In Zone 1, 132 fragments of charcoal were identified from 42 samples. The dominant species was ash followed by oak and elm and then by maple. There were also a few fragments of a diffuse porous wood and unidentifiable fragments (Table 7-1).

Zone 3. In Zone 3, 70 samples or 276 fragments of charcoal were identified from the water-screened samples and 2 samples or 60 fragments of charcoal were identified from the

COMMON NAME	SCIENTIFIC NAME	ZONE 1		ZONE 3		ZONE 3B		TOTAL AB
		AB*	OC~	AB*	OC~	AB*	OC~	
Ash	*Fraxinus*	112	34	220	61	29	7	361
cf. Ash	cf. *Fraxinus*	3	1	3	3			6
Oak	*Quercus*	2	2	16	11			18
cf. Oak	cf. *Quercus*	1	1					1
Elm	*Ulmus*	1	1	20	9			21
cf. Elm	cf. *Ulmus*	2	1	1	1			3
Maple	*Acer*			3	3			3
cf. Maple	cf. *Acer*	1	1	1	1			2
Conifer				1	1			1
Diffuse Porous		4	2	1	1			5
cf. Bark				1	1			1
Unidentifiable		6	3	9	8	1	1	15
TOTAL		132	46	276	100	30	8	438

AB* Number of charcoal fragments OC~ Number of samples taxa occurred in

Table 7-1: Charcoal Identified from Waterscreen Samples

COMMON NAME	SCIENTIFIC NAME	ABUNDANCE*	OCCURRENCE~
Ash	*Fraxinus*	43	2
Oak	*Quercus*	4	2
Elm	*Ulmus*	2	1
Maple	*Acer*	2	1
Willow	*Salix*	7	2
Poplar/Willow	*Populus/Salix*	2	1
TOTAL		60	9

* Number of charcoal fragments ~ Number of samples taxa occurred in

Table 7-2: Charcoal Identified from Flotation Samples

COMMON NAME	SCIENTIFIC NAME	ZONE 1 n=40	ZONE 3 n=72	ZONE 3B n=8	ZONE 1-3B n=120
Ash	*Fraxinus*	D	A	D	A
Elm	*Ulmus*	O	O		O
Oak	*Quercus*	R	O		O
Willow	*Salix*		R		R
Poplar/Willow	*Populus/Salix*		R		R
Maple	*Acer*	R	R		R
Conifer			R		R
Diffuse Porous		R	R		R
Bark			R		R
Unidentifiable		O	O	O	O

D=Dominant (76-100%) A=Abundant (51-75%) F=Frequent (26-50%)
O=Occasional (6-25%) R=Rare (trace-5%)

Table 7-3: Summary of Recovered Charcoal based on Occurrence

flotation samples. It is interesting to note that willow and cf. poplar/willow (cf. *Populus/Salix*) were recovered from the flotation samples but not from the waterscreened samples from this zone. This is probably a result of differential fragmentation as discussed above. Weaker woods such as poplar and willow tend to be absent or under-represented in samples selected by hand. In both types of samples ash was high in occurrence. This was followed by willow, oak, elm, and maple in the flotation samples and oak, elm, and maple in the waterscreened samples (Tables 7-1, 7-2). If the results from both sample types are combined, ash was followed by oak, elm, maple, and willow (Table 7-3). A single fragment of conifer was also recovered from Zone 3.

A floor plan showing the distribution of waterscreened charcoal (Figure 7-1, Appendix 7-A:Figure 1), shows that most excavation units in the northeast contained quantities of charcoal. The absence of charcoal from some of the units elsewhere means that they contained only "minuscule" fragments (Kroker 1992:pers. comm.). Ash charcoal was abundant in almost all of the units that were sampled for charcoal. There was, however, a concentration of elm in the northeast area of the excavation units. The Zone 3 horizon in this area of the excavation was less than half a centimeter thick and was sparsely distributed with artifacts. The elm concentration may represent the periphery of a feature extending west beyond the excavated area (Kroker 1992:pers. comm.).

Zone 3B. There were 8 samples or 30 pieces of charcoal identified from Zone 3B. All of the pieces but one unidentifiable fragment were identified as ash (Table 7-1). These fragments may represent a natural feature such as a tree fall (Kroker 1992:pers. comm.).

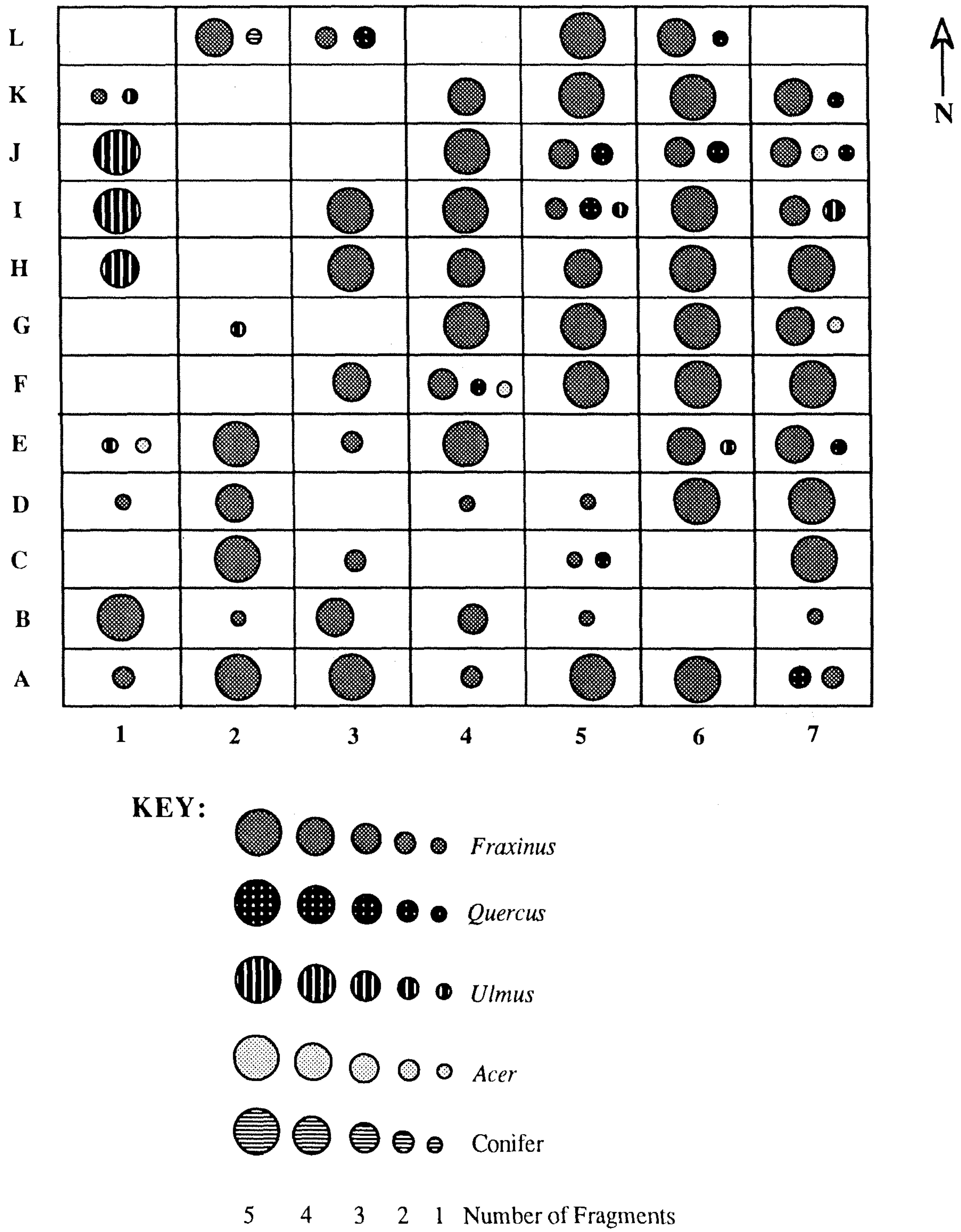


Figure 7-1: Frequency Distribution of Zone 3 Charcoal

7.4.1.1 Wood Use

Ethnographic reports were surveyed for recorded wood use by Native groups of southern Manitoba and surrounding areas to aid in interpreting the charcoal remains (Table 7-4). Most reports mentioned the use of wood for construction of dwellings and for tools, utensils, and other items of material culture. They described fires built inside of tipis, earth lodges, and sweatlodges, or fires used for drying meat or roasting corn. Unfortunately, the species of wood used for fuel is rarely specified. Different parts of trees and shrubs were used for tool manufacture, dyes, food, beverages, and medicine. Excess wood or residue from such activities may have been burned in hearths or discarded in middens (Deck 1989).

7.4.1.2 Environment

The charcoal evidence implies a riverbottom forest habitat. Although the proportions vary from one place to another, the same major tree types occur along the Red River today (Table 7-5). The only exception to this is a single fragment of conifer recovered in Zone 3. This may have been deposited by cultural activity or brought into the site through post depositional processes such as flooding.

7.4.2 Seeds

Water-screening of the deposits yielded 17 seeds and organic fragments from Zone 1 and 6 from Zone 3. Both the flotation samples derived from the northeastern portion of the excavated area. One came from a presumed hearth feature, a concentration of ash, charcoal and fire-cracked rock in excavation Unit G4. The other was from I6, a unit that had scattered rocks and fragments of animal bone. The water-screen and flotation samples contained uncharred (Appendix 7-B:Tables 2 and 4) and charred seeds (Table 7-6, Appendix 7-B:Table 3). The uncharred seeds are problematic in that it is uncertain that such seeds would survive in these deposits for several thousand years. All but one of the 16.5 uncharred seeds and fragments from the water-screening belong to a species of bindweed (*Convolvulus sepium*) that is typical of prairies thickets and clearings (Scoggan 1957). There is also a fragment of a shell of hazel (*Corylus*) which is a typical shrub of forests clearings and margins. How these and perhaps the other uncharred seeds found their way into deposits several meters deep is unknown. They may have recently washed or fallen down or were carried down by burrowing animals.

The few identifiable seeds recovered included five specimens of red osier dogwood (*Cornus stolonifera*) from Units A4 and D4 and a fragment of goosefoot (*Chenopodium*) from the 'hearth' feature in Unit G4. Red osier dogwood is a common shrub along river and stream banks in southern Manitoba, while goosefoot is associated with disturbed areas. Dogwood berries are edible albeit not very palatable. We found no regional ethnographic reports that described the use of the berries or seeds of red osier dogwood. It seems that this species was primarily used as a tobacco additive by the northern Cheyenne, Chippewa, Dakota, Omaha, and Ponca. The inner white bark was dried and reduced to powder and mixed with tobacco (Densmore 1929; Gilmore 1919; Hart 1981). The northern Cheyenne mixed the powder with buffalo chips and bear berry (*Arctostaphylos uva-ursi*) for use as tobacco. The stems were also used by the Cheyenne for making arrowshafts (Hart 1981). Judging by their abundance in archaeological sites, the protein-rich seeds of goosefoot

Taxa	Fuel	Other Use (wood or charcoal)	Use Not Specified	Cultural Group(s)	Reference
maple, boxelder *(Acer)*		charcoal for skin painting and tattooing		Dakota, Omaha	Gilmore 1919
			x	Plains Cree	Skinner 1914; Mandelbaum 1979
			x	Plains Ojibwa	Howard 1977
cottonwood/poplar *(Populus)*	x	skin painting		Omaha	Gilmore 1919
	x	construction; artifact manufacture		Hidatsa	Wilson 1917
			x	Plains Cree	Skinner 1914; Mandelbaum 1979
			x	Plains Ojibwa	Howard 1977
			x	Middle Missouri	Griffin 1977
elm *(Ulmus)*	x			Dakota, Omaha, Ponca, Pawnee	Gilmore 1919
	x			Hidatsa	Wilson 1917
			x	Middle Missouri	Griffin 1977
willow *(Salix)*	x	construction; artifact manufacture		Hidatsa	Wilson 1917
			x	Plains Cree	Skinner 1914; Mandelbaum 1979
			x	Plains Ojibwa	Howard 1977
			x	Assiniboin	Denig 1928
			x	Middle Missouri	Griffin 1977
ash *(Fraxinus)*		construction; artifact manufacture		Hidatsa	Wilson 1917
			x	Plains Ojibwa	Howard 1977
			x	Middle Missouri	Griffin 1977
oak *(Quercus)*			x	Plains Cree	Skinner 1914; Mandelbaum 1979
driftwood from river	x	construction		Hidatsa	Wilson 1917
bark	x			Ojibwa	Howard 1977

Table 7-4: Ethnographic Records of Wood Use on the Northern Plains

were apparently used for food throughout southern Manitoba and adjacent areas in Precontact times. Ethnographic accounts record its use by the Dakota, Pawnee, and Omaha. Young plants were cooked as a soup or stew (Gilmore 1919).

COMMON NAME	SCIENTIFIC NAME	RECENT 1	POSTCONTACT 2	PRECONTACT 3	PRECONTACT 4
Ash	*Fraxinus*	X	X	X	X
Oak	*Quercus*		X	X	X
Elm	*Ulmus*	X	X	X	X
Maple	*Acer*	X		X	X
Willow	*Salix*	X		X	X
Poplar	*Populus*	X	X	X	
Basswood	*Tilia*		X		

Key:
1 = Shay *et al.* vegetation at The Forks, 1989.
2 = 1990 and 1991 Fort Gibraltar I excavations, Public Archaeology Program.
3 = The Forks North Point Site, Canadian Parks Service 1988 excavation.
4 = 1992 excavation, Public Archaeology Program.

Table 7-5: Wood Taxa Represented at The Forks (Previous Studies)

COMMON NAME	SCIENTIFIC NAME	ABUNDANCE		FREQUENCY (n=2)	
		Quantity	Percent	Quantity	Percent
Willow	Salicaceae fam.	1.0	10.0	1	50.0
cf. Knotweed	cf. *Polygonum* sp.	0.5	5.0	1	50.0
Goosefoot	*Chenopodium* sp.	0.5	5.0	1	50.0
cf. Rose	cf. Rosaceae fam.	0.5	5.0	1	50.0
Unidentified seed		7.5	75.0	1	50.0
TOTAL		10.0	100.0		

Table 7-6: Charred Seeds from Flotation Samples

7.4.3 Other Remains

In addition to the charcoal and seeds, seven other types of remains were sorted from the flotation samples (Appendix 7-B:Tables 1 and 5). These included fragments of burnt or calcined bone, fish scales, lithic flakes, mollusc shell, snail eggs, fungal sclerotia, and probably flatworm cocoons.

Both flotation samples contained moderate amounts of bone and burnt bone (6-29 grams per litre) many fish scales (about 500 to over 1000 fragments per litre) and lithic flakes (28-50 per litre). Neither sample had much shell, nor snail eggs, fungal sclerotia, or probable flatworm cocoons. The lack of the latter three types suggests that the soils of Zone 3 were not well-developed.

7.5 Comparison with Other Sites at The Forks

The contents of the two flotation samples from DlLg-33:92A resemble some of the flotation samples from other archaeological sites at The Forks. Many of the same wood species seem to have been exploited in both Postcontact and Precontact times. The charcoal assemblage from DlLg-33:92A is most similar in composition to that recovered from the Precontact levels at the North Point Interpretive Node site (Table 7-5). However, there was a greater mixture of charcoal types at the North Point site as well as a higher percentage of willow, poplar, and maple (Deck 1990). It is difficult to compare these finds with the Postcontact Fort Gibraltar I excavation where the basswood (*Tilia*), ash, oak, elm, and poplar charcoal were recovered from a burnt structure and not a living floor or hearth as was the case at the earlier sites (Table 7-5).

In addition to those from DlLg-33:92A, we have analyzed over 100 flotation samples from four other sites at The Forks ranging in age from A.D. 500 to the historic period. Our analyses have revealed some of the plant foods used by the inhabitants. These included the seeds of goosefoot (*Chenopodium*), knotweed (*Polygonum*), dock (*Rumex*), bulrush (*Scirpus*), and marsh elder (*Iva*), and the nuts of acorn (*Quercus*) and hazel (*Corylus*). Berries and fleshy fruits were represented by raspberry (*Rubus*), wild cherry and plum (*Prunus* spp.), high bush cranberry (*Viburnum*), rose (*Rosa*), and hawthorn (*Crataegus*).

7.6 Recommendations

Our study of charcoal and seeds from the Archaic site of DlLg-33:92A has been both an exciting and frustrating experience. Exciting because of the opportunity to analyze the oldest charcoal and seed assemblage so far recovered in Manitoba. Frustrating because there was only one hearth feature to recover flotation samples from. We now know some of the woods used for fuel among these early peoples but we are still uncertain about their uses of plant foods. To what extent did they rely upon wild seeds, nuts, and berries for their livelihood? Answers to such questions must await further excavation and sample analysis. In the meantime, we suggest two ways in which the interpretation of past plant use can be made more rewarding:

(1) It would help to integrate the recovery and analysis of plant remains more fully into future research designs.

(2) We suggest that flotation samples be collected as the main means of recovery because, as shown above, they are a relatively unbiased means of recovering these remains. Waterscreened samples could then be used as supplementary samples.

7.7 *References*

Archibold, O.W.

1981 Buried Viable Propagules in Native Prairie and Adjacent Agricultural Sites in Central Saskatchewan. *Canadian Journal of Botany* 59:701-706.

Archibold, O.W. and L. Hume

1983 A Preliminary Survey of Seed Input into Fallow Fields in Saskatchewan. *Canadian Journal of Botany* 61:1216-1221.

Blong, R.J. and R. Gillespie

1978 Fluvially Transported Charcoal Gives Erroneous ^{14}C Ages for Recent Deposits. *Nature* 271:739-741.

Bryant Jr., V.M.

1974 The Role of Coprolite Analysis in Archaeology. *Bulletin of the Texas Archaeological Society*, 45:1-28.

Deck, D.M.

1989 Wood Charcoal Remains from the Lockport Site, Manitoba. Unpublished M.A. Thesis, University of Manitoba.

1990 Analysis of Wood Charcoal Remains from The Forks North Point Site. Unpublished Report.

Denig, Edwin Thompson

1928 *Indian Tribes of the Upper Missouri.* Edited with notes and biographical sketch by J.N.B. Hewitt. Smithsonian Institution, Bureau of American Ethnology 46th *Annual Report.* Washington, D.C.

Densmore, Frances

1929 *Chippewa Customs.* Smithsonian Institution, Bureau of American Ethnology Bulletin 86. Washington, D.C.

Gilmore, Melvin Randolph

1919 Uses of Plants by the Indians of the Missouri River Region. Smithsonian Institution, Bureau of American Ethnology Thirty-third *Annual Report.* Washington, D.C.

Griffin, David E.

1977 Timber Procurement and Village Location in the Middle Missouri Subarea. *Plains Anthropologist* 22(78), Part 2, Memoir 13. Trends in Middle Missouri Prehistory: A Fest Schift Honoring the Contributions of Donald J. Lehmer. Raymond Wood (Ed.).

Hart, Jeffrey A.

1981 The Ethnobotany of the Northern Cheyenne Indians of Montana. *Journal of Ethnopharmacology* 4:1-55.

Howard, James H.

1977 *The Plains-Ojibwa or Bungi: Hunters and Warriors of the Northern Prairies with Special Reference to the Turtle Mountain Band. Reprints in Anthropology*, Volume 7. J. & L. Reprint Company, Lincoln, Nebraska.

Mandelbaum, David G.

1979 *The Plains Cree: An Ethnographic, Historical, and Comparative Study. Canadian Plains Studies* 9. Canadian Plains Research Center, University of Regina.

Miksicek, C.H.

1987 Formation Process in the Archaeobotanical Record. In *Advances in Archaeological Method and Theory*, pp. 211-247. M.B. Schiffer (Ed.). Academic Press, New York.

Scoggan, H.G.

1957 *Flora of Manitoba.* National Museum of Canada *Bulletin* No. 140. Department of Northern Affairs and National Resources. Ottawa.

Skinner, Alanson

1914 Notes on the Plains Cree. *American Anthropologist.* 16(1):68-87.

Wilson, Gilbert Livingstone

1917 *Agriculture of the Hidatsa Indians, An Indian Interpretation.* The University of Minnesota Studies in the Social Sciences, *Bulletin of the University of Minnesota* No. 9. Minneapolis.

Zalucha, L.A.

1981 Advances in the Identification and Interpretation of Archaeological Charcoal: Implications for Past and Present Studies. In *Current Directions in Midwestern Archaeology* 9, S.C. Anfinson (Ed.). Minnesota Archaeological Society, Occasional Publications in Minnesota Anthropology.

APPENDIX 7-A

L		9 (5)	7 (5)		73 (5)	190 (5)	
K	2 (2)			4 (4)	196 (5)	136 (5)	59 (5)
J	8 (5)			30 (5)	112 (5)	251 (5)	67 (5)
I	6 (5)		6 (5)	27 (5)	117 (5)	57 (5)	22 (5)
H	4 (4)		8 (5)	26 (5)	242 (5)	67 (5)	113 (5)
G		1 (1)		60 (5)	73 (5)	111 (5)	72 (5)
F			34 (5)	60 (5)	38 (5)	31 (5)	47 (5)
E	2 (2)	7 (5)	4 (4)	6 (5)		5 (5)	85 (5)
D	1 (1)	6 (5)		1 (1)	1 (1)	20 (5)	81 (5)
C		17 (5)	2 (2)		2 (2)	1 (1)	23 (5)
B	11 (5)	1 (1)	8 (5)	15 (5)	1 (1)		1 (1)
A	2 (2)	419 (5)	31 (5)	2 (2)	8 (5)	10 (5)	4 (4)
	1	2	3	4	5	6	7

KEY:

Total quantity of charcoal sampled (Number of pieces identified)

Figure 7A-1: Distribution of Waterscreened Samples Collected from Zone 3

UNIT	NO. OF SAMPLES	CHARCOAL QUANTITY PER SAMPLE	SAMPLES CHOSEN FOR ANALYSIS	PIECES OF CHARCOAL ANALYZED	TOTAL CHARCOAL
A1	1	2	2	2	2
A2	5	199,1,15,199,5	15	5	419
A3	3	1,3,27	27	5	31
A4	2	1,1	1,1	2	2
A5	2	1,7	7	5	8
A6	2	1,9	9	5	10
A7	2	3,1	3,1	4	4
B1	2	4,7	7	5	11
B2	1	1	1	1	1
B3	1	8	8	5	8
B4	2	9,6	6	5	15
B5	1	1	1	1	1
B7	1	1	1	1	1
C2	3	5,2,10	10	5	17
C3	1	2	2	2	2
C5	1	2	2	2	2
C6	1	1	1	1	1
C7	2	3,20	20	5	23
D1	1	1	1	1	1
D2	1	6	6	5	6
D4	1	1	1	1	1
D5	1	1	1	1	1
D6	1	20	20	5	20
D7	4	4,4,33,40	33	5	81
E1	1	2	2	2	2
E2	2	1,6	6	5	7
E3	1	4	4	4	4
E4	1	6	6	5	6
E6	1	5	5	5	5
E7	5	23,41,6,1,14	14	5	85
F3	1	34	34	5	34
F4	3	3,33,24	24	5	60
F5	2	18,20	18	5	38
F6	4	9,2,5,15	5	5	31
F7	3	2,42,3	42	5	47
G2	1	1	1	1	1
G4	5	11,13,1,31,4	31	5	60
G5	3	27,13,33	33	5	73
G6	3	48,25,38	48	5	111
G7	3	35,8,29	29	5	72
H1	1	4	4	4	4
H3	1	8	8	5	8
H4	5	8,1,6,3,8	8	5	26
H5	5	9,5,2,26,200	9	5	242
H6	4	46,19,1,1	19	5	67
H7	1	113	113	5	113
I1	1	6	6	5	6
I3	1	6	6	5	6
I4	3	11,5,11	11	5	27
I5	3	9,63,45	45	5	117
I6	2	9,48	9	5	57
I7	2	10,12	10	5	22
J1	1	8	8	5	8
J4	5	5,3,11,3,6,2	11	5	30
J5	6	60,23,10,3,2,14	23	5	112
J6	3	133,82,36	36	5	251
J7	3	7,19,41	19	5	67
K1	1	2	2	2	2
K4	3	1,1,2	1,1,2	4	4
K5	6	32,4,28,60,65,7	7	5	196
K6	3	20,49,67	49	5	136
K7	3	45,11,3	11	5	59
L2	1	9	9	5	9
L3	1	7	7	5	7
L5	2	14,59	59	5	73
L6	3	120,30,40	40	5	190
TOTAL	151	3143	1012	276	3143

Table 7A-1: Zone 3 Charcoal Samples from 1992 Excavations

APPENDIX 7-B

TYPE OF REMAIN	MEASUREMENT	SIEVE MESH-SIZE (in millimeters)						
		LIGHT PORTION						HEAVY PORTION
		4.00	2.00	1.00	0.50	0.35	0.25	1.60
uncarbonized seeds	number*	X	X	X	X	X	X	X
carbonized seeds	number*	X	X	X	X	X	X	X
bone	weight	X	X					X
burnt bone	weight	X	X					X
charcoal	weight	X	X					X
lithics	number#	X	X					X
ceramics	number#	X	X					X
fish scales	weight	X	X					X
shell	weight	X	X	X	X	X	X	X
fungal sclerotia	number*	X	X	X	X	X	X	X
snail eggs	number*	X	X	X	X	X	X	X
flatworm eggs	number*	X	X	X	X	X	X	X

* Whole pieces were counted as 1 and fragments were counted as 0.5

\# Pieces were counted as 1, with no differentiation between wholes and fragments

Table 7B-1: Fractions Examined For Each Type of Remain from Flotation Samples

ZONE	CAT. #	TYPE OF REMAIN	COMMON NAME	SCIENTIFIC NAME	UNIT	QTY
1	71	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	B1	1.0
	560	charred seed	Red-osier Dogwood	*Cornus stolonifera*	A4	4.0
	561	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	A4	1.0
	697	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	B4	1.0
	1367	charred seed	Red-osier Dogwood	*Cornus stolonifera*	D4	1.0
	1758	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	E4	1.0
	2199	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	C1	1.0
	3086	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	H7	1.0
	3217	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	E2	1.0
	3680	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	D1	1.0
	3881	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	D1	3.0
	4832	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	A5	1.0
3	3302	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	J1	1.0
	3330	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	H3	1.0
	3331	uncharred nut	Hazel	*Corylus* sp.	H3	0.5
	3893	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	D1	1.0
	6878	uncharred seed	Hedge Bindweed	*Convolvulus sepium*	H4	1.0
	7281	uncharred organic	unidentified	unidentified	K2	1.5

Table 7B-2: Seeds Recovered from Zones 1 and 3

Litres	5	DlLg-33:92A-9467						Sample = Hearth/Burnt Soil around Ash of Hearth in Unit G4, Zone 3							
Fraction Size	Heavy	D/L*	4mm	D/L*	2mm	D/L*	1mm	D/L*	.5mm	D/L*	.35mm	D/L*	.25mm	D/L*	Total	Density /Litre for Sample
Initial Weight (gm)	578.80		4.60		3.27		4.56		2.15		0.56		0.45		594.39	
Sample Weight (gm)	36.38		4.60		3.27		4.56		2.15		0.12		0.10		51.18	
TAXA																
Chenopodium sp.		0.000		0.000		0.000		0.000	0.500	0.100		0.000		0.000	0.500	0.100
cf Rosaceae fam.		0.000		0.000		0.000	0.500	0.100		0.000		0.000		0.000	0.500	0.100
cf. *Polygonum* sp.		0.000		0.000		0.000	0.500	0.100		0.000		0.000		0.000	0.500	0.100
Unidentified seed		0.000		0.000		0.000	6.500	1.300	1.000	0.200		0.000		0.000	7.500	1.500
															9.000	1.800

Litres	4	DlLg-33:92A-9468						Sample = Occupation Horizon Unit I6, Zone 3							
Fraction Size	Heavy	D/L*	4mm	D/L*	2mm	D/L*	1mm	D/L*	.5mm	D/L*	.35mm	D/L*	.25mm	D/L*	Total	Density /Litre for Sample
Initial Weight (gm)	323.20		1.40		2.20		3.00		1.20		0.60		0.40		332.00	
Sample Weight (gm)	20.20		1.40		2.20		3.00		1.20		0.60		0.40		29.00	
TAXA																
Salicacae fam.		0.000		0.000		0.000		0.000		0.000		0.000	1.000	0.250	1.000	0.250
															1.000	0.250

Table 7B-3: Charred Seed Recovery from Flotation Samples

Litres	5	DlLg-33:92A-9467							Sample = Hearth/Burnt Soil around Ash of Hearth in Unit G4, Zone 3							
Fraction Size	Heavy	D/L*	4mm	D/L*	2mm	D/L*	1mm	D/L*	.5mm	D/L*	.35mm	D/L*	.25mm	D/L*	Total	Density /Litre for Sample
Initial Weight (gm)	578.80		4.60		3.27		4.56		2.15		0.56		0.45		594.39	
Sample Weight (gm)	36.38		4.60		3.27		4.56		2.15		0.12		0.10		51.18	
TAXA																
Amaranthus sp.		0.000		0.000		0.000		0.000	0.500	0.100		0.000		0.000	0.500	0.100
Salicaceae fam.		0.000		0.000		0.000		0.000		0.000		0.000	1.000	0.900	1.000	0.900
															1.500	1.000

Litres	4	DlLg-33:92A-9468							Sample = Occupation Horizon Unit I6, Zone 3							
Fraction Size	Heavy	D/L*	4mm	D/L*	2mm	D/L*	1mm	D/L*	.5mm	D/L*	.35mm	D/L*	.25mm	D/L*	Total	Density /Litre for Sample
Initial Weight (gm)	323.20		1.40		2.20		3.00		1.20		0.60		0.40		332.00	
Sample Weight (gm)	20.20		1.40		2.20		3.00		1.20		0.60		0.40		29.00	
TAXA																
Unidentified seed		0.000		0.000		0.000		0.000	1.000	0.250		0.000		0.000	1.000	0.250
Chenopodium sp.		0.000		0.000		0.000		0.000		0.000	0.500	0.125		0.000	0.500	0.125
															1.500	0.375

Table 7B-4: Uncharred Seed Recovery from Flotation Samples

Litres	5	DlLg-33:92A-9467						Sample = Hearth/Burnt Soil around Ash of Hearth in Unit G4, Zone 3								
Fraction Size	Heavy	D/L*	4mm	D/L*	2mm	D/L*	1mm	D/L*	.5mm	D/L*	.35mm	D/L*	.25mm	D/L*	Total	Density /Litre for Sample
Initial Weight	578.80		4.60		3.27		4.56		2.15		0.56		0.45		594.39	
Sample Weight	36.38		4.60		3.27		4.56		2.15		0.12		0.10		51.18	
TAXA																
bone	4.070	12.951		0.000	0.190	0.038		0.000		0.000		0.000		0.000	4.260	12.989
burnt bone	3.910	12.441	0.010	0.002		0.000		0.000		0.000		0.000		0.000	3.920	12.443
charcoal	1.170	3.723	4.600	0.920	2.780	0.556	2.600	0.520		0.000		0.000		0.000	11.150	5.719
lithics	16.000	50.911		0.000		0.000		0.000		0.000		0.000		0.000	16.000	50.911
fish scale	135.000	429.566		0.000	91.000	18.200	653.000	130.600		0.000		0.000		0.000	879.000	578.366
shell	0.010	0.032		0.000	0.010	0.002	0.010	0.002	0.010	0.002		0.000		0.000	0.040	0.038
fungal sclerotia		0.000		0.000		0.000		0.000	1.000	0.200		0.000	1.000	0.900	2.000	1.100
snail eggs		0.000		0.000		0.000		0.000	4.000	0.800		0.000		0.000	4.000	0.800
flatworm eggs		0.000		0.000		0.000		0.000	2.000	0.400		0.000	2.500	2.250	4.500	2.650
															924.870	665.016

Litres	4	DlLg-33:92A-9468						Sample = Occupation Horizon Unit I6, Zone 3								
Fraction Size	Heavy	D/L*	4mm	D/L*	2mm	D/L*	1mm	D/L*	.5mm	D/L*	.35mm	D/L*	.25mm	D/L*	Total	Density /Litre for Sample
Initial Weight	323.20		1.40		2.20		3.00		1.20		0.60		0.40		332.00	
Sample Weight	20.20		1.40		2.20		3.00		1.20		0.60		0.40		29.00	
TAXA																
bone	7.300	29.200		0.000	0.200	0.050		0.000		0.000		0.000		0.000	7.500	29.250
burnt bone	1.500	6.000		0.000	0.200	0.050		0.000		0.000		0.000		0.000	1.700	6.050
charcoal	1.400	5.600	1.400	0.350	1.700	0.425		0.000		0.000		0.000		0.000	4.500	6.375
lithics	7.000	28.000		0.000		0.000		0.000		0.000		0.000		0.000	7.000	28.000
fish scale	282.000	1128.000	4.000	1.000	80.000	20.000		0.000		0.000		0.000		0.000	366.000	1149.000
shell	0.100	0.040		0.000	0.010	0.003	0.010	0.003	0.020	0.005		0.000		0.000	0.050	0.050
fungal sclerotia		0.000		0.000		0.000		0.000	7.500	1.875	3.500	0.875	7.000	1.750	18.000	4.500
snail eggs		0.000		0.000		0.000		0.000	9.000	2.250	2.000	0.500		0.000	11.000	2.750
flatworm eggs		0.000		0.000		0.000		0.000		0.000	5.000	1.250	1.000	0.250	6.000	1.500
															421.750	1227.475

Table 7B-5: Other Artifact Recoveries from Flotation Samples

8.0 VERTEBRATE FAUNA OTHER THAN FISH

by *T. Geoff Marr*

The vertebrate faunal remains, other than fish, were initially divided into two main categories based primarily on size. The first group includes those specimens determined to be large or medium mammal remains, deriving from food procurement activities of the occupants of the site. The second group includes small mammal, small bird, reptile, and amphibian remains, which are assumed to represent the species that were deposited naturally on site. There were no large or medium bird remains identified during the 1992 field season.

The faunal recoveries were analyzed by cultural horizon. The culturally derived specimens recovered from Zone 3 are discussed in Section 8.2. The naturally deposited specimens in Zone 3 are discussed in Section 8.4. Recoveries from Zone 3B are described in Section 8.5.

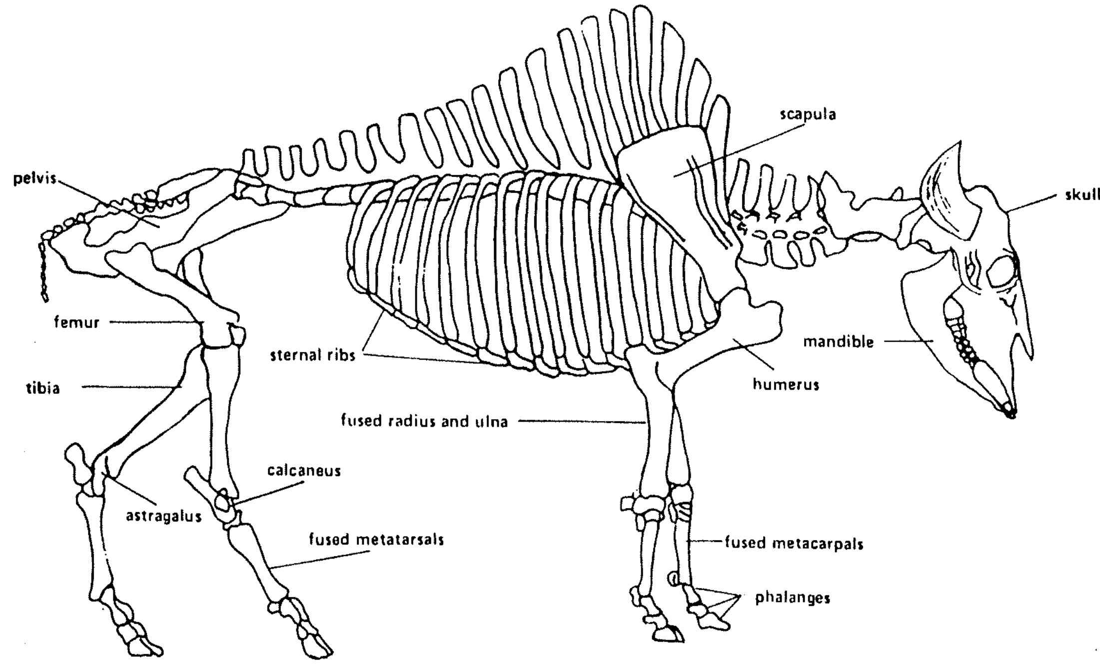
8.1 Methodology

The process of identifying the specimens, anatomically and taxonomically, required the use of the Manitoba Museum of Man and Nature and the University of Manitoba Anthropology Laboratory's faunal collections. Both reference collections contain mainly complete skeletons of the species possibly present at the site. They were used in conjunction with various published works designed to identify species using skeletal elements (Olsen 1960, 1964, 1968, 1972, 1979; Schmid 1972; Gilbert 1973). Figure 8-1 provides an illustration and a list of relevant osteological terms.

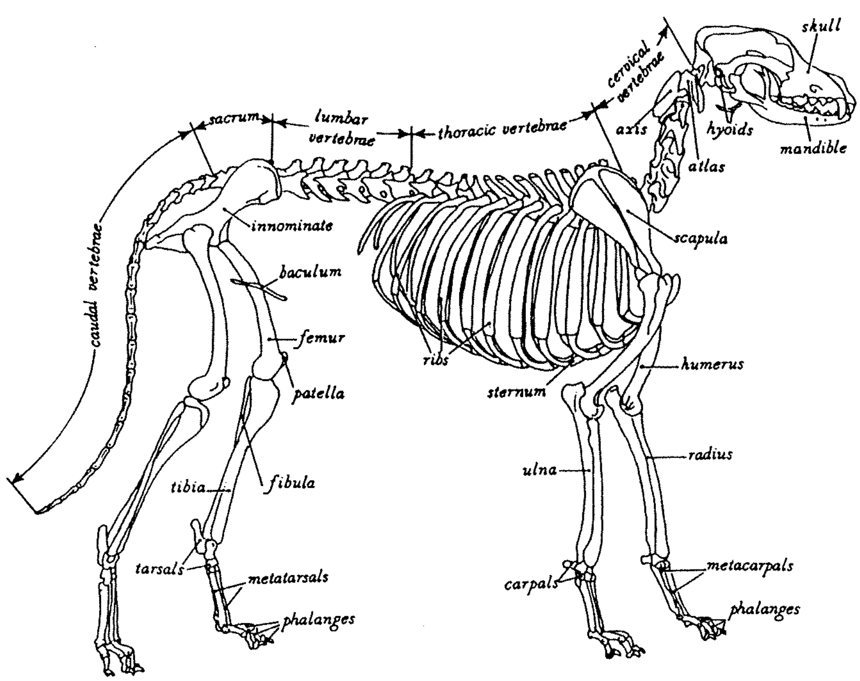
Several specimens were identified simply as mammal, without being able to determine the size of animal. Most of the specimens identified as belonging to large or medium mammals were so fragmented that they could provide very little significant information anatomically and taxonomically, and were therefore listed simply by class and size. The remainder of the large and medium mammal remains were identified anatomically to bone element and taxonomically to family, genus, or species.

Anatomical identification involved determining the element name (e.g., skull), the physical state of the element (complete or incomplete), the present condition of the specimen (broken, chipped or good), the element part (e.g., nasals), the element side (left or right), and the element portion (e.g., proximal or distal). These attributes were considered for each specimen when it applied.

Further observations were made during the sorting and cataloguing process. Quantities and weights were obtained from each catalogue number. In addition, evidence of the bone being burnt (charred or calcined), cut, purposely broken (spiral fractured), or worked, was recorded. These characteristics may indicate human modifications, while evidence of weathering indicates post-depositional modifications. The specimens, where possible, were identified as adult, juvenile, or foetal. Also, the context of the specimens was recorded when applicable; i.e., from a disturbed area such as a rodent burrow, or from an archaeological feature such as a hearth.



Generalized skeleton of a bison.



Generalized skeleton of a canid.

Figure 8-1: Illustration of Mammalian Osteology

8.2 Culturally Derived Mammal Remains From Zone 3

The assemblage contained 2951 artifacts that were determined to be large or medium mammal remains. Of these, 549 specimens could not be distinguished by size and were listed as mammal, 2083 specimens were recorded as large or medium mammal, and 319 specimens were identified to family, genus or species. Table 8-1 lists the number of identified specimens in each category, while Figure 8-2 displays the relative frequencies of undifferentiated, large, medium, and identified specimens for Zone 3 culturally derived mammals remains.

TAXON	Quantity	Weight (gm.)	Relative Frequency
MAMMALIA			
Large	2032	2053.8	0.689
Medium	51	11.1	0.017
Undifferentiated	549	213.7	0.186
Identified (below)	319	776.5	0.108
TOTALS	2951	3055.1	1.000

Table 8-1: Number of Specimens Per Category

Large mammals identified from this assemblage include bison, moose, deer, and bear. Medium mammals identified include wolf, coyote, fox, fisher, otter, mink, beaver, and squirrel. A taxonomic list is available for reference in Appendix C. Figure 8-3 shows the distribution of these taxa within the excavation area.

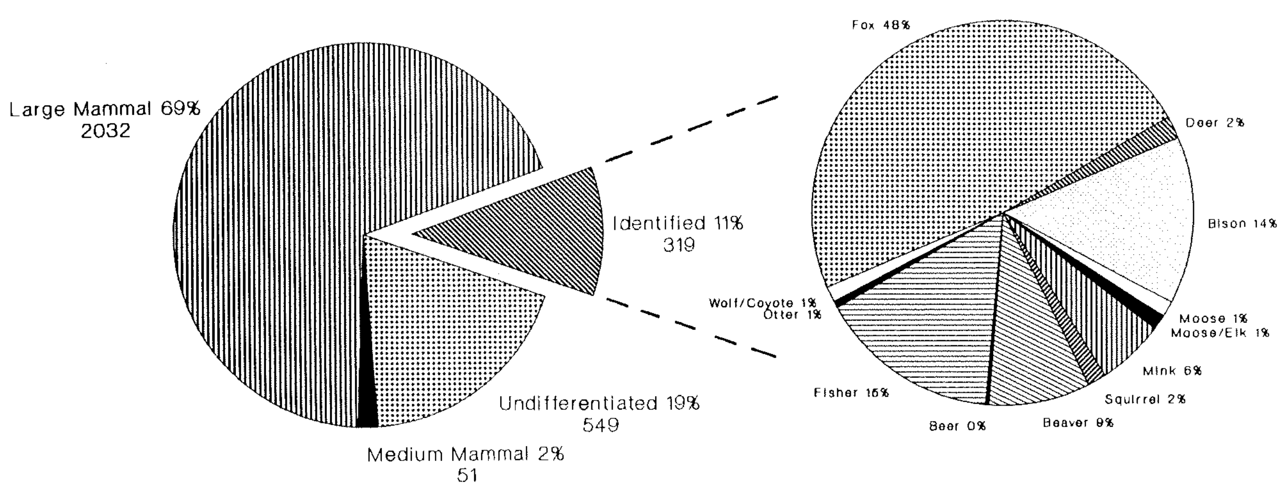


Figure 8-2: Relative Frequency of Mammal Remains

Taxonomically, the large and medium mammals identified to family, genus, and species from this assemblage fall into three separate orders including cloven-hoofed mammals, carnivores, and rodents. The relative frequency of the identified species within each order is calculated by the number of identifiable specimens per taxon (NISP) (Table 8-2). Figure 8-2 shows the relative frequency of the taxa on an overall basis, also using NISP. More in-depth analysis determined the minimum number of individuals (MNI) that would be required to account for the remains recovered. These frequencies will be discussed in more detail in Section 8.2.4.

TAXON	Quantity	Weight (gm.)	Relative Frequency
ARTIODACTYLA			
Bovidae	-	-	-
Bison bison	44	403.6	0.759
Cervidae	4	35.7	0.069
Alces alces	4	12.5	0.069
Odocoileus sp.	6	18.9	0.103
Sub-Totals	58	470.7	1.000
CARNIVORA			
Canidae	-	-	-
Canis lupus	3	61.7	0.013
Canis latrans	1	3.0	0.004
Vulpes vulpes	151	129.2	0.658
Mustelidae	5	2.0	0.022
Mustela vison	18	3.3	0.079
Martes pennanti	48	32.6	0.211
Lutra canadensis	2	8.9	0.009
Ursidae	-	-	-
Ursus americanus	1	8.5	0.004
Sub-Totals	229	249.2	1.000
RODENTIA			
Castoridae			
Castor canadensis	27	56.0	0.844
Sciuridae			
Tamiasciurus/Sciurus	4	0.5	0.125
Spermophilus sp.	1	0.1	0.031
Sub-Totals	32	56.6	1.000
IDENTIFIED TAXA TOTALS	319	776.5	

Table 8-2: Number of Identified Specimens Per Taxon

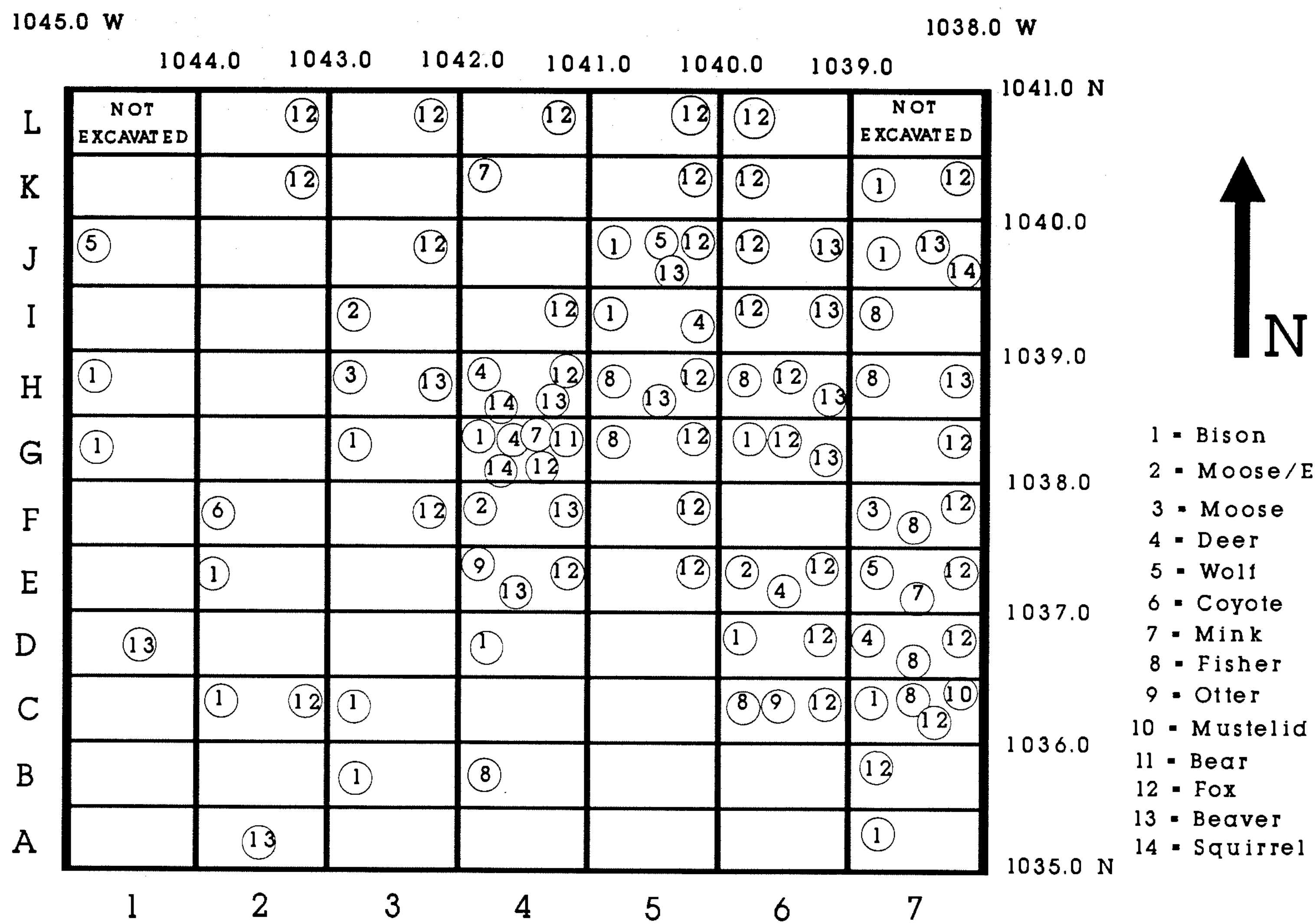


Figure 8-3: Distribution Map of All Identified Taxa

Specimens classified as worked bone or tooth totalled 22 specimens, while 203 specimens were burnt. Both burnt and worked bone included specimens identified beyond the level of class and are included in the totals above.

8.2.1 Order Artiodactyla

Artiodactyls are also known as the cloven-hoofed mammals. This order includes two groups, the cow family (bovids) and the deer family (cervids), represented within the Zone 3 assemblage. Bison is the only bovid identified, with 44 specimens recognized. Remains identified as cervid include moose (four specimens) and white-tailed or mule deer (six specimens), as well as four specimens that may be moose or elk (#7820 right ulnare; #7022 left 2nd and 3rd tarsal; #7673 right patella). The distribution of artiodactyl remains is illustrated in Figure 8-4.

8.2.1.1 Bison (*Bison bison*)

Bison are the largest terrestrial mammals in North America (Banfield 1974:405). According to Banfield (1974:407,408), "no remains have been found to indicate that bison ever inhabited eastern Canada, but they occurred from eastern Manitoba to eastern British Columbia and northward to the Peace River district and Great Slave Lake region of the Northwest Territories". Banfield (1974:406) goes on to describe bison as herding and grazing animals that follow seasonal migration routes which may cover distances over 150 miles. Banfield's report details historic ranges of bison. However, bison remains, radio-carbon dated at 4850 $\pm$ 60 years ago, were discovered in the Kenora area (McAndrews 1982:41), indicating a more easterly extension, perhaps as a result of the Hypsithermal.

Most of the 44 specimens identified as bison bone in Zone 3 were very fragmented, and displayed evidence of butchering (cut marks and spiral fractures). Some pieces which were identified as worked bone may be bison, although this cannot be verified due to the modification of the specimens. Elements identified as bison include tibia, scapula, vertebra, carpus, tarsus, metacarpus, rib, and patella.

8.2.1.2 Moose (*Alces alces*)

Moose are the largest living member of the deer family. They are found across North America from Alaska to Newfoundland and Maine (Banfield 1974:395,397). Moose are solitary browsers, preferring leafy and aquatic vegetation versus the prairie grasses favoured by bison. Banfield (1974:395) describes the ability of moose to dive in order to feed on submerged roots. Seasonal migration is noted to occur among moose that move to mountain slopes in summer and winter in the valleys (Banfield 1974:396), although this tendency would be reduced in the geographic area that encompasses the site.

Only four specimens were identified as belonging to moose, with one specimen (#1850) being a fragment from a skull bone (the temporal process of the right zygoma). The other three specimens (which were all assigned to the same catalogue number; #5955) are fragments of vertebral spinous processes, probably all from the same vertebra.

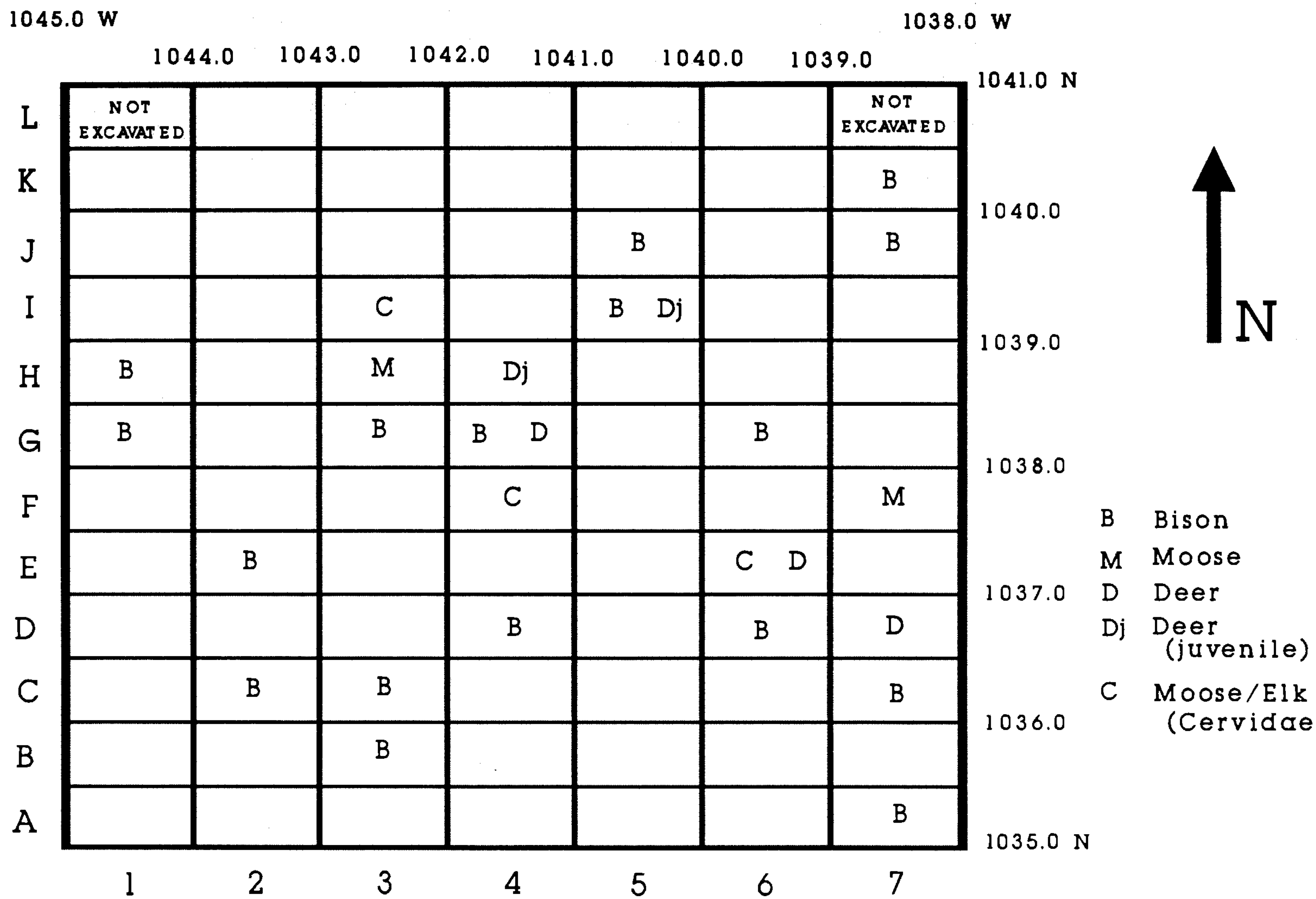


Figure 8-4: Distribution Map of Artiodactyla

8.2.1.3 White-Tailed or Mule Deer (*Odocoileus*)

White-tailed and mule deer differ in feeding habits in that the former is more of a solitary browser, while the latter more often prefers social grazing (Banfield 1974:390). Both species make altitudinal seasonal migrations, similar to moose, in mountainous regions.

The range of white-tailed and mule deer overlaps at The Forks, and because these species are similar anatomically, it becomes difficult in determining which is present. The antlers are the feature that distinguishes these two species osteologically (Banfield 1974:388).

Six specimens were identified as *Odocoileus*: three were adult bone (#1767 left metacarpal; #9721 right metacarpal; and #6554 right tibia), and three were juvenile bone (#859 left first phalanx; #2385 right tibia; and #3375 third phalanx). These were the only mammal bones identified as juvenile in Zone 3. (While nearly all the mammal bone from Zone 3 was bone from mature and juvenile animals, six specimens were foetal bone that could not be identified beyond the taxonomic level of class). The 1st and 3rd phalanx specimens of juvenile deer bone are both proximal fragments that have been calcined.

8.2.2 Order Carnivora

Three families of carnivore were present in the bone sample from Zone 3, including ursids, canids, and mustelids. Figure 8-5 includes the distribution of carnivore remains other than fox.

Bears are the only member of the family Ursidae, and are the largest living terrestrial carnivorous mammals (Banfield 1974:304). Banfield (1974:305) stated that "all Canadian bears hibernate to some extent". Presently, the black bear is the only ursid found in Manitoba, although the grizzly bear roamed most of southern Manitoba at the time of the site occupation, becoming extinct here in historic times (Banfield 1974:310). Thus, although the one ursid specimen is likely black bear, we cannot totally discount the possibility of grizzly bear occurring also.

The dog family (Canidae) includes wolves, coyotes, domestic dogs, and foxes. The specimens from Zone 3 that were determined to be canid fell into three distinct categories based on size: large, medium and small. Four relatively large- and medium-sized specimens were determined to be genus *Canis* (wolf, coyote, dog), while 151 small size specimens were identified as *Vulpes* (fox).

The weasel family (Mustelidae) includes small and medium sized mammals that have mainly carnivorous feeding habits. Three genera are represented here: *Lutra*, *Martes* and *Mustela*. Two specimens have been assigned to the river otter (*Lutra canadensis*), 48 specimens are from fisher (*Martes pennanti*), 18 specimens are from mink (*Mustela vison*), and five specimens may be either *Martes* or *Mustela*. These latter specimens are all vertebrae and, based on size, seem to fall midway, between the vertebrae identified as fisher (large), and those identified as mink (small). Thus, because mink and fisher both display marked sexual dimorphism (Banfield 1974:318,330), meaning that these species both display two distinct size ranges based on sex, then the medium

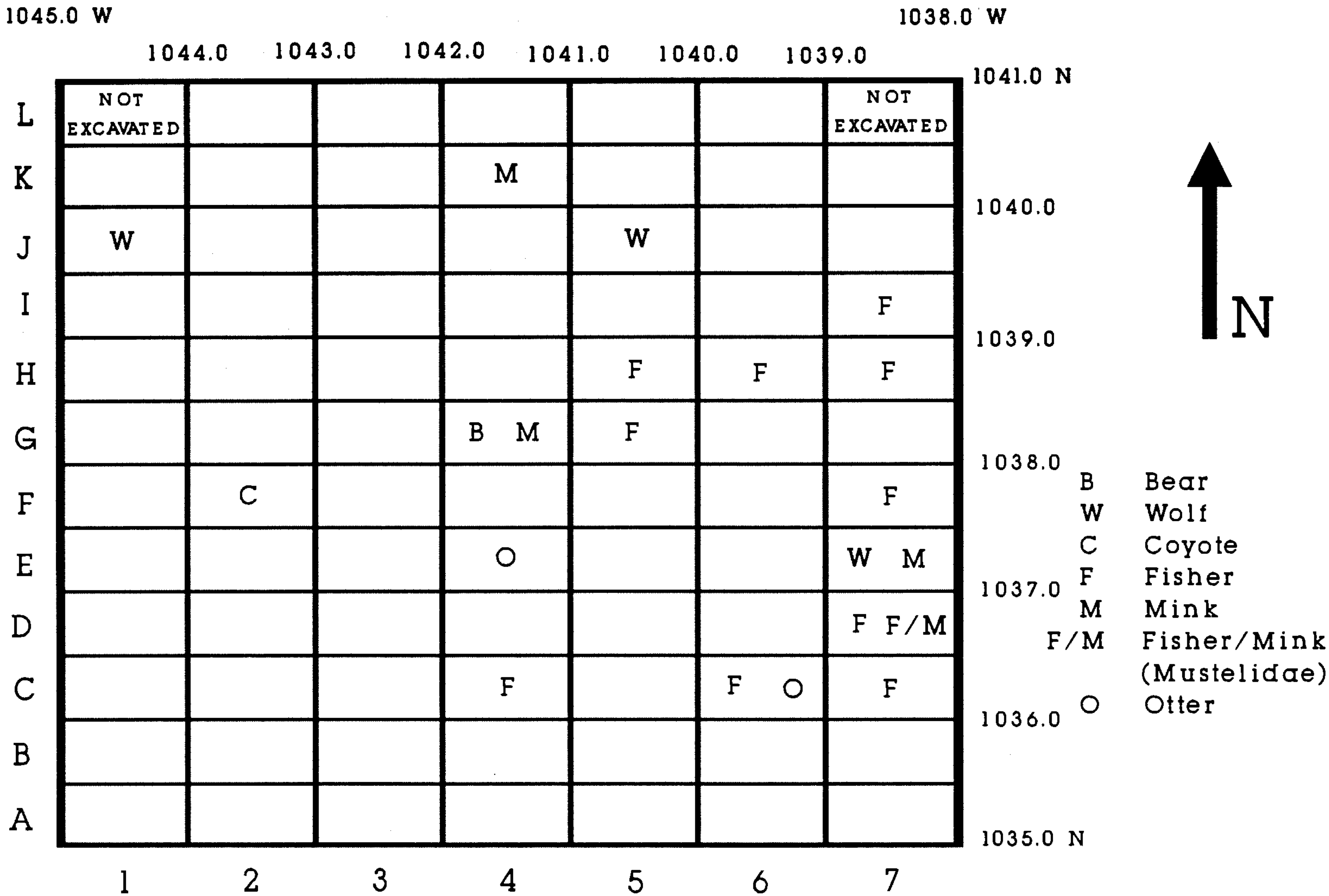


Figure 8-5: Distribution Map of Carnivore Remains

sized vertebrae may represent a small female fisher or a large male mink. The vertebrae from the reference collection for marten (*Martes americana*), another mustelid, did not match these specimens as closely as mink or fisher.

8.2.2.1 Bear (*Ursus americanus*)

Black bears are described as mostly solitary, forest dwelling, semi-arboreal omnivores. The same applies to grizzly, though they are not as active tree-climbers, and some may have more carnivorous habits (Banfield 1974:308). Because the teeth are the only sure way to distinguish black and grizzly bear skeletons, species identification could not be made on the single *Ursus* specimen. The element (#5132) is a left fibula, with the distal epiphyseal line visible, thus indicating that it may have been a sub-adult individual recovered at the site. Its relative size suggests that this is probably from a black bear.

8.2.2.2 Wolf, Coyote, or Dog (*Canis* sp.)

Three of the four specimens identified as *Canis* probably come from wolf (#1183 right maxilla with canine, premolars and molars; #3296 left lower third molar; and #7137 right humerus), while one is likely coyote (#6320 right humerus). A problem arises in trying to determine, from such a small bone sample, whether these specimens are wild, tame, or domestic. As a result we can say that wolf or large-sized dog and coyote or medium-sized dog were present in Zone 3.

8.2.2.3 Fox (*Vulpes vulpes*)

Foxes, like the other members of the canid family, are cursorial predators, meaning that they chase their prey and kill by biting and clawing (Banfield 1974:286). Unlike the members of the genus *Canis*, *Vulpes* are seldom tamed as pets (Banfield 1974:299), and thus we can be fairly certain that we are dealing with wild animals here, either red fox (*Vulpes vulpes*) or swift fox (*Vulpes velox*). Red fox are more likely to be the species present, based solely on size comparisons. However, we cannot completely discount the smaller swift fox, whose former range included southern Manitoba, and whose skeleton is only distinguishable from red fox based on relative size.

One hundred and fifty one specimens were identified as *Vulpes*, and due to this high number, the distribution of these remains were plotted separately on Figure 8-6. Two specimens were burnt bone (#4630 left third metatarsus; and #3232 right centrale), and four specimens were worked bone (Sections 8.3.3.1, 8.3.4.1 and 8.3.5.2).

8.2.2.4 Otter (*Lutra canadensis*)

River otter are aquatic carnivores that prefer to feed on fish and small mammals (Banfield 1974:343). Their range in Canada extends from Newfoundland to Vancouver Island and north to the Yukon Territories. Though they are wary of humans in the wild, they are described as sociable, docile, and playful, and are the only member of the weasel family that can easily be domesticated (Banfield 1974:341-343). Two specimens (#4035 left tibia; and #5665 right humerus) were found.

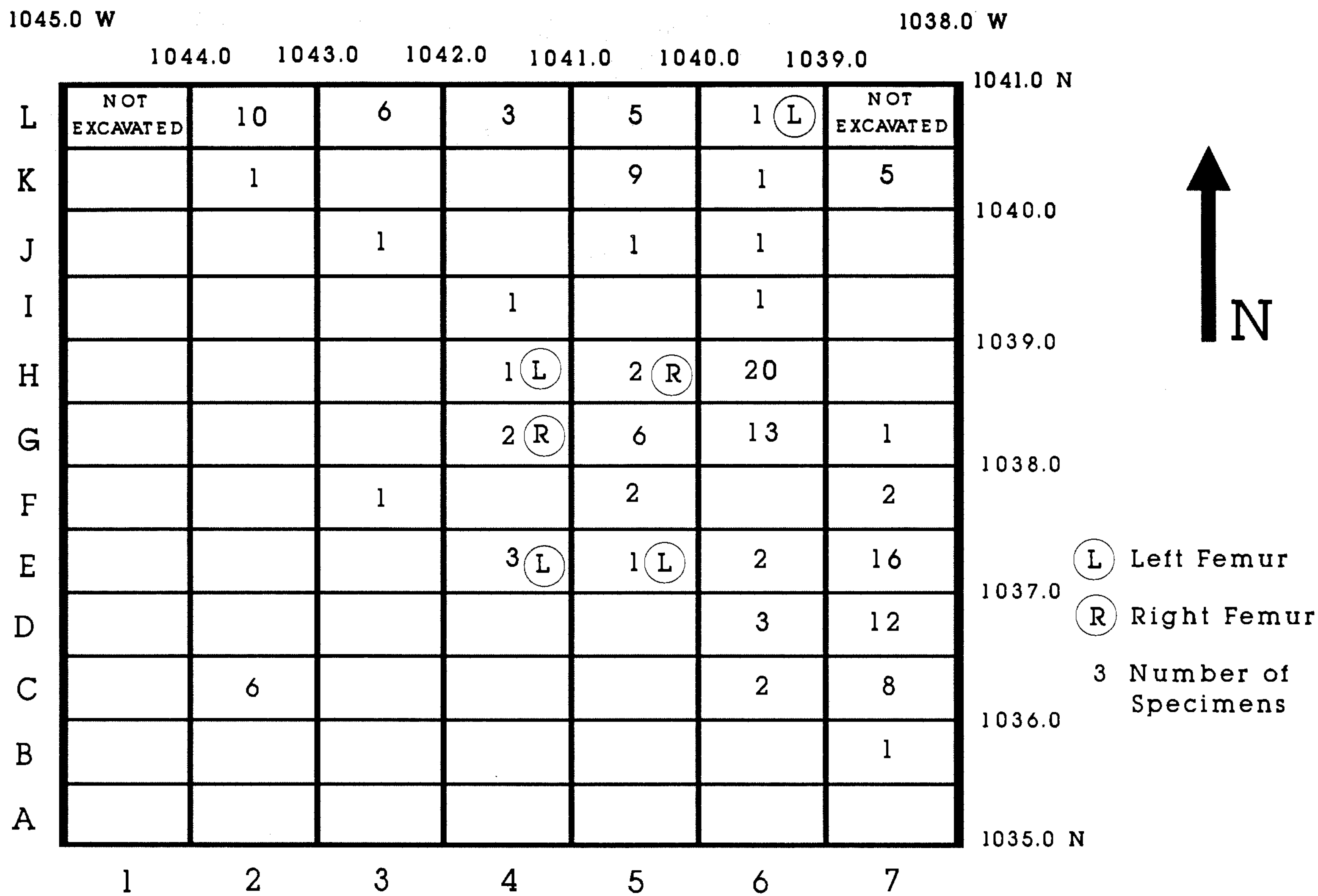


Figure 8-6: Distribution Map of Fox Remains

8.2.2.5 Fisher (*Martes pennanti*)

Fisher are solitary carnivores that mainly kill small and medium mammals and may scavenge on large mammal carcasses (Banfield 1974:318). They are less arboreal than marten (*Martes americana*), but their range and habits are similar (Banfield 1974:319). The 48 fisher specimens include the following elements: tibia, ulna, radius, metacarpus, and vertebrae including the atlas, as well as various other cervical, thoracic, lumbar, and caudal vertebrae.

8.2.2.6 Mink (*Mustela vison*)

Mink are described by Banfield (1974:330) as "bold, ferocious and untameable" semi-aquatic carnivores. Their distribution in Canada is similar to otter, although mink are typically solitary and spend more time on land than otter (Banfield 1974:330). Eighteen specimens, all vertebrae, were identified as mink. One specimen was burnt (#5001 caudal vertebra).

8.2.3 Order Rodentia

Large rodents in Manitoba include beaver, muskrat, porcupine and woodchuck, but beaver is the only one identified among the Zone 3 mammal remains. Squirrels are medium-sized rodents which, like beaver, are considered to have been culturally deposited in Zone 3. The distribution of the 27 specimens identified as beaver, and the five specimens determined to be squirrel, are shown in Figure 8-7. Pocket gophers (another medium-sized rodent) and small rodents such as mice and voles, are all assumed to have been naturally deposited, and are classified as small mammals. Naturally deposited small mammals are discussed in Section 8.4.

Banfield (1974:96) noted in regard to squirrels that "some are wholly terrestrial, others are arboreal, and a few are nocturnal gliders...all have more or less bushy tails". Species from the squirrel family that are presently found in southern Manitoba include: chipmunks, woodchucks, ground squirrels, tree squirrels, and flying squirrels (Banfield 1974:98-146).

The sciurid specimens recovered were determined to be ground and tree squirrel remains. Three of the five squirrel specimens were calcined, and this was a major factor in placing this family in the culturally used mammals category.

The calcined specimens (#3374 right femur; #5000 distal humerus; #5002 humerus shaft) were all tree squirrel (*Sciurus* or *Tamiasciurus*), as was #9452 (left femur). In contrast, #5831 (left scapula) was likely from a ground squirrel (*Spermophiles*).

8.2.3.1 Beaver (*Castor canadensis*)

Beaver are highly social aquatic rodents (Banfield 1974:160). The beaver's range and habitat are similar to those of the river otter, which is one of the beaver's main predators. Beaver are vegetarian and are unusual in that they work as a colony to construct large dams, lodges, bank burrows and canals (Banfield 1974:160).

All 27 specimens identified from Zone 3 were either teeth or mandibular fragments. No representation of body elements were recovered. Six specimens were worked bone or tooth and are described in Section 8.3.2.

8.2.3.2 Tree Squirrel (*Sciurus/Tamiasciurus*)

Red squirrels are smaller than grey squirrels, but their skeletons are usually distinguished based on differences in the cranium, and the fact that red squirrel have vestigial bacula (Banfield 1974:138). Because only post-cranial tree squirrel remains were recovered, these specimens were simply identified as *Sciurus/Tamiasciurus* (grey or red squirrel).

Grey squirrels are described as socially tolerant tree squirrels, and "the relationship between the grey and the smaller red squirrel is an interesting one. The red squirrel is highly territorial in behaviour and drives all intruders from its territory, including the grey squirrel. The latter species, being indifferent to the defense of territory, readily gives ground, though it is not intimidated by the incident" (Banfield 1974:133). They both are active all winter, though they usually are inactive during blizzards (Banfield 1974:134,139).

Red squirrels are described as bold, curious, noisy, and rapacious, mainly solitary, and are more arboreal than the grey squirrel (Banfield 1974:139). Banfield (1974:140) also noted that "the red squirrel is far more carnivorous than the other tree squirrels...it has been known to eat deer mice, meadow voles, young cottontails, robins, bluebirds, orioles, and ruffed grouse". As a result, the red squirrel appears to be more flexible than the grey squirrel in its habitat requirements (Banfield 1974:139).

Winnipeg is located in an area in which the ranges for both the red and grey squirrel overlap at present. Their presence at the time of the occupation of the site would depend upon favourable climatic conditions and habitat. Further palaeoecological investigation is needed to indicate whether either or both species occurred.

8.2.3.3 Ground Squirrel (*Spermophilus* sp.)

Three species of ground squirrel are presently found in Manitoba, including Richardson's ground squirrel (*Spermophilus richardsonii*), the thirteen-lined ground squirrel (*S. tridecemlineatus*), and Franklin's ground squirrel (*S. franklinii*) (Banfield 1974:114,122,125).

Because these species all burrow (Banfield 1974:115,123,125), and the single ground squirrel specimen from Zone 3 shows no evidence of being burnt, butchered or worked, this specimen is more likely to have been deposited naturally, while the tree squirrel specimens are assumed to have come from cultural deposits.

It is possible that the ground squirrel specimen is from an individual that died in its burrow, although it would be expected to have been a more complete skeleton. It is possible that owls or other carnivores may have left it here, though there were no visible marks to indicate this. In addition, the bone could have been brought in by flood waters, or by been stuck to the bottom of

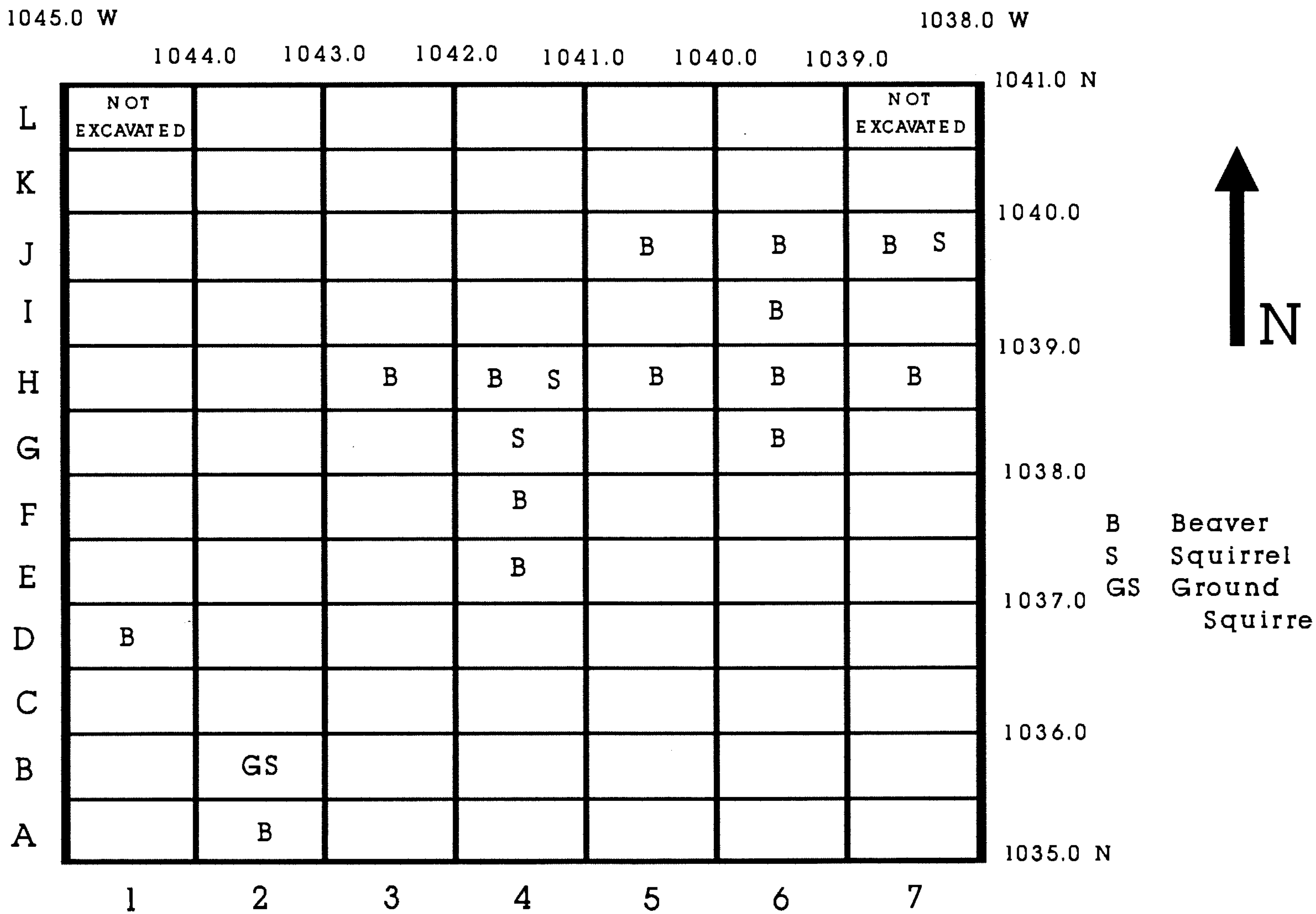


Figure 8-7: Distribution Map of Beaver and Squirrel Remains

a human or animal foot. Thus, the presence of the ground squirrel remains could be the result of natural phenomena rather than cultural activity.

Richardson's ground squirrels are described as herbivores, living in "loose straggling colonies" (Banfield 1974:114,115). "These ground squirrels hibernate for about seven months of the year, and emerge, as a rule, during the second half of March". (Banfield 1974:115). Banfield also stated that these squirrels "prefer high rolling hills of gravelly or sandy soils in which to burrow...and avoid wetlands" (1974:115).

Thirteen-lined ground squirrels are the smallest species in this group, and are described as more solitary and insectivorous than other ground squirrels (Banfield 1974:122,123). The period of hibernation is also more variable for this species, which "does not inhabit the open grasslands as do so many other ground squirrels" (Banfield 1974:123).

Franklin's ground squirrels are described by Banfield (1974:125) as better tree-climbers than other ground squirrels, and are typically more solitary, omnivorous, and hibernate about two weeks longer than Richardson's ground squirrels. He indicated that "this species bears a closer resemblance to the tree squirrels than the other ground squirrels do because of its long, bushy tail, which makes up two-thirds of its total length" (Banfield 1974:125). In regard to habitat, Franklin's ground squirrels prefer wooded areas and the edges of woods.

8.2.4 Minimum Number of Individuals

Table 8-3 details the minimum number of individuals (MNI) that would account for the remains of each taxon that has been identified. The MNI for each taxon in Zone 3 can then be compared relative to the total MNI of all taxa identified (Figure 8-8). It should be noted that this method deals with each individual animal as a unit, regardless of whether it is a beaver or a bison. The different animal sizes should be kept in mind when attempting to interpret taxon frequency. One can assess the diet frequencies by weighting the data, based not only on energy expenditure required to acquire each taxon, but also on the amount of energy return in the form of meat. These techniques are useful but go beyond the scope of this report.

In the case of the artiodactyls, MNI for bison, moose and the specimens identified as moose/elk is one, and as the deer remains include both mature and juvenile remains, MNI is two.

For the carnivores, MNI is one for bear, wolf, coyote, fisher, otter, mink, and the *Martes/Mustela* specimens. *Vulpes vulpes* had, by far, the highest number of specimens, and so calculating the MNI for this species was somewhat more complex than it was for the others.

Table 8-4 lists the fox specimens identified by element, illustrating the method of determining the MNI. In this instance, four different left femurs have been identified as red fox. The left femur is the most frequent element of those elements that are considered reliable indicators of MNI. Other elements such as vertebrae, ribs, and phalanges may be more numerous, but because the element

TAXON	Minimum Number of Individuals	Number of Identified Specimens Per Taxon	Relative Frequency Per Taxon
ARTIODACTYLS			
Bison	1	44	0.200
Undifferentiated Cervid	1	4	0.200
Moose	1	4	0.200
Deer	2	6	0.400
SUB-TOTAL	5	58	1.000
CARNIVORES			
Bear	1	1	0.091
Wolf	1	3	0.091
Coyote	1	1	0.091
Fox	4	151	0.364
Undifferentiated Mustelid	1	5	0.091
Fisher	1	48	0.091
Mink	1	18	0.091
Otter	1	2	0.091
SUB-TOTAL	11	229	1.001
RODENTS			
Beaver	3	27	0.600
Tree Squirrel	1	4	0.200
Ground Squirrel	1	1	0.200
SUB-TOTAL	5	32	1.000
TOTAL	21	319	

Table 8-3: Minimum Number of Individuals of Culturally Used Mammals

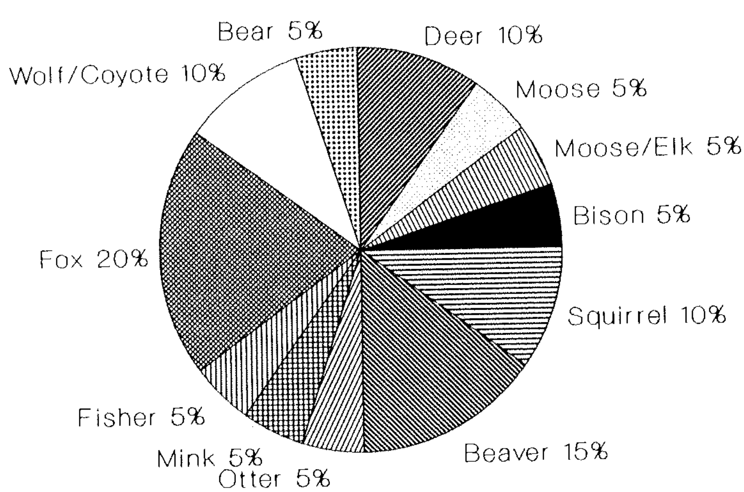


Figure 8-8: MNI of all Identified Taxa

type (e.g., third cervical, third rib) or element side (left or right) are not always readily determined, these elements are usually ignored when calculating the MNI.

In the case of the mink and the taxon identified as *Martes/Mustela*, only vertebrae were found. These elements were scrutinized more closely so that the vertebrae were separated into categories (i.e., element part: cervical, thoracic, lumbar, sacral, or caudal), in order to estimate MNI. This estimate is somewhat less reliable due to the difficulty in identifying taxa based on less distinct elements such as vertebrae. For instance, vertebrae determined to be cervical could not be readily identified according to their numerical sequence (e.g., third or fourth cervical), therefore it is uncertain whether or not there were two third cervicals present.

ELEMENT	BODY SIDE		
	Left	Right	Medial
Patella	1	2	-
Cuboid Tarsus	3	1	-
Centrale Tarsus	2	2	-
Lateral Tarsus	2	0	-
Calcaneus	3	0	-
Astragalus	2	0	-
Femur (complete)	1	0	-
Femur (distal)	3	2	-
Tibia (complete)	1	0	-
Tibia (distal)	2	0	-
Tibia (proximal)	1	3	-
Fibula	0	1	-
Humerus (proximal)	0	1	-
Humerus (distal)	0	1	-
Ulna (proximal)	1	0	-
First Carpal	0	1	-
Scapula (proximal)	1	1	-
Innominate (complete)	0	1	-
Innominate (ischium)	1	0	-
Innominate (ilium)	1	0	-
Sacrum	-	-	1
Atlas	-	-	1
TOTALS	25	16	2

Table 8-4: Elements of *Vulpes* Used for Minimum Number Determination

ɜments identified were all mandibular and teeth fragments. Two left mandible fragments inferior symphysial portion of the bone, and one fairly complete left mandible, are the specinicus that determine MNI as three. The MNI for tree squirrel is one, as is the case for ground squirrel.

8.2.5 Seasonality

Some clues to the season or seasons of the Zone 3 occupation may be derived from the analysis of the cultural derived mammal remains. Often, the seasonal availability of a species may depend, in part, on harvesting techniques available to the hunters. Also, we must consider that some species may have been preferred more at certain times of the year.

According to Speth (1983:70), bison appear to have been preferred typically in the spring and fall migration periods, when the herds coalesced, and their location and direction of travel could easily be predicted. He also noted that the presence of foetal and juvenile remains can be used to determine the kill season (Speth 1983:70). Kroker (1989:175) suggested that fall was the time when bison herds were closest to the area of The Forks in their circular migration route, making this a convenient campsite at that time.

Northern plains bison usually calve in April or May, and if enough young bison remains are present in an assemblage, then the estimate of the average age of the young may be taken to represent the time elapsed since the birthing period (Speth 1983:70). In the case of the Zone 3 assemblage no foetal or juvenile bone was present. Only one individual was represented and seasonal determination could not be ascertained.

Moose were most likely preferred during the fall rut, which coincides with an increase in population density of these animals (Balmer 1983:88). Late winter is another good moose hunting season, when a crust builds over deep snow which a person can walk upon, but which a moose breaks through (Balmer 1983:85). Again, because of the limited representation of moose in the assemblage, little can be said about the season of occupation based on the remains from this species, considering that they may be less available during other seasons but still may be harvested.

The juvenile deer remains may provide us with an estimate of the season of occupation at the site, although it would be a rough estimate at best, considering the sparse sample recovered. Banfield (1974:390,393) estimated that on average, white-tailed and mule deer give birth in June. For mule deer, calving may occur any time between March and November, with juveniles reaching sexual maturity at 18 months. For white-tailed deer, calving occurs between April and September, and sexual maturity is reached after only 12 months. If we estimate the age of the juvenile deer remains in Zone 3 at about one month, then it is possible that this individual was taken in July, but with such a small sample, April to December is the safest estimate. Balmer (1983:78) indicated that for white-tailed deer "variation in the season of procurement may reflect scheduling decisions relative to differences in other resources available", yet fall and winter appear to have been preferred. Again, the small sample of deer remains does not provide for further analysis.

According to Balmer (1983:79), black bear may have been less available to hunters during winter due to hibernation, although with the use of different hunting techniques, bears could still be had year round. Nevertheless, she indicated that fall was the preferred season for bear because they carry more fat at this time, although hunting in the spring was also favoured because hunters could predict where bear would go to fish during spawning season.

The other carnivores present, the canids and mustelids, would all have been available throughout the year, though winter is the preferred season if fur quality is a major priority (Smith 1985:11). Fur quality is poorer during other seasons. The value given fur has likely been exaggerated since the advent of the fur trade. Prior to the fur trade, hunters were less likely to be influenced by the desire to ensure the quality of the fur, and fur-bearers were likely used much more as food species. As a result, fur-bearing mammals would have been sought based on dietary necessity rather than for trade, and seasonal harvesting restrictions based on fur quality would have been minimized.

Beaver were likely available year round but also required different procurement techniques depending on season. In winter, for instance, the ice formed a barrier which would prevent spearing of beaver, and probably required techniques such as snaring in and around ice hole entrances. Smith (1985:11) suggested that winter is the preferred season for beaver pelts, but again this would apply more to post-European influence.

The beaver remains from Zone 3 appear to include a high proportion of worked pieces. The suggestion that the presence of these remains is due to their use as tools, could indicate that these specimens may have been in the possession of the occupants of the site indefinitely before being discarded. If this were the case, then the beaver remains would not be able to supply us with any information about seasonality, even if the sample were large enough for statistical purposes.

8.2.6 Harvesting and Butchering Techniques

Harvesting and butchering techniques vary with the size and species. Large animals may be more easily killed by using a spear and be butchered where they fell, whereas small animals might be easier to trap and carry home whole. Evidence of harvesting techniques such as bison jumps or drive sites, or hare drive sites may be more readily apparent than the techniques used in solitary kill situations, although that evidence is likely to be found at the kill site. Butchering techniques may be observed at both the kill site and at the campsite where secondary processing occurs.

The remains from the culturally used mammals from Zone 3 appear to indicate that a considerable range of size and species were selected for. Because of the small sample size, specific choices such as sexual selection or age selection could not be perceived.

Size and species selection may also play a part in the absence of certain species that we might expect to find, although seasonal availability may be involved. For instance, muskrat and hare were absent from the assemblage even though they would seem to be a reliable food source. This may be due to a preference for other species at this site; the season of occupation was a time when these species were not as available to hunters; or these species were processed elsewhere on the site.

"The muskrat is the largest of the North American rats, mice, and lemmings" (Banfield 1974:197). This aquatic rodent, like the beaver, was available all year to hunters, though the fur is prime in winter. "Muskrat live in family units occupying a house" (Banfield 1974:197). Harvesting of muskrat in winter would require technology similar to that used on the beaver. The absence of muskrat may have been because the local river habitat was unsuitable, and thus was unable to support a resident population. Muskrat are herbivores that prefer shallow ponds and marshes, and they are unlikely to be found along major waterways.

"The snowshoe hare, like the other leporids, is crepuscular and nocturnal in its activity and remains active all winter as well" (Banfield 1974:81). These hares (*Lepus americanus*) are vegetarian, social animals with an acute sense of hearing. They probably were the only species of the order Lagomorpha present in Manitoba at the time of site's occupation as both the eastern cottontail and jack rabbit are first recorded in the homestead era - 1885 and 1914, respectively. (Banfield 1974:79, 90). Hares, although a common game animal, are absent. It may be that the absence of this species in the assemblage was due to a greater preference for larger species during the season that the site was occupied. Also, rabbit may have been undesirable to the occupants of the site, or alternatively, rabbit remains may simply be present in areas of the site that are as yet uncovered.

Some other species noticeably absent from the assemblage sample are medium and large birds. This may be because the site was occupied during a season unfavourable to bird hunting; the birds were handled elsewhere; or perhaps birds were simply not preferred game at this site. Again, the small sample size cannot provide conclusive evidence. According to Smith (1985:11), most bird species were favoured during spring, summer, and/or fall, while some owl species were favoured in winter.

Butchering techniques can be deduced by an analysis of the culturally used mammal remains. This involves observation of specimens recovered as well as a consideration of spatial relationships and technology. Specimens recovered from Zone 3 as a whole appeared to show considerable fragmentation, an abundance of spiral fractured splinters, and pieces that exhibit cut marks from butchering.

In addition, burnt specimens were fairly numerous in certain areas, and their spatial distribution is illustrated by weight in Figure 8-9. This map is useful especially in conjunction with Figure 8-10, which shows the mammal bone distribution by weight also. Together these maps help to determine the patterns of deposition that relate to butchering.

Worked bone can be looked at spatially, but as these pieces may have been in use indefinitely, their relationship in the butchering process is more complex. Spatial distribution of these different aspects (burnt, worked, and quantity by weight) are examined in Section 8.2.7.

Another means of investigating butchering activities is to analyze the portions of the animals that were recovered. For instance, if hide processing was performed in this area, then perhaps only the skin and possibly phalanges, caudal vertebrae and maybe cranium attached, may have been brought back to the processing area. Thus, a profusion of only these elements may indicate what was going on here. Smith (1985:13), who analyzed faunal material from The Forks historic periods, stated that

Although some of these species were represented by a small number of bones (sometimes only one or two), unless the bones come in on a skin, it was likely that the meat was used. The whereabouts of the rest of the skeletons can best be accounted for by supposing the bone was either eaten by dogs, burned to a state of unidentifiable fragments, or contained in the soil in areas in and around the site that have not been excavated. Of course, it is likely that much of the skeleton of the large game animals was never brought to the fort, but butchered where taken.

Table 8-5 displays the skeletal element representation for culturally exploited mammals, so that we can readily observe the portions of animals that were found. Of particular interest here is the incidence of only vertebral specimens identified to mink and *Martes/Mustela*, post-cranial elements of fox and fisher, and only cranial elements for beaver. This may be due to random chance and a small sample size. Still, it is possible that these specimens are the result of some purposeful action.

SPECIES	BODY PORTION				
	Cranial	Vertebra /Rib	Pectoral	Pelvic	Feet
Bison		38	1	2	3
Moose	1	3			
Deer (adult)				1	2
Deer (juvenile)				1	2
Cervid (undiff.)				1	2
Bear				1	
Wolf	2		1		
Coyote			1		
Fox		57	6	22	66
Fisher		43	3	1	1
Mink		18			
Otter			1	1	
Mustelid (undiff.)		5			
Beaver	27				
Tree Squirrel			2	2	
Ground Squirrel			1		

Table 8-5: Skeletal Portions of Culturally Used Mammal Remains

8.2.7 Activity Areas

Figures 8-3, 8-9, and 8-10 each display distribution patterns that are, in part, due to human behaviour, and are also influenced by environmental factors such as scavenging and post-depositional disturbances (e.g. flooding, burrowing animals). Each category appears to have, in common, a higher density in the northeast quarter of the excavation area, and a second dense area in the southeast quarter. This may indicate areas of concentrated activity at the time of occupation.

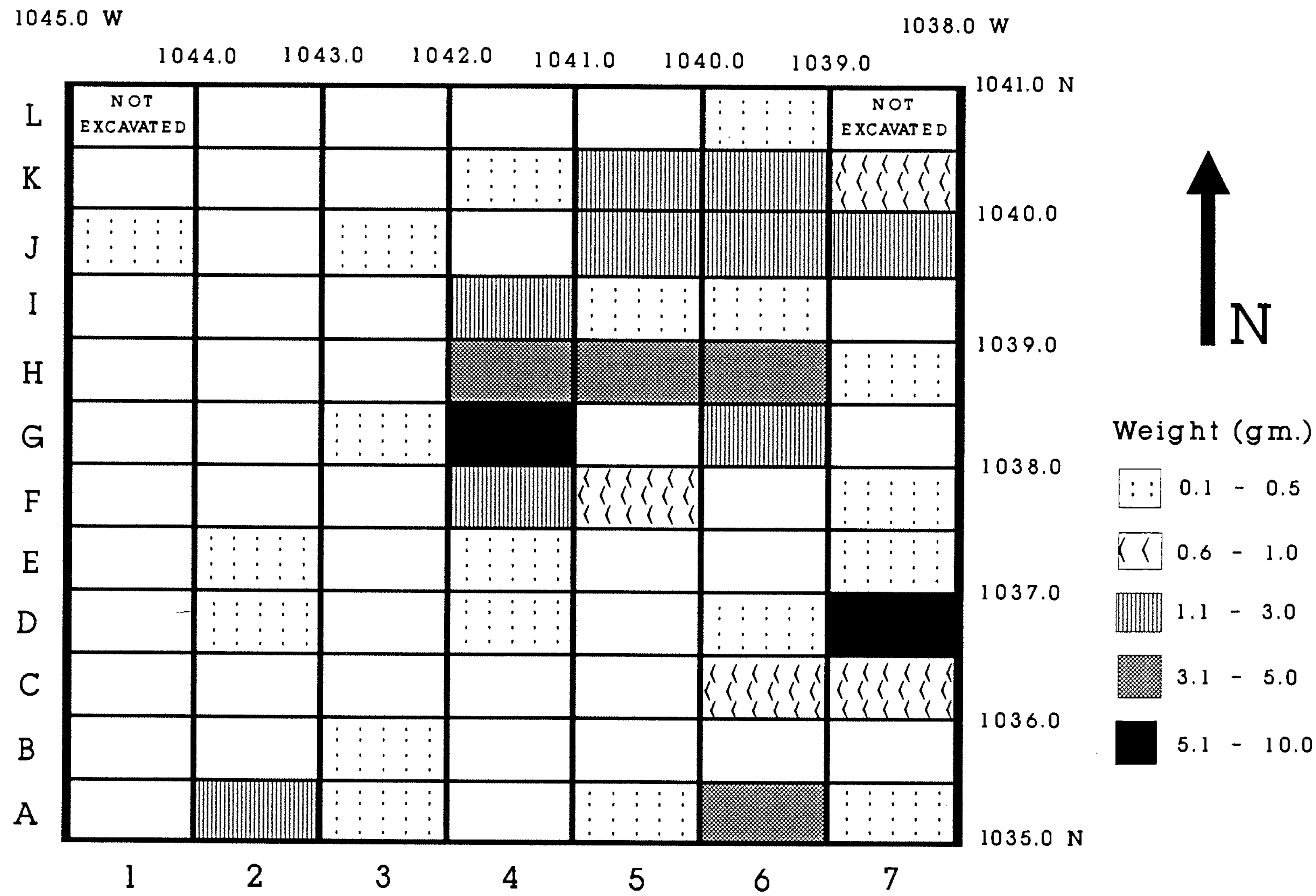


Figure 8-9: Distribution of Burned Mammal Remains (by weight)

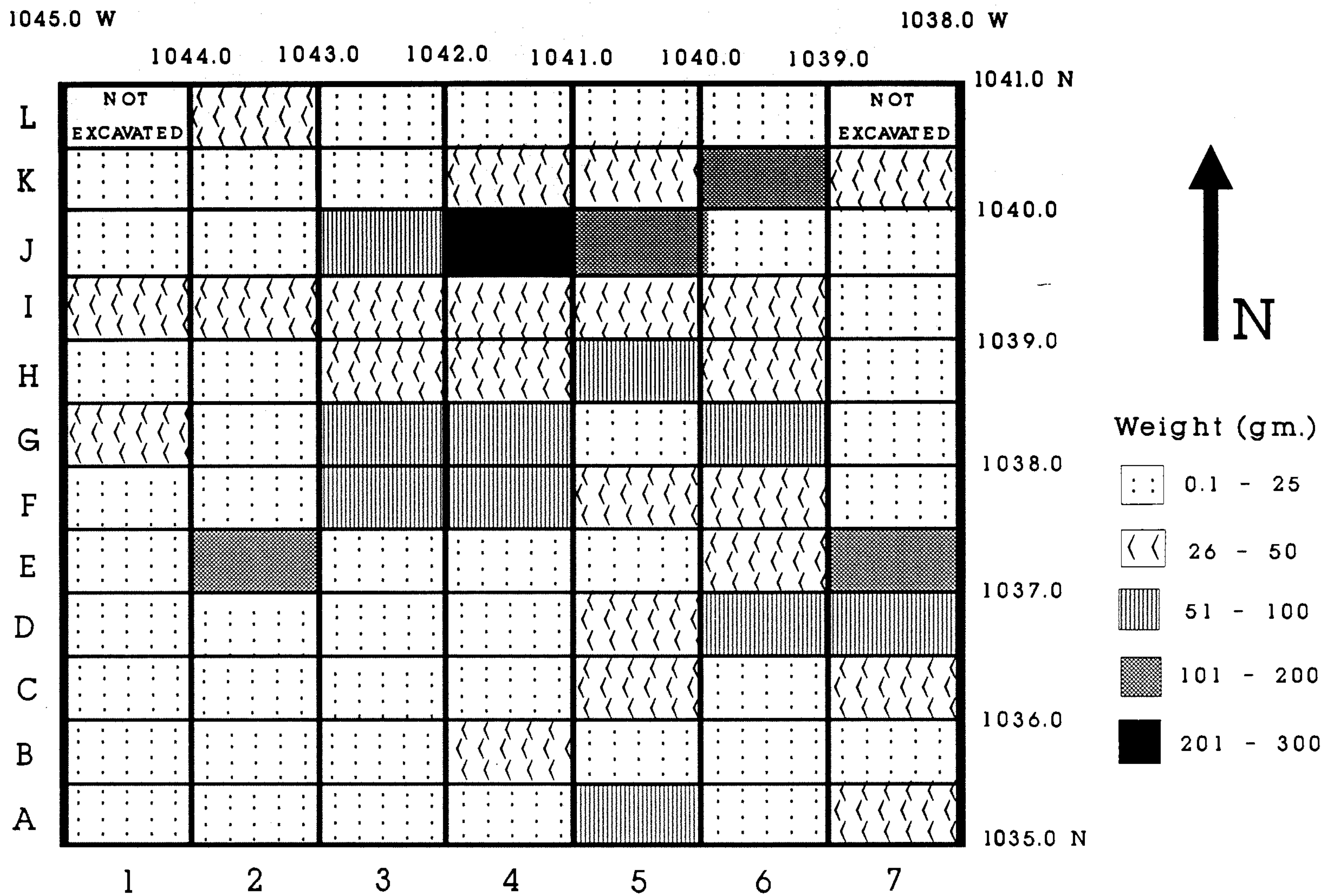


Figure 8-10: Distribution of Mammal Butchering Remains (by weight)

Figure 8-3 shows the taxa distribution and reveals that, for the species which have numerous specimens identified such as fox, fisher and bison, the specimen dispersal is high. This suggests that post-mortem disturbance was also high, although we can't be sure that this is not due at least partly to natural rather than cultural forces.

Another set of instances that relate to the dispersal of taxa are the identification of element portions that fit portions in other units. Two instances of this were observed: #3230 left 4th metacarpal diaphysis in Unit K7 fits with #1415 left 4th metacarpal distal epiphysis in Unit K5; and #7599 left ulna proximal epiphysis in Unit I7 fits with #6965 left ulna distal epiphysis in Unit H7. These pieces were discovered to match by chance, and there was no systematic attempt to match broken element portions outside of the most obvious and convenient instances.

Figures 8-9 and 8-10 show the distribution of total cultural mammal bone and burnt specimens, suggesting that at least some processing of animals for consumption was likely occurring in the area of dense bone debris. In addition to the immediate consumption of meat, activities may have involved further butchering and redistribution, marrow extraction by breaking or cutting the bone, drying, smoking or cooking of meat and or bone, tool and other artifact manufacturing, woodworking, and hide preparation. Soft parts utilized as food or modified as artifacts such as hide thongs, snowshoe string, stomach bags, clothing, etc., may be deduced from the tool kit recovered. Ethnographic evidence can suggest potential technologies, but the actual application may be different at these Precontact periods.

The incidence of specimens found in association with archaeological features are also important when considering activity areas. Five specimens (#5079 undifferentiated fragment, and #5077, #5112, #5113, #5114 large mammal fragments) were found in an ash deposit/hearth in Unit G4, while three specimens (#6817, #6818, #9561 large mammal fragments) were present in the ash deposit/hearth in Unit H4. These specimens may provide evidence of food consumption in this area, though this is not the only interpretation possible.

8.3 Worked Bone and Tooth

The worked bone and tooth from Zone 3 have been divided into categories that are based on the hypothesized function of the object. Function cannot always be accurately deduced, and alternative functions for worked objects are discussed where possible. Categories of worked specimens from Zone 3 include: objects for food procurement by fishing; manufacturing equipment for woodworking; implements used in the manufacture of apparel; scrap from boneworking; and miscellaneous worked bone. Another category of worked bone could be utensils or cutlery used in the processing and consumption of food. Although no complete specimens of knives or handles were identified, those artifacts which may belong to this category are discussed in Section 8.3.5.

Twenty-two specimens, from Zone 3, were classified as worked bone (19) or tooth (3). The distribution of worked faunal remains are displayed in Figure 8-11. It should be noted that the distribution of worked objects roughly coincides with the concentration of butchered remains in the

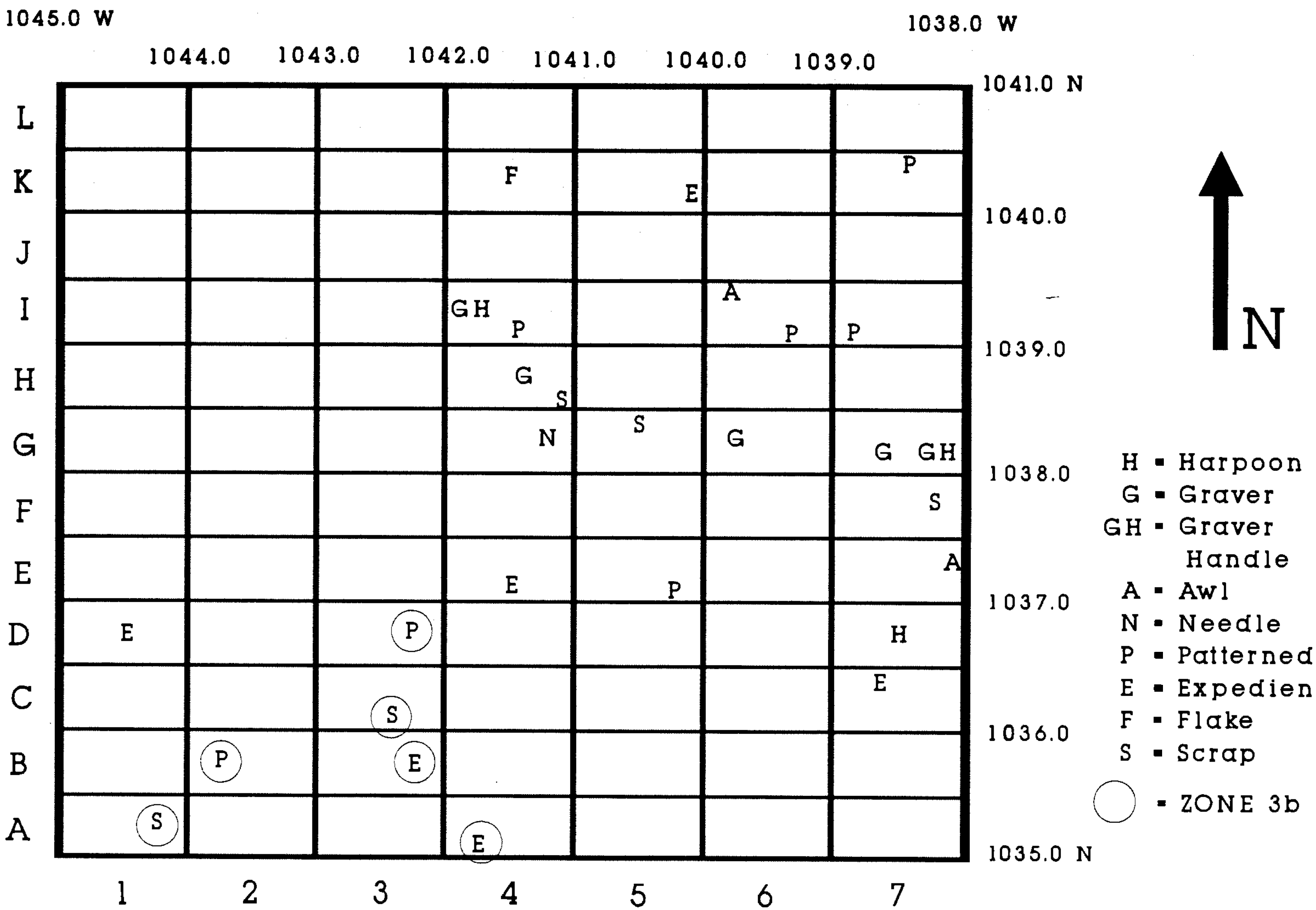


Figure 8-11: Distribution of Modified Mammal Bone and Tooth

excavation area. Table 8-6 lists the worked faunal specimens including measurements taken on each piece, and each specimen has been photographed.

CAT. NO.	UNIT	ARTIFACT NAME	LENGTH mm.	WIDTH mm.	THICK mm.	WEIGHT gm.
3517	D7	Harpoon	51.5	7.5	7.5	2.72
3373	H4	Graver	47.0	7.5	3.0	0.96
5247	G6	Graver	27.0	8.0	6.5	1.25
1864	H3	Graver	68.0	8.0	7.5	3.89
8040	J5	Graver Handle	61.0	53.5	19.5	20.77
6444	G7	Graver Handle	34.5	28.5	7.5	3.19
1350	J6	Awl	100.0	14.5	5.5	6.19
7135	E7	Awl	112.5	4.0	5.0	3.57
5078	G4	Needle	15.0	3.0	2.0	0.05
3273	E5	Patterned Tool	56.5	19.5	20.5	3.70
7502	K7	Patterned Tool	59.5	14.0	3.5	2.67
8059	J5	Patterned Tool	102.0	18.5	6.5	9.06
9038	H6	Patterned Tool	68.0	11.5	4.0	2.46
9406	J7	Patterned Tool	66.0	8.0	4.5	1.73
5684	E4	Expedient Tool	73.0	13.0	5.5	3.83
6664	D7	Expedient Tool	112.0	24.0	13.0	11.39
7440	K5	Expedient Tool	128.0	11.5	4.5	3.87
9585	D1	Expedient Tool	76.0	14.5	8.0	3.17
1563	K4	Flake	8.5	19.0	1.5	0.14
8682	H5	Scrap	34.0	21.0	21.5	2.62
6783	H4	Scrap	23.5	21.0	22.5	2.37
8482	F7	Scrap	27.0	19.0	4.5	1.21

Table 8-6: Measurements of Worked Faunal Material (Zone 3)

8.3.1 Food Procurement

Several lithic tools were used to procure food, though only one specimen of worked faunal remains appears to fall into this category. This specimen is a bone harpoon that may provide the only direct evidence of fish procurement, though it is possible that the specimens of worked shell (Section 11) may also have been used for fishing.

8.3.1.1 Bone Harpoon

The bone harpoon (#3517), recovered from Zone 3, was identified as a toggling harpoon. Bone and antler projectile points from other sites in Canada and the north-central United States may be made using various styles. Some examples from Archaic, Woodland, and Post-European periods include: bone cut into lithic-like side-notched projectile points (Lehmer *et al.* 1978:264); base-notched antler projectile points (Moore 1985:53); conical antler harpoons (Stoltman 1973:105); toggle-headed harpoons of antler tine (Brose 1970:141); deer third phalanx projectile points (Gibbon 1973:8; Theler 1989:218). Locally, MacNeish (1958:129) described a unilateral multi (square) barbed antler point from Archaic level excavations at the Cemetery Point Site at Nutimik Lake on the Winnipeg River (Southeastern Manitoba), but this specimen is quite large and flat (as were most harpoon points encountered in the literature), in comparison with the specimen recovered from The Forks.

The specimen (Plate 8-1) was manufactured from a cylindrical long bone which may have derived from a medium-sized mammal such as a wolf. The point of the barb, possibly from the distal phalangeal process, has been carved and ground to a point at one end. The single unilateral barb makes up 27 percent of the total length of the point. The shaft is bulbous 14 mm from the base, but tapers beyond the bulb to a point. The point appears fairly straight with the barb in profile, but looking straight on at the barb, the shaft bends slightly at the bulb, so that the point aims minimally to the left.

The proximal end is rounded over, with a groove cut near the base probably for attaching a line. The proximal quarter (27%) of the artifact has been carved to a smaller diameter (7 mm). It appears to have been designed to fit into a round socket, with the line attached in the groove serving to wedge the point in the socket.

This toggling harpoon was likely used for spearing fish. When the fish was speared, the point would remain in the fish and become free from the shaft socket, so that the line would be used to draw in the fish.

This specimen differs from most harpoons points described in the literature, in that it is small and cylindrical, and has a groove versus a hole for attaching a line. The bend in the point shaft appears to follow the contours of the bone element, and does not appear to significantly offset the point.

8.3.2 Manufacturing Equipment for Woodworking

All five specimens are beaver remains (Plate 8-2). Three are teeth (incisors), while two are lower jaw (mandible) bones that have been worked. Approximately 22% of the beaver remains showed evidence of modification or use as tools. A similar situation, at Precontact sites in Michigan, was described by Theler (1989:219), who indicated that "the high proportion of mandibular and cranial fragments compared to other beaver elements at many Oneota sites probably reflects curation of mandible or skull sections until the incisors could be removed". One such site, dated to the fifteenth century A.D., included three beaver mandibles with the incisors removed by cutting away the bone, as well as four beaver incisor fragments modified by grinding (Theler 1989:171,218).

8.3.2.1 Beaver Incisor Gravers

Worked incisors were cut, carved and ground, split, or used whole. Split tooth gravers appear to be common at archaeological sites in Canada and the northern United States. Brose (1970:143) and Snortland-Coles (1979:77) refer to beaver incisors that have been split longitudinally, with the distal end being used as a graver. This appears to be the case with specimen (#3373) (Plate 8-2a), recovered in Zone 3, though it may be that the proximal end was used as a graver as well.

A second beaver incisor graver (#5247) consists of the distal portion of a whole tooth. This longitudinal portion has been cut away from the rest of the tooth, carved, ground and polished. The distal edge or occlusal surface of the tooth has been cut or broken and reworked so that one side has been tapered inwards and the working edge is reduced (Plate 8-2b). In addition, the proximal half of the piece has been carved so that it is reduced in diameter uniformly to the midway mark, at which point the tooth has been carved so that the distal half begins by expanding lingually (posterior), then tapers to form a chisel edge. This tool appears to have used similar technology as the harpoon point in that both are made with the similar basal projection for attachment.

One complete beaver incisor (#1864) was recovered, and appears to have wear at the distal edge from use as a graver (Plate 8-2c). This specimen may have been inserted into an antler handle, as was the case at other sites (Orchard 1946:20,104; MacNeish 1958:136; Stoltman 1973:110). It may also have been hand held and used, as is, or possibly the tooth was used in the mandible (Section 8.3.2.2) which subsequently broke away. It is likely that this tool was used as a graver, probably on wood, as a second edge was worn at the occlusal surface that is distinct from the natural edge. The proximal edge may have been cut, and there is some polish at this end also.

8.3.2.2 Beaver Mandible Graver Handle

Two specimens from Zone 3 were identified as worked beaver mandible. Both are parts of woodworking or boneworking tools, (i.e., gravers, chisels or gouges). The bone portion of the mandible would have served as the handle, and the incisor would have been the working end. Figure 8-12 illustrates the morphological characteristics of a beaver mandible and the modifications required to make a handle.

The first mandible (#8040 left) is the complete anterior portion beyond the third molar, which is missing (Plate 8-2d). The incisor is also missing, and it may have been removed when the bone had dried out and the tooth became loose. The articular and angular processes are gone and may have been cut away, and the coronoid process has been cut at about the same height as the molar occlusal surface. There is wear polish that suggests that this tool was used like a pistol grip handle with the incisor in place acting as a graver.

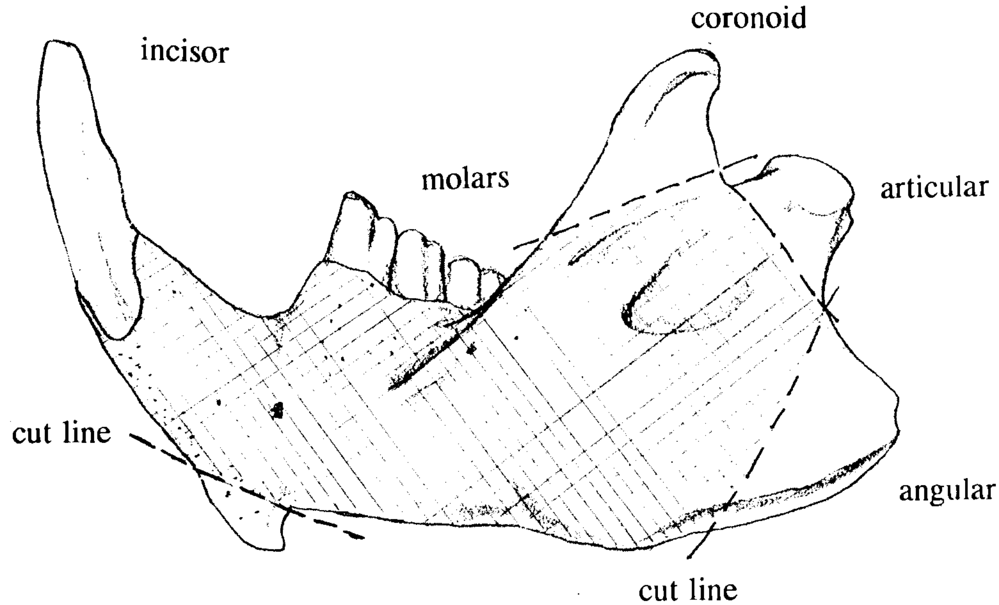


Figure 8-12: Beaver Mandible and Modifications (adapted from Gilbert 1973)

MacNeish (1958:136) noted, when excavating in southeast Manitoba, that worked beaver teeth were found in the Middle Woodland period at sites such as Lockport. According to MacNeish, beaver teeth recovered had abrading on the interior surface next to the biting end. He believes that

> *...this abrading was caused by the use of the tooth as a tool. Furthermore, the angle of the abrading would seem to indicate the tooth was used as a gouge. Perhaps it was set in a handle (like the Cree crooked knife) or used in the beaver jaw with the bone serving as a handle.* (MacNeish 1958:136)

There was no direct evidence that mandibles were used as handles at that site, but the beaver mandibles from The Forks site appear to confirm his speculation.

The second beaver mandible specimen (#6444) was only identified as such because it included a portion of the tooth socket on the lingual (tongue) side of the bone. The buccal (cheek) surface has a series of shallow cuts horizontally, overlayed by a series of deep cuts vertically (Plate 8-2e). The polished surface on the buccal side appears to coincide with the base of the coronoid process, and the posterior margin has also been worn. Wear is also present along the superior lingual and buccal margin, while the anterior portion is broken away. Polish on the buccal surface extends horizontally across the bone about one third of the way up from the bottom edge. This polish may be due to this jaw having been set into some sort of notched shaft. Polish appears to have been made over the cuts.

It is possible that this beaver jaw was first used as a graver while the bone was still fresh. The deep cuts have likely been made to provide added grip and precision in handling the tool. After a period of time, the bone would have dried out and the tooth would have begun to loosen. At this stage, the mandible may have been lashed to some sort of shaft in order to hold the tooth in place. Eventually, the incisor might have been removed and reworked, as was the case with the three tooth specimens from Zone 3.

Theler (1989:236) stated, in regard to a Precontact Oneota site, that

> *...more than one-half of the beaver remains were dentition related elements that included teeth, mandibles and maxillae. Beaver long bones were almost non-existent at the site. Beaver jaws and maxillae seemed to have been separately saved for extraction of the incisors which were evidently used as chisels. The faunal evidence does not indicate much use of beaver or other riparian mammals as dietary items.*

The mandible illustrated in Theler (1989:181) shows that the incisors were removed by cutting away a rectangular slice of bone on the lingual surface. The beaver mandibles from Zone 3 may have been present for the same reason, though the indication here is that the teeth may have been used routinely in the jaw first before the teeth were reworked.

8.3.3 Implements Used in Clothing Manufacture

Three specimens were placed in this category; one split rib awl, one ulna awl, and one needle. Some of the miscellaneous worked bone, which could not be explicitly identified, may also belong to this category.

8.3.3.1 Awl

Bone awls are common at archaeological sites in Canada and the United States. Awls are made from a variety of different types of bone. Several authors (Orchard 1946:88; MacNeish 1958:135; Caldwell 1966:65; Brose 1970:140) have referred to the occurrence of bison split rib awls, which appear to be similar to the one found in Zone 3 (#1350). This specimen (Plate 8-3a) was carved and ground at one end to a round, tapering point that was likely used to perforate hides. Both the tip and base are broken. The curvature and cancellous tissue on one side suggest that this is a rib.

The other awl (#7135), was identified as a red fox left ulna (Plate 8-3b). It is nearly complete and is in good condition. Polish was seen along the shaft especially at the distal end, where two parallel cuts perpendicular to the shaft length may indicate that the end of this awl was removed, possibly to serve as a needle. Ulna awls are mentioned by other authors (Orchard 1946:80; MacNeish 1958:136; Caldwell 1966:66), although these are heavier tools that were made of deer bone.

8.3.3.2 Needle

The single needle specimen (#5078) was carved, ground, and polished on all four sides, but is broken at the tip and base (Plate 8-3c). This specimen shows traces of red ochre on the bone surface suggesting that the needle was used to sew material that was painted with ochre. According to Kroker and Goundry (1990:132)

> *ochre was used for decorative purposes; the mineral was pulverized and mixed with a variety of suspending media, e.g., bear grease, fish oil, goose fat. The resultant pigment was used as either a personal cosmetic or general purpose paint for teepees, ceramics, parfleches, etc.*

Needles recovered at other sites were usually larger, and were often made from split bison rib. Brose (1970:141), for instance, refers to large mat-sewing needles with eyes, and to net-making shuttles. The incomplete specimen from Zone 3 is therefore somewhat unusual because it is so small, and is rectangular in cross-section rather than flat or round.

8.3.4 Miscellaneous Worked Bone

Nine pieces were grouped here, all of which are large mammal bone fragments that have wear polish indicating use as an implement. Two main subdivisions of this category are based upon degree of modification prior to use.

Patterned tools display evidence of having been shaped by cutting, grinding, and/or carving. Expedient tools, on the other hand, were used 'as is' or underwent only minor reworking. Often the only evidence of use as a tool is the presence of wear polish.

Five are split bone that has been patterned but are too incomplete to identify, and four are probably expedient tools made from spiral fractured splinters (possibly reworked).

8.3.4.1 Patterned Worked Bone

Specimen #3273 is a *Vulpes* left distal femur (Plate 8-4a) that has butchering (cut marks) on the distal condyls. The proximal end has been cut and polished and may have served as a chisel, although it is also possible that this tool served as a handle for something that would have been fitted in the proximal end. The shaft is highly polished suggesting wear from hand held usage.

Specimen #7502 is a split rib or long bone fragment (Plate 8-4b) that has been carved and polished. It has been broken at both ends, so it is difficult to say what it was used for, though it may have been the handle of an awl, spatula, or knife.

Specimen #8059 is a split rib that was carved on two sides and one end, while one end is broken (Plate 8-4c). Polish is on both the cancellous and cortical bone sides. This tool resembles spatulas that were used to soften hides (Orchard 1946:80; Lehmer *et al.* 1978:280). Other possible uses are as a marrow extractor, or as a knife or awl handle.

Specimen #9038 is also a split rib that has been carved on two sides and one end, though this end is cut straight whereas the previous specimen was rounded and more polished at the worked end

(Plate 8-4d). Thus, this end would probably not have made a good spatula, and the likely use was as a knife or awl handle.

Specimen #9406 is a split rib which was carved on all four sides (Plate 8-4e), and has been reduced in width and rounded. Though both ends are broken, it appears this could have been used as an awl or needle.

8.3.4.2 Expedient Worked Bone

Specimen #5658 is likely a splinter from a vertebral spinous process or rib, that appears to have been used as an awl or drill (Plate 8-4f). One edge may have been carved or ground to make the point a spiral.

Specimen #6664 is also a vertebral spinous process splinter that may have been used as an awl or drill (Plate 8-4g). Once again, the edges may have been cut or ground to rework the point.

Specimen #7440 is a long bone splinter with wear polish that suggests that this may have been used as an awl or needle (Plate 8-4h).

Specimen #9585 is a long bone splinter (Plate 8-4i) that has been reworked along both edges, and is more polished than the other expedient pieces. This bone may have served as a scraper or gouge.

8.3.5 Manufacturing Debris from Boneworking

Four specimens were included in this category, with one being a detritus flake of bone thought to have been created using stone tool manufacturing technology on partly dried bone. The other three pieces are classified as scrap from boneworking; two were from tube manufacturing and one was from an unknown manufacturing process.

8.3.5.1 Bone Flake

This specimen (#1563) is a small, thin flake of bone (Plate 8-3d) that may have been made while working bone using lithic flaking techniques. The flake appears to have been struck along a fairly flat edge. The opposite edge is broad and curved much like an ulu knife, though no wear polish is evident to indicate it was ever used as a tool. The concave side is smooth, and the convex (cortical) side has evidence of a flake scar from previous impaction.

8.3.5.2 Scrap from Tube Manufacturing

Two specimens were identified in this category. Both are red fox distal femur epiphyses, one left and one right, from adjacent units. This may indicate that they came from the same animal.

Both are thought to have been cast off after being cut around the diameter of the shaft deep enough to break the bone. According to Moore (1985:55), this was the case with specimens at the eighteenth century On-A-Slant Village site.

Although both specimens appear to be from the same size of individual, one has been cut closer to the distal end so that it is 30% shorter than the other specimen. The shorter specimen (#6783),has a slightly larger inner diameter (8.0-8.5 mm) because of the way the bone naturally expands at this end (Plate 8-3e). The other specimen (#8682) has an inner diameter of 6.0-7.5 mm (Plate 8-3f). It is assumed that the diaphysis (shaft) was utilized in some fashion, while these ends were discarded.

Bone tubes at other sites have been interpreted as having various functions. These include: bird bone whistles (MacNeish 1958:135; Wood 1971:39; Stoltman 1973:107; Theler 1989:221;); bone beads (Wood 1971:39; Stoltman 1973:136; Lehmer *et al.* 1978:271; Snortland-Coles 1979:77; Moore 1985:53); sucking tubes (Johnson 1969:15; Stoltman 1973:107) or pipestems (Stoltman 1973:107).

Another possible use for the tubes produced by this method is as a convenient fastener for the harpoon point. The point could have been fitted at one end, while a harpoon shaft could be fitted in the other end (Figure 8-13). It was observed that the harpoon point base was approximately equal to the tube diameter.

8.3.5.3 Scrap from Miscellaneous Bone Manufacturing

One specimen (#8482) belongs in this category. This bone appears to have been cut along two opposite edges (Plate 8-3g) but is broken at the other two edges. The bone also has been longitudinally cut so that this piece is mostly cancellous bone, while the piece removed would have been mainly cortical bone. It appears that this specimen is scrap from the manufacture of strips of cortical bone, though purpose is unknown.

8.4 Naturally Deposited Vertebrate Faunal Remains

The taxa in this category include small mammals, small birds, reptiles and amphibians. Small mammals from Zone 3 include pocket gophers, mice, voles, and shrews. The bird specimens were from small perching birds (order Passeriformes), the reptile remains were from garter snakes, and the amphibian remains were from frogs or toads. The NISP are shown in Table 8-7 and the distribution of these taxa are shown in Figure 8-14.

In addition to faunal remains, naturally occurring rodents are assumed to have provided evidence of their presence by creating rodent burrows in the soil matrix in Units A1 and D1. Remains of burrowing small mammals may have been deposited at the time of the occupation, or possibly lived many years later and tunnelled down to the Zone 3 level. As a result, small mammals represented in the assemblage cannot be assumed to have come from the same period as the site occupation.

8.4.1 Mammal Remains

Natural mammal remains from Zone 3 include small and some medium rodents, as well as small insectivores. The rodent remains in this category include specimens identified from two families:

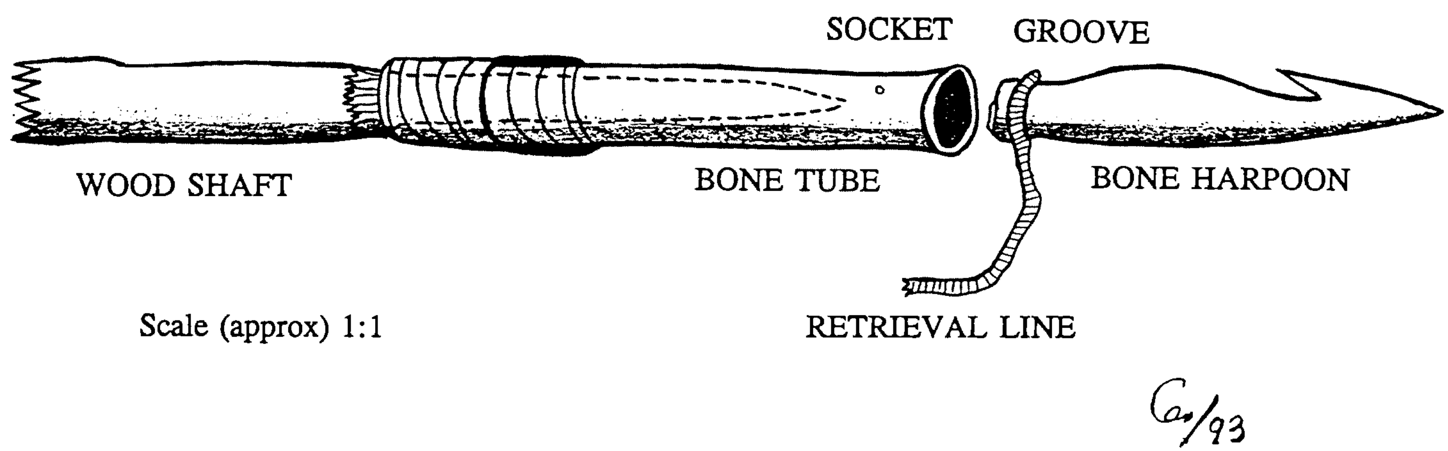


Figure 8-13: Hypothesized Reconstruction of Tube-Socket Toggling Harpoon

pocket gophers (Geomyidae) and mice and voles (Cricetidae). One specimen was identified as pocket gopher while 18 were identified as cricetid, including eight mandibles identified to the genus level, and 10 elements (including six incisors, three vertebrae, and one humerus) listed at the family level.

TAXON	Quantity	Weight (gm.)	Relative Frequency
MAMMALIA			
Rodentia			
Geomyidae	-	-	-
Thomomys talpoides	1	1.2	0.002
Cricetidae	10	1.0	0.017
Peromyscus maniculatus	4	0.3	0.007
Microtus/Clethrionomys	4	0.5	0.007
INSECTIVORA			
Soricidae			
Sorex/Microsorex	1	< 0.1	0.002
AVES			
Passeriformes	1	< 0.1	0.002
Eggshell	1	< 0.1	0.002
REPTILIA			
Squamata			
Thamnophis sp.	405	4.0	0.678
AMPHIBIA			
Salienta	169	5.5	0.283
IDENTIFIED TAXA TOTALS	596	12.8	1.000

Table 8-7: Number of Identified Specimens Per Taxon for Naturally Deposited Fauna

8.4.1.1 Pocket Gopher (*Thomomys talpoides*)

Banfield (1974:147), writing about the family Geomyidae, indicated that

> *...although most of the species are found further to the south, two species have reached the Canadian prairies. The pocket gophers constitute the third family of Canadian mammals that is modified for a fossorial life, the other two families being the moles and the mountain beaver.*

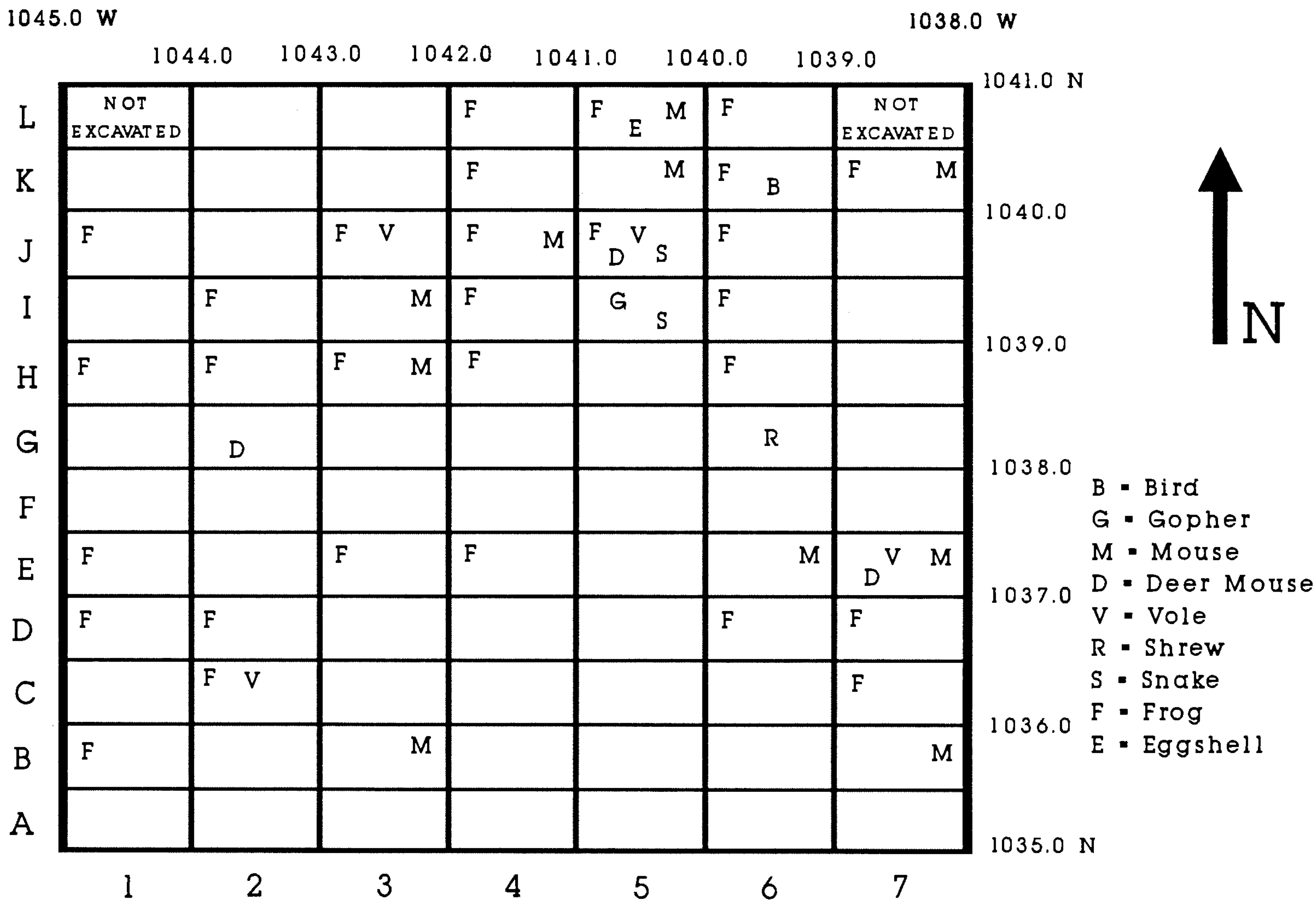


Figure 8-14: Distribution of Naturally Deposited Faunal Remains

The northern pocket gopher (*Thomomys talpoides*) is a rat-sized rodent with pronounced cheek pouches, whose excavations and mounds are similar to those produced by moles. These animals are described as mainly solitary, active all year in their burrows, and may at times be so densely populated that they appear to form an organized colony (Banfield 1974:147).

The other pocket gopher in Canada, the plains pocket gopher (*Geomys bursarius*), can be distinguished from *T. talpoides* because *G. bursarius* incisors have two longitudinal grooves which are absent in the other species (Banfield 1974:147,151). The single pocket gopher specimen (#897) is a skull less the braincase with teeth complete, so it could therefore be identified as *Thomomys talpoides*. Thomas (1971:369,371) indicated that this species often occurs in archaeological sites and is a good example of a species that may be natural or cultural bone.

The proper common name for these species is pocket gopher, as the general term 'gopher' is often applied to ground squirrels as well as a variety of burrowing animals including a tortoise, a snake, and several other burrowing rodents. The word gopher derives from the french word gaufre which means honeycomb (Banfield 1974:114).

8.4.1.2 Mouse (*Peromyscus maniculatus*)

According to Burt (1976:152,194), the family Cricetidae includes New World mice, rats, lemmings, voles and muskrat, while Old World rats and mice are included in the family Muridae. Four specimens identified as cricetid are likely deer mouse. These specimens (#1605 left, #3420 right, #3421 left, #5927 left) are all mandibles.

Deer mice are described by Banfield (1974:165) as easily tamed, sociable, sedentary, seed-eating herbivores that nest in burrows and are active year round. Banfield (1974:166) suggested that "few other mammals exhibit such a broad tolerance for different habitats as does the deer mouse...one factor alone seems to remain constant: the habitat must be dry. Deer mice seldom occur in low, wet habitats". The presence of deer mice indicates that this area likely had sufficient drainage, which is also a prerequisite for a suitable human campsite.

8.4.1.3 Vole (*Microtus/Clethrionomys*)

Banfield (1974:178) noted that cheek teeth are the feature which distinguishes voles from mice: in voles, "the cheek teeth are relatively long and are characterized by prismatic occlusal surfaces". Four mandibles (#273 left, #5778 left, #7075 left, #8923 right) were identified. *Microtus pennsylvanicus* or *Clethrionomys gapperi* (meadow and northern red-backed voles) are the likely species but could not be differentiated. Both species are active year round (Banfield 1974:181,210).

Northern red-backed voles prefer forest habitats and are active climbers. They are solitary in summer, but live in family groups in winter, are mostly omnivorous and smaller than meadow voles, and are far from docile when captured (Banfield 1974:180,181). According to Banfield (1974:180), "generally these voles construct no special runways of their own but often use those of other species such as the bog lemming and the meadow vole".

Meadow voles, in contrast, prefer grassland habitat and avoid forests. They feed mainly on grasses, live in large uncooperative colonies, and are "...known to swim across small lakes and dive when pursued" (Banfield 1974:209,210).

8.4.1.4 Shrew (*Sorex/Microsorex*)

Shrews belong to the order Insectivora, and Banfield (1974:8) declared that "it has been suggested that this order constitutes a wastebasket into which small primitive mammals of uncertain affinities have been dumped". Insectivores, which are the most primitive placental mammals, can be separated into two families in Canada: Talpidae (moles) and Soricidae (shrews) (Banfield 1974:8).

"The shrews are among the smallest living mammals...the tips of the teeth are red stained (in Canadian species)" (Banfield 1974:8). According to the Curator of Mammals at the Manitoba Museum of Man and Nature (Jack Dubois 1993:pers.comm.), the staining of these teeth has disappeared, probably due to weathering. Species whose range includes southern Manitoba at present include the masked shrew (*Sorex cinereus*), the American water shrew (*S. palustris*), the arctic shrew (*S. arcticus*), and the pygmy shrew (*Microsorex hoyi*), all of which are active year round (Banfield 1974:10,14,18,21).

The masked shrew is relatively small (approx. four inches long), mainly solitary, feeds mostly on insects, prefers humid environments, and "in order to maintain a high metabolic rate, it eats its own weight in food each day" (Banfield 1974:8,9).

The American water shrew is the largest of the four species at about six inches long. They are adapted to an aquatic environment and are seldom found far from water (Banfield 1974:13,14).

The arctic shrew is about four and one half inches long; "these shrews are rather docile and unafraid in captivity" (Banfield 1974:17). Also, they appear to prefer a drier habitat than other shrews (Banfield 1974:18).

"The pygmy shrew, which is only about 3 1/2 inches long, is the smallest mammal in the New World, and are one of the smallest in the whole world" (Banfield 1974:20). These shrews appear to be more tolerant of humidity than other shrews (Banfield 1974:21).

Banfield (1974:20) stated that the premolars are the feature that distinguishes *Sorex* and *Microsorex*, and since these are missing in this single specimen (#5310 maxillae with molars less premolars, canines, and incisors), the distinction could not be made.

8.4.2 Bird Remains

None of the skeletal bird remains recovered from Zone 3 were from large or medium sized bird. The single small bird specimen recovered is interpreted to have been naturally occurring. While this absence may suggest that bird was not an important food item at this particular site, it is possible that specimens may be found in other areas of the occupation horizon that have not been excavated to date.

The avian specimen was identified to the order Passeriformes (the perching birds). According to Olsen (1979:82), "this order constitute the largest group of birds and include forms that range in size from raven to the smaller creepers and warblers. There are more than 8000 species of birds of which over 5000 are passerines". The element (#2457) was identified as the right tarsometatarsus of a small bird. Based on the size and shape, the bone appears to match most closely the brown thrasher (*Taxostoma rufum*), as illustrated in Olsen (1979:143,145).

One specimen of eggshell (#1648) was recovered from Unit L5. The fragmentary nature of the specimen precluded identification as to species or size range.

8.4.3 Reptile Remains

All remains identified as reptile from Zone 3 are assumed to have been deposited naturally. There were 405 specimens identified as reptile, all of which are snake. Five species of snake are presently found in Manitoba, and these specimens are considered to have derived from garter snake (*Thamnophis*), either the western plains (*T. radix*) or the red-sided (*T. sirtalis*) species.

According to Preston (1982:83,87), the western plains garter snake prefers grasslands, while the red-sided garter snake prefers woodlands. Both species prefer to feed mainly on amphibians and hibernate for about six to seven months (Preston 1982: 85,87,89). Elements identified as snake from Zone 3 include vertebrae, ribs, and cranial bones.

8.4.4 Amphibian Remains

As was the case with reptiles, all amphibian remains from Zone 3 were classified as natural occurrences. There were 169 specimens of mainly complete elements identified as amphibian. Amphibian remains were identified to the order Salienta (frogs/toads), but no attempts were made to distinguish families.

Preston indicates that four families of frogs and toads are found in Manitoba, at present, including 11 species. One species, the plains spadefoot (Pelobatidae), prefers grasslands and feeds mainly on insects; two species, the eastern American and Canadian toad (Bufonidae), may prefer forest or prairie, and also eat mainly insects. Four specimens of treefrog (Hylidae) include two species (northern spring peeper and grey treefrog) that prefer moist wooded areas and eat only insects, while Cope's grey treefrog and the boreal chorus frog prefer grassy ponds and marshy meadows and eat mainly insects. Four species of 'typical' frogs (Ranidae) include two species (green frog and mink frog) that are primarily aquatic, and prefer beetles and insects, spiders and snails. The wood frog prefers wooded areas and mainly feed on insects, while the northern leopard frog prefers grassland and wet woods, and has a diet that depends more on availability than preference (Preston 1982:45-70).

Frogs and toads, like snakes, are inactive during the winter months and it may be that at least some of the amphibian remains were from animals that died in their winter burrows, as was possible with snake. The completeness of the snake and frog remains suggest that they had little post-depositional disturbance.

8.4.5 Minimum Number of Individuals

The minimum number of individuals (MNI) required to account for the natural vertebrate faunal remains recovered from Zone 3 are listed by taxon in Table 8-8. The frequency of individuals in each taxon is depicted in Figure 8-15.

While the MNI was one for both pocket gopher and shrew based on incomplete skull bone, MNI for deer mouse and vole was three for both due to the fact that three left mandibles were identified in both instances.

Eight of the eighteen cricetid specimens were mandibles, and it is likely that this element was recovered disproportionately. This may have been due, in part because it is usually the strongest bone in the body, and is therefore less susceptible to post-depositional decay. In addition, deposition through natural mechanisms such as owl pellets and carnivore scats, would result in fewer of the smaller, more gracile elements, due to passage through the digestive tract. Also, most other elements from this group are usually too small to be captured by the field screening process, and are usually recovered through the process of flotation instead.

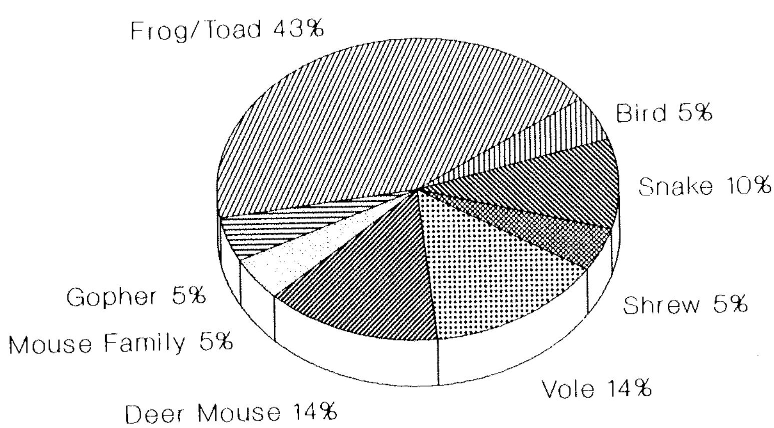


Figure 8-15: Frequency of MNI of Naturally Deposited Fauna

MNI for bird is obviously one, though calculating MNI for reptile and amphibian remains is more involved. Reptile remains were restricted to two units, I5 and J5. Though the number of specimens identified as snake seems high at 405 pieces, it should be noted that "in the suborder Serpentes the vertebral column is elongate having from 200-400 segments" (Olsen 1979:73). In Zone 3, 217 vertebrae and 172 ribs were identified as snake, while only 16 specimens were cranial. MNI was calculated using the dentary bone (part of the lower jaw), of which there were two pairs (#845 left and right dentary from Unit I5; #1611 left and right dentary from Unit J5), so we can assume that MNI is two.

For frog/toad, the number of identified specimens in Zone 3 is 169. These specimens included eighteen femurs, which are not readily sided. Therefore, the eighteen femurs should be considered to represent nine individuals. Thus, MNI for frog/toad would be nine.

TAXON	Minimum Number of Individuals	Relative Frequency
MAMMALIA		
Rodentia		
Geomyidae	-	-
Thomomys talpoides	1	0.048
Cricetidae	1	0.048
Peromyscus maniculatus	3	0.143
Microtus/Clethrionomys	3	0.143
INSECTIVORA		
Soricidae		
Sorex/Microsorex	1	0.048
AVES		
Passeriformes	1	0.048
REPTILIA		
Squamata		
Thamnophis sp.	2	0.095
AMPHIBIA		
Salienta	9	0.429
IDENTIFIED TAXA TOTALS	21	1.002

Table 8-8: MNI Per Taxon for Naturally Deposited Vertebrate Fauna

8.5 *Recoveries from Zone 3B*

The Zone 3B vertebrate fauna (other than fish) included 119 specimens. Twelve specimens from Zone 3B were charred (none were calcined), and six specimens were worked. Due to fragmentation, only one specimen could be identified beyond class and size. No specimens resulting from natural deposition were recovered.

8.5.1 Culturally Derived Mammal Remains

Nearly all the specimens from Zone 3B were identified as large or medium sized mammal remains (Table 8-9).

TAXON	Quantity	Weight (gm.)	Relative Frequency
MAMMALIA			
Large	115	113.3	0.966
Medium	2	0.6	0.017
Undifferentiated	1	< 0.1	0.008
Artiodactyla			
Bovidae			
Bison bison	1	7.6	0.008
TOTALS	119	121.5	0.999

Table 8-9: Number of Identified Specimens Per Taxon

The cultural deposits designated as Zone 3B were found only in units in the southwest quarter of the excavation area. Units containing faunal remains in Zone 3B included A1, A4, B1, B2, B3, C3, and D3. The Zone 3B occupation appears to be concentrated south and/or west of the excavation area. It may be that this horizon was an earlier occupation than Zone 3.

The single culturally derived mammal bone identified to species in Zone 3B was from bison (#5482 lumbar vertebra spinous process). Most (65%) of the faunal remains, other than fish, from Zone 3B were identified as large mammal, as opposed to only 40% in Zone 3. Zone 3B large and medium mammal remains were highly fragmented and butchering marks were common, as was the case with Zone 3 remains.

Zone 3 and 3B are similar if we compare the average weight per specimen from each zone. The remains from both zones have an average weight of about 1.02 grams per specimen, which may indicate similar processing procedures that would break up the bone.

8.5.2 Worked Bone

Worked specimens from Zone 3B (Table 8-10) were all made of bone and included specimens from two different categories: miscellaneous worked bone and scrap from boneworking. Comparing Zone 3 and 3B, it is interesting to note that Zone 3 contained 0.6 percent worked bone or tooth, while in Zone 3B, five percent of the specimens were worked bone.

CAT. NO.	UNIT	ARTIFACT NAME	LENGTH mm.	WIDTH mm.	THICK mm.	WEIGHT gm.
3050	D3	Patterned Tool	28.0	15.0	8.0	2.53
5715	B2	Patterned Tool	28.5	18.0	8.5	1.68
5515	B3	Expedient Tool	64.0	20.5	4.0	5.55
5458	A4	Expedient Tool	32.0	20.0	4.5	2.12
4334	C3	Scrap	63.0	19.0	3.0	2.12
3786	A1	Scrap	59.0	8.0	5.0	1.74

Table 8-10: Measurements of Worked Faunal Material

The miscellaneous worked bone specimens include two specimens that are assumed to have been patterned tools, while two specimens appear to have been expedient tools.

The patterned specimens include one specimen (#3050) that is highly polished on all four sides and one end (Plate 8-5?), while the distal end may have been broken and reworked (some polish). This specimen may have been a handle for an awl or knife, that was broken and reworked as a spatula or hide softener. The second patterned specimen (#5715) is a small piece of wedge-shaped bone that appears to have been cut and polished (Plate 8-5?). The cancellous bone seems to have been smoothed, and this may be a quill flattener as described by Caldwell (1966:70) and Lehmer *et al.* (1978:280).

The expedient specimens are both bone splinters that appear to have been modified for use as awls or drills. One specimen (#5515) is a bone fragment that resembles a projectile point (Plate 8-5?), though the wear polish evident suggests that it was likely held in the hand between the thumb and forefinger and used to drill or gouge. The second expedient specimen (#5458) is also a bone splinter that may have been fractured along one side, while the other side appears to have been cut (Plate 8-5?). The cut and fractured sides meet at a point that is spiral, and this specimen like the previous one, has the cancellous bone on the concave surface polished suggesting that this too was used as a gouge or drill. The cut side shows some wear that may indicate that this specimen was used as a scraper or marrow extractor as well.

One of the scrap specimens (#4334) is a split bone fragment with one long edge that appears to have been cut (Plate 8-5?), while the other (#3786) is a split bone fragment that has been cut along both long edges (Plate 8-5?). Neither specimen has been polished and are likely to be residue from implement manufacturing activities.

8.6 References

Balmer, Ann L.

1983 *Zooarchaeology in the South Central Canadian Shield: An Assessment of the Current Use and Potential with an Example from Lake of the Woods.* Masters Thesis, University of Manitoba, Winnipeg.

Banfield, A.W.F.

1974 *The Mammals of Canada.* University of Toronto Press, Toronto. [Reprinted - 1987]

Brose, David S.

1970 The Archaeology of Summer Island: Changing Settlement Systems in Northern Lake Michigan. University of Michigan, Museum of Anthropology, *Anthropology Papers No. 41.* Ann Arbor.

Burt, William H.

1976 *A Field Guide to the Mammals of America North of Mexico.* Third Edition, Houghton Mifflin Co., Boston.

Caldwell, Warren W.

1966 The Black Partizan Site. *Smithsonian Institution, River Basin Surveys, Publications in Salvage Archaeology*, No. 2. Lincoln, Nebraska.

Gibbon, Guy E.

1973 The Sheffield Site: Oneota Site on the St. Croix River. *Minnesota Historical Society, Series* No. 10. St. Paul.

Gilbert, B. Miles

1973 *Mammalian Osteo-Archaeology: North America.* University of Missouri, Columbia, Missouri.

Johnson, Elden

1969 *The Prehistoric Peoples of Minnesota.* Minnesota Historical Society, St. Paul, Minnesota.

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation, Winnipeg.

Kroker, Sid and Pamela Goundry

1990 *Archaeological Monitoring of the Stage I Construction Program.* The Forks Renewal Corporation, Winnipeg.

Lehmer, Donald J., W. Raymond Wood, and C.L. Dill

1978 *The Knife River Phase.* Department of Anthropology and Sociology, Dana College, Blair, Nebraska and American Archaeology Division, College of Arts and Sciences, University of Missouri-Columbia, Columbia, Missouri.

MacNeish, Richard S.

1958 An Introduction to the Archaeology of Southeastern Manitoba. National Museum of Canada, *Bulletin* No. 157, *Anthropology Series* No. 44. Ottawa.

McAndrews, John H.

1982 Holocene Environment of a Fossil Bison from Kenora, Ontario. *Ontario Archaeology,* 37:41-51.

Moore, Sarah M.

1985 Modified Bone and Antler from On-A-Slant Village (32M026). *Journal of North Dakota Archaeological Association*, Vol. 2:37-66.

Olsen, Stanley J.

1960 Post-Cranial Skeletal Characters of *Bos* and *Bison.* Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. XXXV, No. 4.

1964 Mammal Remains from Archaeological Sites: Part I - South-eastern and Southwestern United States. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 1.

1968 Fish, Amphibian and Reptile Remains from Archaeological Sites: Part I - Southeastern and Southwestern United States. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 2.

1972 North American Birds: Skulls and Mandibles. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 4.

1979 North American Birds: Postcranial Skeletons. In Osteology for the Archaeologist. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 5.

Orchard, W.J.

1946 *Kitchen Middens: Prehistoric Campsites*. School Aids and Text Book Publishing Co. Ltd., Regina.

Preston, William B.

1982 *The Amphibians and Reptiles of Manitoba*. Manitoba Museum of Man and Nature, Winnipeg.

Schmid, Elisabeth

1972 *Atlas of Animal Bones: For Prehistorians, Archaeologists, and Quaternary Geologists*. Elsevier Publishing Company, Amsterdam.

Smith, Pamela J.

1985 Faunal Analysis of the Forks (Winnipeg), (21K1 to 21K6). Environment Canada. Parks Canada, *Microfiche Report Series* 277.

Snortland-Coles, Signe J.

1979 The Duck River or Aschkibokahn Site of West-Central Manitoba: The Role of the Northern Marsh in the Subsistence of the Late Woodland Peoples. *Manitoba Department of Tourism and Cultural Affairs, Historic Resources Branch, Papers in Manitoba Archaeology, Final Report* No. 7. Winnipeg.

Speth, John D.

1983 *Bison Kills and Bone Counts: Decision Making by Ancient Hunters*. University of Chicago Press, Chicago.

Stoltman, James B., Paul W. Lukens, Jr. and David L. Webster

1973 The Laurel Culture in Minnesota. Minnesota Historical Society. *Minnesota Prehistoric Archaeology Series*, No. 8. St. Paul.

Theler, James L.

1989 The Pammel Creek Site Faunal Remains. *The Wisconsin Archaeologist*, Vol. 70, No. 1-2:157-241.

Thomas, David H.

1971 On Distinguishing Natural from Cultural Bone in Archaeological Sites. *American Antiquity*, Vol. 36, No. 3, 366-371.

Wood, W. Raymond

1971 Biesterfeldt: A Post-Contact Coalescent Site on the Northern Plains. *Smithsonian Contributions to Archaeology*, No. 15. Smithsonian Institution Press, City of Washington.

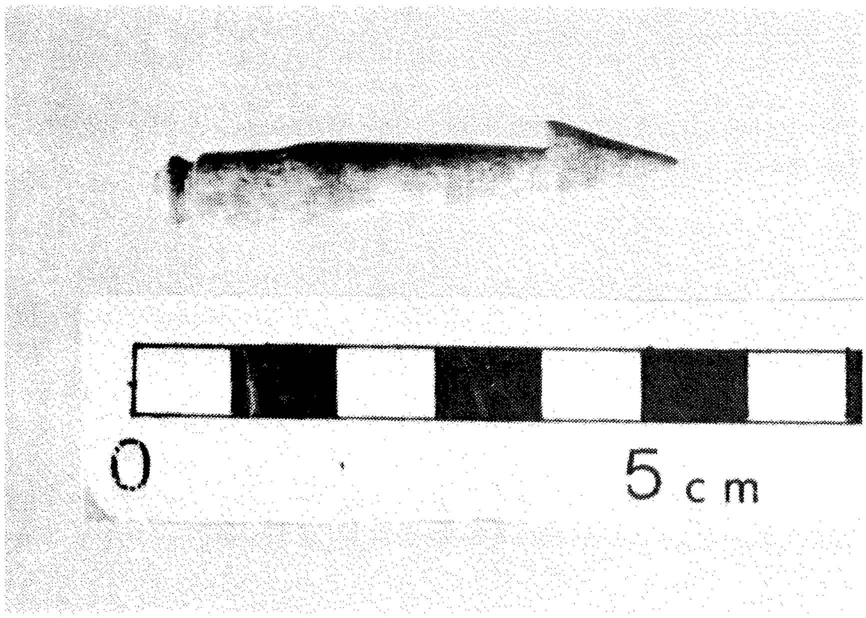


Plate 8-1: Harpoon

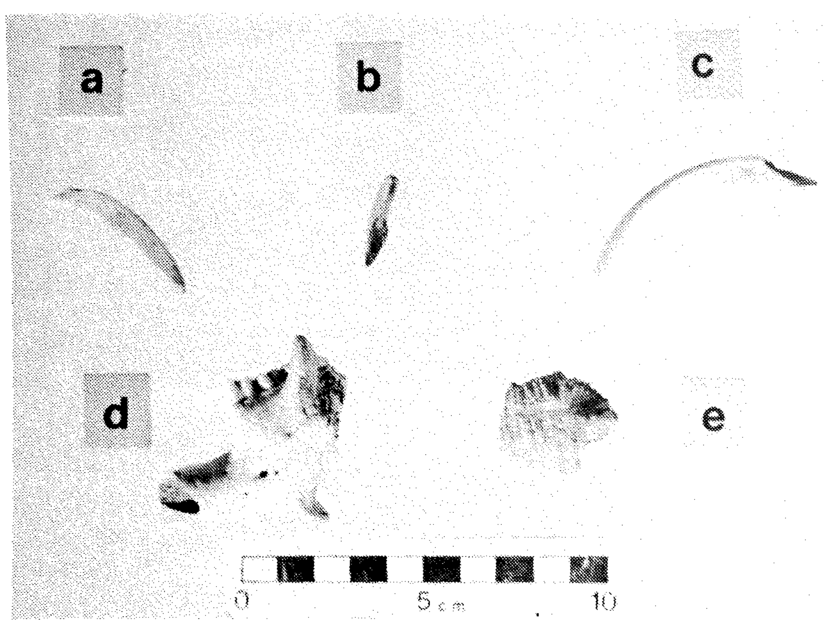


Plate 8-2: Beaver Incisor Gravers and Mandible Handles

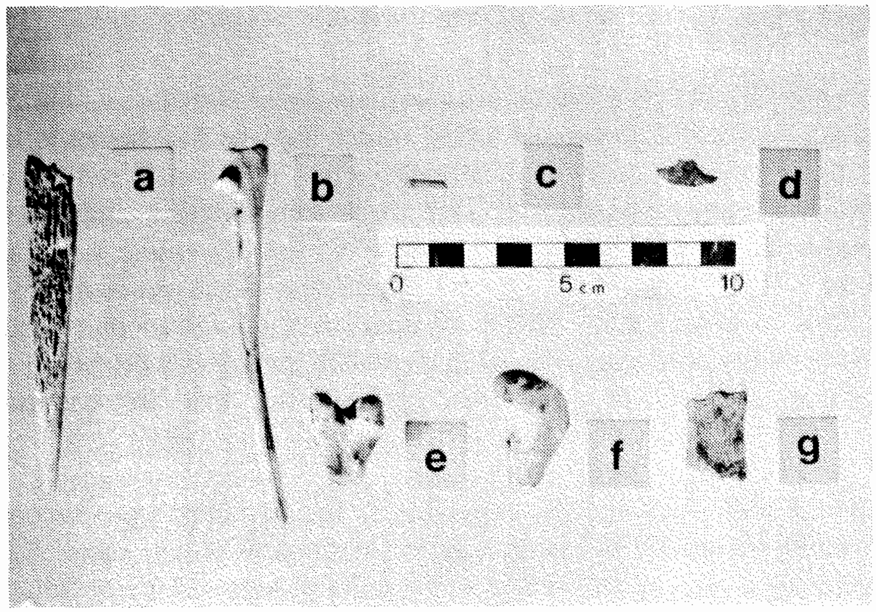


Plate 8-3: Bone Awls, Needle, and Manufacturing Scrap

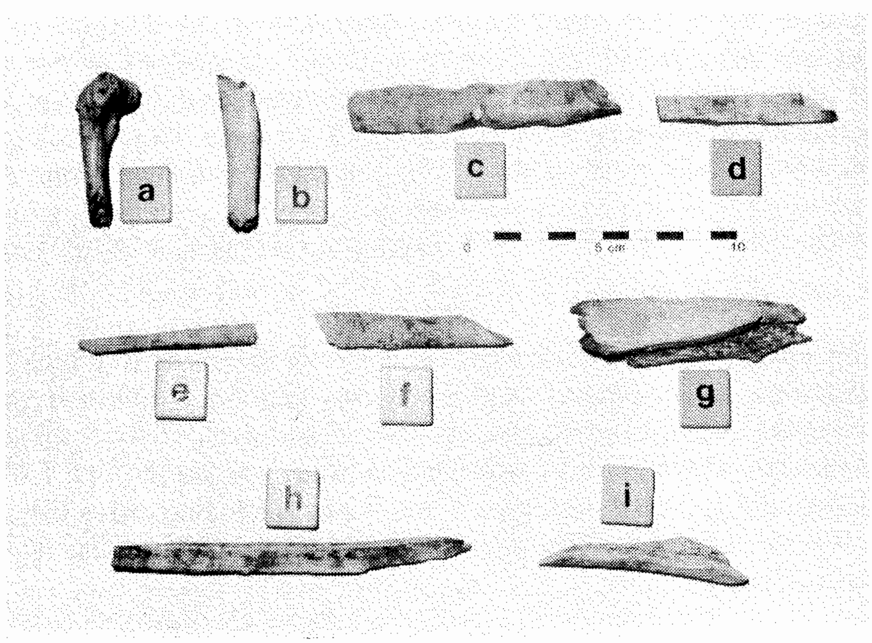


Plate 8-4: Patterned and Expedient Bone Tools

9.0 A STUDY OF THE FISH REMAINS

by *Eric Simonds*

9.1 Introduction

People have been eating fish as a source of food since the earliest known human occupation of the Earth. It has involved a great amount of activity since humans first began to harvest fish and, "as people began to specialize in different and distinctive economies and as their environmental adaptations became more sophisticated and their technological abilities improved" (Fagan 1981:347), so did the importance of fishing. Today, fish constitute a major dietary product - considered to be a high source of protein and therefore a recommended item in the weekly food consumption guide to good health. This long tradition has evolved into what it is still a highly important human activity consisting of large-scale fishing practices worldwide, not withstanding the associated commercial processing and retailing industries that are important to our modern economy.

During the 1992 Public Archaeology excavations, fish remains were recovered from the two separate, horizontally-stratified occupation zones, defined as Zone 3 and Zone 3B, which were collapsed together over most of the site. Another cultural layer (Zone 1), located stratigraphically above Zones 3 and 3B and tentatively dated to 2200 B.P., was also excavated and produced an abundance of fish remains. This material will be analyzed at a later date when further funding becomes available.

The faunal fish remains from Zones 3 and 3B were excavated *in situ* from Archaic cultural horizons tentatively dated to 3000 B.P. This material represents a sub-division of the entire artifact assemblage and was subsequently examined as a specialized analysis of that particular group. A total of 76,840 artifacts (9,205 catalogue numbers) were recovered from Zone 3 and 3,650 artifacts (440 catalogue numbers) were recovered from Zone 3B. Of these, 64,083 artifacts (6,659 catalogue numbers) from Zone 3 and 3,000 artifacts (350 catalogue numbers) from Zone 3B have been identified as fish remains. For the purpose of analysis, the fish assemblages from both Zone 3 and Zone 3B were combined. The stratigraphic relationship of the two Zones has been discussed in Section 4.

The fish remains analyzed from Zones 3 and 3B consisted primarily of cranial elements, jaws and maxillaries (dentaries, premaxillaries, and palatines), vertebrae, ribs and spines, otoliths, and scales. Field recovery methods throughout the project had exclusively employed waterscreening, whereby all of the dirt, which had been trowelled by hand, was put through 1/8" screen mesh. This resulted in a substantial recovery of minute-size artifacts, including many fish skeletal elements of extremely small-scale, with individual elements ranging in size from less than one millimeter to several hundred millimeters.

9.2 *The Identification Of The Fish Remains*

The specimens, prior to this study, had been washed, hand-sorted, tentatively identified, and catalogued under field laboratory conditions. Because this preliminary artifact processing had been carried out with varying degrees of expertise, a great part of the present analysis involved verifying and confirming previous identifications. In addition, time was spent identifying as much of the remaining unidentified material as possible in order to achieve accurate assessments of numbers and frequencies of the individual species and the elements represented in the archaeological sample.

For this in-depth analysis, existing reference collections of comparable specimens of the native species to the Province (available at the Manitoba Museum of Man and Nature [MMMN] and the Universities of Winnipeg and Manitoba), as well as relevant literature describing the anatomy and osteology of the fish (Casteel 1976a; Moyle and Cech 1988; Mundell 1975; Olsen 1968; Villee *et al.* 1989) were used to make positive verification of the artifacts. The current distribution and life histories of these fishes, as well as the sources of the species recently known to be introduced to the area, are well documented (Carpenter 1984; Filisky 1989; Manitoba Department of Natural Resources 1992, n.d.a, n.d.b; McPhail and Lindsey 1970; Robison 1992; Scott and Crossman 1973). This is not the case for the Precontact period. Little is known about the nature and the distribution of fish species and their ecological relationships. We must rely on previous archaeological data to interpret the nature of the 1992 fish assemblage. In general, the composition of the Precontact fauna as well as the relative frequencies of the fishes would have been similar to that which one might find in the study area today.

9.3 *Method and Theory*

Systematic studies of Precontact fish remains and fishing practices have recently been attempted at many archaeological sites. Problems inherent to each, and to analyses involving fish as a whole, have been discussed by many authors. Richard W. Casteel (1972, 1976a) has probably best outlined the wide variety of uses of fish remains when analyzing the archaeological assemblage of a site, including seasonal dating, absolute dating, estimating the live-weight of the specimens, estimating Precontact food resource locations, and environmental change. His research is perhaps best known by archaeologists, and it is important because it deals with a new area in *zooarchaeology* (or faunal analysis studies) which had previously been given little attention when it came to studying a collection of artifacts excavated from a site. Most archaeological research is generally given to the identification and interpretation of the tool (lithic and bone) assemblage, pottery (if present), and finally faunal remains, which itself is all too often biased towards mammal and, to a lesser extent, bird. This is largely because there are abundant reference materials on these artifactual remains, by way of both comparative specimens and examples in the literature, available to the researcher.

Special attention has since been given by some researchers to the technical analysis of specific skeletal elements of the fish, in particular scales, vertebrae, and otoliths. These elements can provide certain details with respect to seasonality indications, live weight estimations, age determinations, and the calculation of the minimum number of individuals. Using fish scales for seasonal dating is perhaps the most popularly employed study when analyzing and interpreting fish faunal remains to answer archaeological problems associated with a site. Casteel (1974b, 1976a:65-68) describes this application in great detail, and similar methods have been employed in the majority of research on fish remains, including Hanna (1981), Martin (1981), and Yerkes (1980, 1981).

Vertebrae have been used as a method to determine live weight estimations (Casteel 1974a, 1976a, 1976b) and seasonal dating (Casteel 1972), as have *otoliths* (Casteel 1974a). Otoliths, or ear-stones, located in the inner ear, are part of the system to control equilibrium and hearing. They grow in size as long as the fish lives and the annual increments reflect the food and surrounding environmental conditions, such as the water temperature (Pannella 1971). Huddleston and Barker (1978) noted the value of recovering and identifying otoliths when present at an archaeological site. In particular, they may demonstrate the presence of certain species that would not otherwise have been identified in the archaeological sample.

The value of research into fish remains, then, is regarded as important when analyzing and interpreting an archaeological site. It becomes *extremely* important at a site such as The Forks, where the fish remains excavated in 1992 constitute over eighty percent (80%) of the total number of artifacts recovered.

9.4 The Nature of Archaeological Fish Remains

Disregarding the difficulties that are encountered by a current lack of knowledge of local Precontact fish populations and the previous unintentional disregard for detailed analyses of fish remains from archaeological site in general, there are problems inherent to any faunal study which must be recognized. It is understood by archaeologists, for example, that the rate of recovery of artifacts during excavation depends on the field methods used. In recent years, the increased use of specific techniques such as flotation, column sampling, and fine mesh or cottoncloth screening, employed specifically to recover smaller material including the remains of small animals, has dramatically improved the quality of faunal samples.

The differential rate of preservation of the various types of bone material (a result of the resorption of bone in the soil matrix) is another factor affecting the nature of an archaeological sample (and the eventual outcome of research on it).

The human behaviour responsible for the deposition of the cultural material plays a role in the nature of the archaeological remains. From ethnohistorical descriptions of fishing in the Northern Isles, Scotland, it was revealed that, after being taken from the sea, the fish remains were deposited in a number of different locations and that some fish were lost from the archaeological record altogether as a result of the way fishing was organized and the different types of processing and butchery methods employed (Brinkhuizen and Clason 1986). Consideration needs to be given also to post-depositional factors such as the affects of flooding or carnivore chewing. These two conditions are referred to by archaeologists as *taphonomy*, or a study of the factors (the cause and effect relationship) affecting the archaeological sample after it has been deposited by the cultural group responsible for leaving the material behind.

The method of analysis can affect the outcome of faunal studies as much as the "biases" resulting from the field recovery methods used, the differential preservation of faunal remains, or the depositional characteristics of the assemblage. For example, Casteel (1976a:47) noted, when identifying fish species, that "the presence of a number of species was indicated *only* by the presence of their scales in the faunal assemblage" (emphasis his). In addition, problems relating to the type of sampling bias that occurs when only fish bones, as opposed to scales, are used in archaeological faunal analysis, resulting in an oversight of fish species of small size, have been discussed by Yerkes (1980). This failure to record fish species on the basis of identifying scales is not entirely an accurate assumption, however, as Terrance Martin (1981) disclosed. Based upon the findings for his study area, any exhaustive attempt to identify an entire assemblage of fish scales would probably not reveal any new species that were not already identified from the well-preserved collection of bones.

9.5 Fish Populations And The Palaeoenvironment

The range in the types of fish that one would expect to find is largely dependent upon which species inhabit the region. Out of a total of 181 species of fish currently known to inhabit Canada's freshwaters, Scott and Crossman (1973:4) identified 79 species in Manitoba, including species recently introduced to the province. In fact, the Red and Assiniboine Rivers, along with their many tributaries, in Manitoba, contain the third most diverse fish fauna in Canada.

In general, the composition of the fauna as well as the relative frequencies of the fishes at the time when the site was occupied would be similar to that which one might find in the area today. The distribution and life histories of the fishes, as well as the sources of the species recently introduced are known from studies of these natural resources. Table 9-1 lists selected species of fish that are currently native to Manitoba waters. These are considered to be sport or angling fish of the type commonly sought after by either the Precontact or Postcontact fisherman, be it for food or for trophy. Appendix 9-I provides further documentation on the fishes of Manitoba, including some background information about the more important species found at The Forks.

The fish that inhabit the waters in the Province of Manitoba today have not always been here. Some species have been introduced as recently as only one hundred years ago (for instance, *Cyprinus carpio*, commonly known as carp). Others have existed for millions of years and are thought to be closely related to the evolutionary ancestors of modern forms of fish (*Acipenser fulvescens*, for example, commonly known as lake sturgeon), and for this reason they are referred to as *primitive* fishes. The present fish population in Manitoba is obviously very diverse, since the provincial river systems, through a vast network of lakes and rivers that criss-cross this continent, are connected to major bodies of water: the Arctic Ocean (to the north by way of Hudson's Bay), the Gulf of Mexico (south by way of the Red and Mississippi Rivers), the Great Lakes region (and further east to the Atlantic Ocean), and the Pacific Ocean (to the west). Each of these waterways is divided into many geographical zones with environments and related floral and faunal ecologies that are very distinct from one another.

SCIENTIFIC NAME	COMMON NAME(S)
Acipenser fulvescens	Lake Sturgeon
Aplodinotus grunniens	Freshwater Drum, Silver Bass
Catostomus catostomus	Longnose Sucker
Catostomus commersoni	White Sucker
Coregonus artedii	Lake Herring, Tullibee
Coregonus clupeaformis	Lake Whitefish
Cyprinus carpio	Carp
Esox lucius	Northern Pike, Jackfish
Hiodon alosoides	Goldeye
Hiodon tergisus	Mooneye
Ictalurus melas	Black Bullhead, Catfish
Ictalurus nebulosus	Brown Catfish
Ictalurus punctatus	Channel Catfish
Lota lota	Burbot, Maria, Ling Cod
Micropterus dolomieui	Smallmouth Bass
Perca flavescens	Yellow Perch
Salvelinus namaycush	Lake Trout
Stizostedion canadese	Sauger
Stizostedion vitreum	Walleye, Pickerel

Table 9-1: List of Selected Freshwater Fishes of Manitoba

Throughout the past one million years or so (an era known as the Pleistocene), Manitoba was covered by a gigantic sheet of ice for lengthy durations, on several occasions. The most recent, or last time, was about 50,000 years ago; ending about 10,000 years ago (a period known as the Wisconsin Ice Age). Glaciation in the province, lasting up to about 8,000 years B.P., however, prevented not only people from inhabiting here, but also faunal populations such as fish. Glacial episodes occurred many times, resulting in a process whereby fish populations, or more specifically fish communities, would be forced southward and thereby either re-populating or being introduced to new regions. Similarly, with the retreating ice sheet, many fish populations would move northwards into the newly-created habitats, but also leaving a distinctive fish community behind. From the geological evidence, we are able to find some correlation to the *present zoogeography*, or distribution of fish fauna.

McPhail and Lindsey (1970) identified three locations which were the main refuges for the fish that were to enter during the different glacial periods: the Bering Strait area, the Pacific area, and the Mississippi area (Figure 9-1). At the maximum extent of the Wisconsin glaciation, "freshwater fishes must have persisted in a number of refuges around the ice margin" (McPhail and Lindsey 1970:10). The ice sheet began to melt and recede northwards, creating an enormous volume of meltwater which formed rivers and lakes that have shaped the landscape considerably. These new aquatic environments would be soon populated by the migrating fish populations as they followed the drainage of the main river systems and their tributaries.

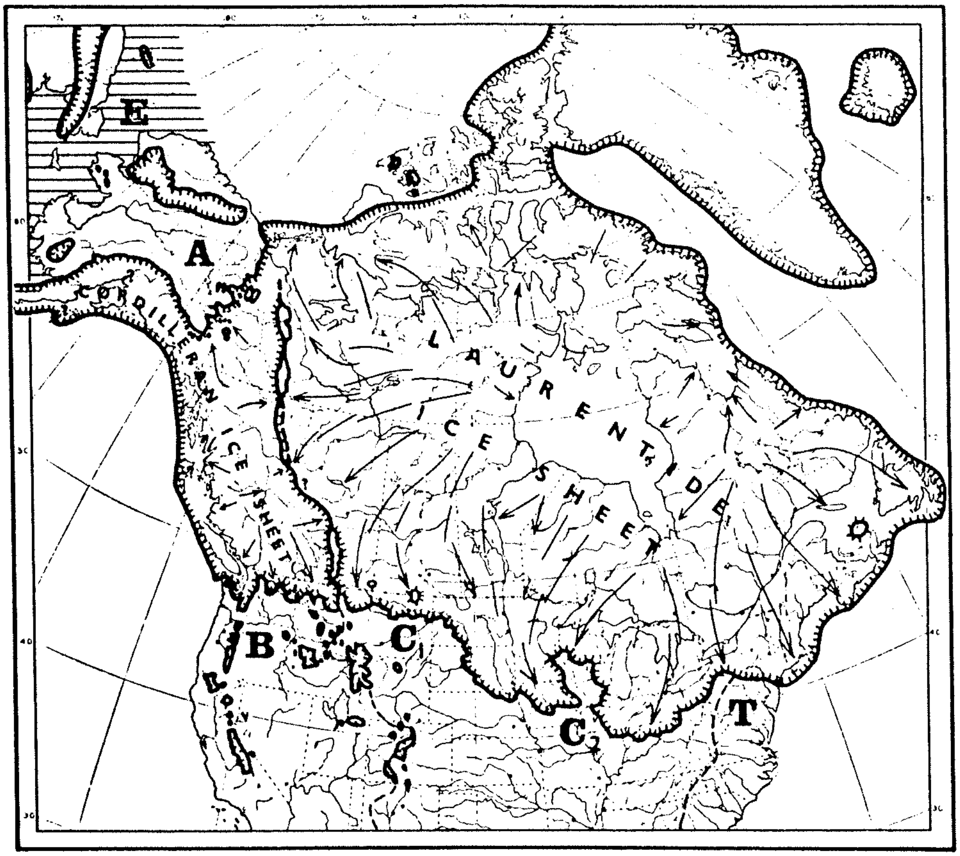


Figure 9-1: Location of refuges for freshwater fish which were to later populate Manitoba. The maximum extent of glaciation during the Wisconsin Period is indicated by hachures, while the arrows suggest directions of ice advance. The refuges for freshwater fish are indicated by letters: The Bering refuge, which includes Alaska (A) and the exposed Bering land bridge (E); the Pacific (B); and the Missouri (C_1) and Upper Missouri (C_2) Rivers. The Atlantic region (T) did not contribute any species into Manitoba (from McPhail and Lindsey 1970:9).

The International Garrison Diversion Study Board (1976) listed 76 species for the Red River in Manitoba and Clarke *et al.* (n.d.) reported 35 fish and lamprey species from a survey of the Red River in Winnipeg during the early 1970s. From tagging studies in the Red River (Clarke *et al.* n.d.) there is an obvious indication of extensive fish movement in the river, with fish tagged at Winnipeg being recovered in all the connecting watersheds, including the Red River in Minnesota, Lake Winnipeg, and the Assiniboine River. White sucker, black bullhead, channel catfish, and freshwater drum were the most abundant large fish species, and emerald shiner was the most abundant small species. The species composition downstream of St. Andrew's Lock and Dam (Lockport) is slightly different than that of upstream, since lake whitefish, tullibee, and sturgeon were not found above Lockport. However, prior to the construction of the Lock and Dam some fish species were available at The Forks. Lake sturgeon, for instance, were once plentiful in the Red and Assiniboine Rivers, and Sturgeon Creek in the west end of Winnipeg was once a sturgeon spawning ground. Only northern rivers such as the Nelson and Saskatchewan, and the Winnipeg River in the south now harbour sturgeon as a result of dam constructions which are a barrier to their migration. As noted earlier, the distribution and life histories of the fishes of Manitoba are well documented (Appendix 9-I), and we may therefore eliminate those species recently introduced into the study area from consideration in any further discussion. Species recently introduced into southern Manitoba waters include carp, black crappie, rainbow trout, smallmouth bass, white bass, and splake. The species listed in Table 9-1 are the most abundant, and the more important fish in the province, for both the Precontact as well as the Postcontact fisherman.

Understanding the origins of the present fish population is important to our study. It is of benefit to know the evolution and community patterns that have developed throughout the natural history of the province. In order to examine any changes throughout time in the fish species of Manitoba, we compare the anatomy of fish species from 3000 years ago (using our archaeological remains) to the present type found in modern reference collections. Research such as this is important not only for archaeologists, but also for *ichthyologists*, who are interested in studies of changes in North American fish fauna, the distributional ecology of fishes as related to environmental correlates, diverse species associations and distributional patterns within drainages, or the evolutionary ecology of North American stream fishes as related to life-history, mating systems, and population genetics (Matthews and Heins 1987).

9.6 The Anatomy Of Fish

There are more than 20,000 species of fish worldwide - the largest group of *vertebrates* that are known to exist. This is not surprising considering that about 80% of the Earth's surface is covered by either fresh or salt water.

Biologists usually group fish into three major divisions: the jawless fishes (including the hagfishes and the lampreys), the cartilaginous fishes (including the sharks and the rays), and, by far the largest group, the bony fishes (including over 97 percent of all known living fish species). Since only the last group are of concern to us here, only they are discussed further.

The bony fish are classified as Phylum Chordata, Subphylum Vertebrata, Superclass Pisces, Class Osteichthyes. Members of the Phylum Chordata are animals with backbones, and the Subphylum Vertebrata are distinguished from other chordates by having a backbone, or vertebral column, that forms the skeletal axis of the body. All Pisces have highly vascular gills with a large surface for the transfer of oxygen and carbon dioxide (i.e., respiration) which enables them to live in water. A unique feature of fish is the presence of a swim bladder, "a hydrostatic organ that enables the fish to change the density of its body and so to remain stationary at a given depth" (Villee *et al.* 1989:730). Class Osteichthyes, the bony fish, are often referred to as *teleost,* that is, having a skeletal structure made of solid bone as opposed to the cartilaginous material found in other Pisces such as sharks and rays. Figure 9-2 illustrates the general internal and external anatomical features of a teleost fish, and Figure 9-3 provides a generalized outline of the skeletal elements of most common fishes.

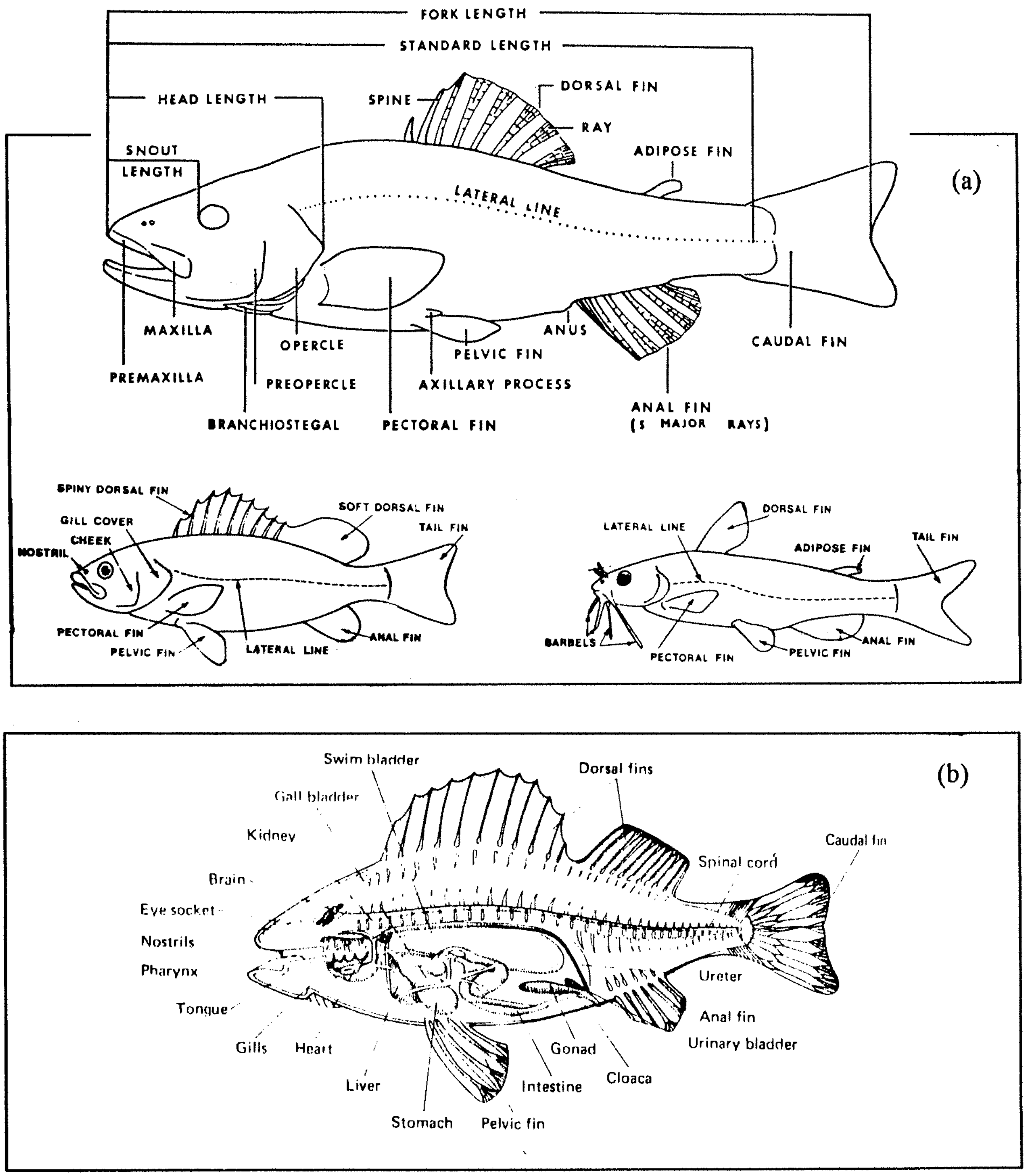


Figure 9-2: Identification of (a) some external features of an imaginary fish, illustrating various body parts and measurements of the different types of fish (from McPhail and Lindsey 1970:31, and Manitoba Department of Natural Resources n.d.a); and (b) the internal anatomy of a bony fish (from Villee *et al.* 1989:730).

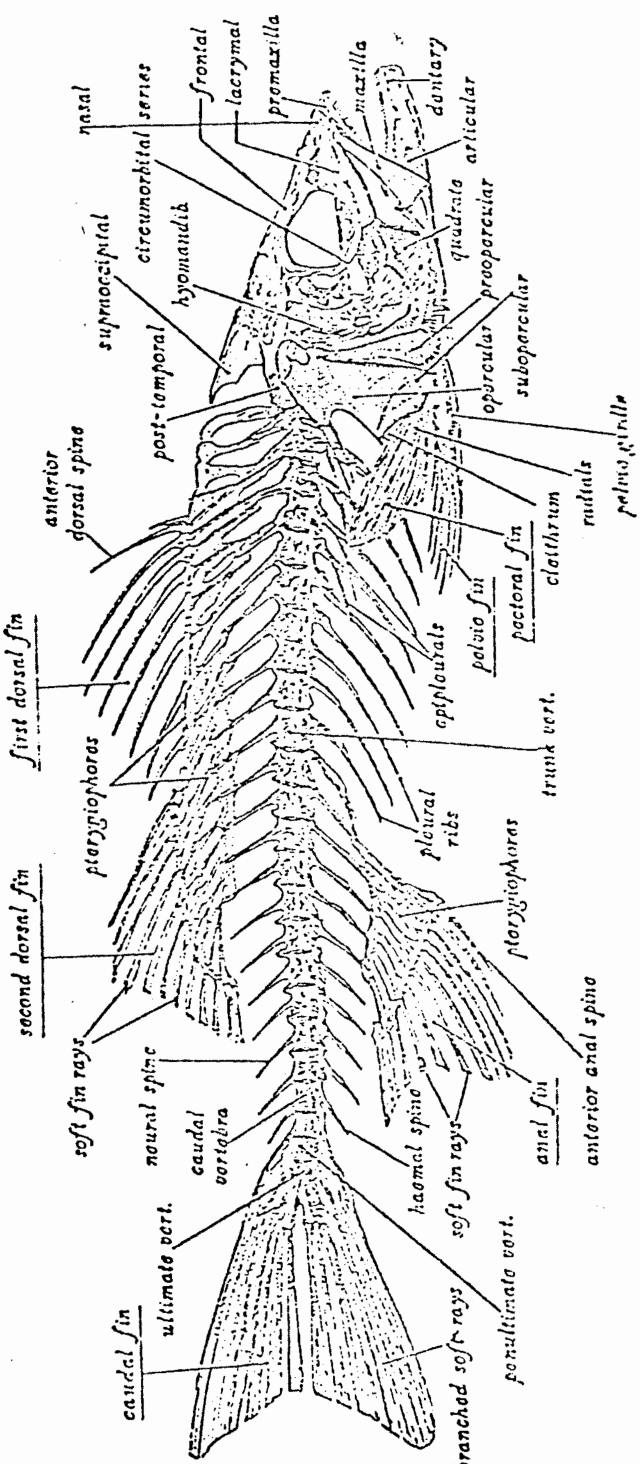


Figure 9-3: Nomenclature of generalized articulated teleost fish skeleton (from Olsen 1968:2).

Knowledge and familiarization of the internal generalized skeleton of a fish is necessary not only to identify certain faunal elements and their location on the body, but also for understanding the nature of the archaeological sample. Fish remains can provide a great deal of information about the site that other artifacts cannot. A unique characteristic of fish is that they do not control their own body temperature but rather, within certain limits, the temperature of their bodies varies in direct proportion to the external environment, or water temperature. This condition is known as *poikilothermic*. Since the water temperature varies with seasonal regularity, so does that of the fish. "The effect of this variation upon the fish is reflected in his rate of growth which varies positively with the external temperature. Thus, in warmer months the fish and his prey organisms grow rapidly, while in months of colder temperatures the fish grows less rapidly and certain food items may be unavailable" (Casteel 1972:404). The result is that fish scales and some bones record these periodicities of growth within their own structures by means of alternating zones of wide, opaque bands and narrow, translucent bands representing rapid, warm weather growth and slow, cold weather growth respectively (Casteel 1972:405). These, and other features of archaeological fish remains make them worthwhile to analyze, as they provide environmental as well as cultural data.

9.7 The Analysis Of The Fish Remains

The fish remains from the 3000 year old Archaic occupation at The Forks were remarkably well preserved and many were complete enough to allow for positive identification. The entire sample of 67,083 specimens (7,009 catalogued artifact records) was examined and the object identified to the skeletal element and the genus and species of fish, if possible. Nearly one-quarter (22.3%) of the sample was identified to genus/species and 46.8% of the sample was identified to the skeletal element. Figure 9-4 lists the frequency, by species, of fish identified in The Forks sample. Seven taxa were present, all of which are found in the Red River watershed system. All of The Forks specimens, therefore, are native to Manitoba, and within the range in species of fish available to Precontact populations.

The most significant species in terms of numbers are species of Catostomidae, followed by species of Ictaluridae, and then in fewer numbers by *Stizostedion* spp., and *Esox lucius*, and lastly by *Aplodinotus grunniens*, *Hiodon* spp., *Lota lota*. Most (77.7%) of the sample was unable to be properly identified as to species. Some of this material may still be identifiable given more intensive study. The 38.1% of Undetermined fish material can not be identified at all as a result of the condition of the recovered specimens.

The frequency of skeletal elements by species is illustrated in Table 9-2. From the graph it is evident that the greatest number of skeletal elements represented in the archaeological sample are from the head region, in addition to a large proportion of spines and rays. This obviously suggests that the heads and fins were being disarticulated at the processing stage, prior to the remainder of the fish being smoked in preparation for food.

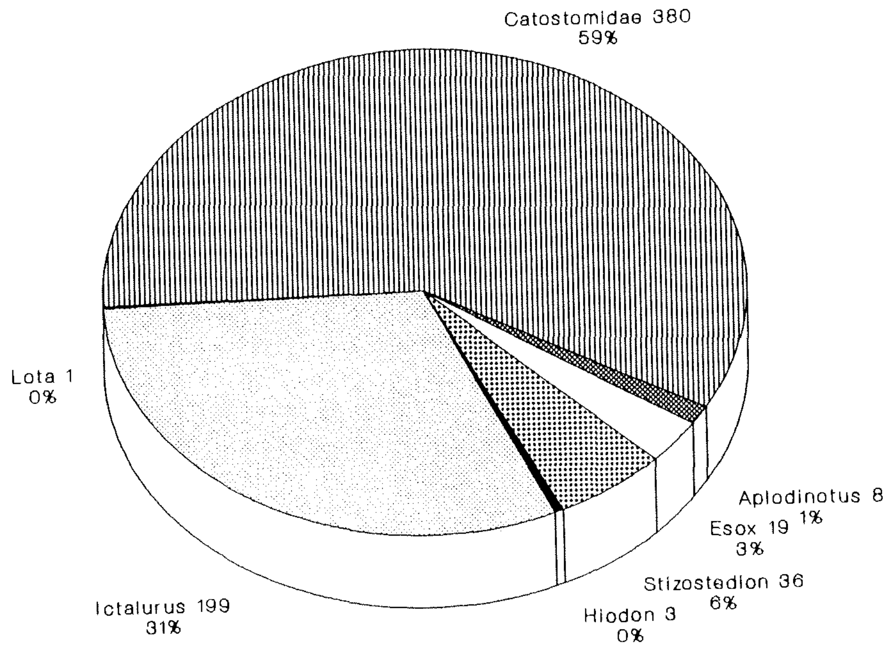


Figure 9-4: Frequency of Minimum Numbers of Fish Identified

9.7.1 Distribution

Fish remains were recovered in all units of the excavation, but were more concentrated in certain areas than in others (Figure 9-5). The distribution illustrates the density per unit by weight, of the total amount of fish remains from both Zones 3 and 3B. A similar distribution chart was generated based on the frequency of specimens per unit, by quantity. This pattern was nearly identical to Figure 9-6 and was not replicated here since weight, in this case, is a more accurate assessment of the distribution of the recoveries.

The distribution pattern of fish remains shows a heavy cluster in Unit A2. Another dense cluster is centred around Unit G4, the location of the circular hearth (Section 4.2.2). A concentration was present in Units J5 and K5, adjacent to the linear hearth (Section 4.2.2). The last concentration was observed in Unit E7 on the eastern edge of the excavation area, suggesting that further evidence of fish processing lies to the east.

While the analysis of fish remains did not separate the artifacts from Zone 3 and Zone 3B, the recoveries were mapped to determine if there was a distinct deposition pattern. The map showed only that fish remains were present in the horizon designated as Zone 3B and did not provide any data for interpretation of the faunal remains.

DIAGNOSTIC ELEMENT	Ictalur-idae	Catostom-idae	*Stizo-stedion*	*Hiodon*	*Lota*	*Aplod-inotus*	*Esox*	Unassigned to Species
Angular	78	313	-	-	-	-	-	7
Ceratohyal	101	376	-	-	-	2	-	15
Cleithrum	244	-	-	-	-	-	-	1
Dentary	156	418	44	-	2	-	42	64
Dentary/Angular	82	-	-	-	-	-	-	5
Dorsal Spine	59	-	-	-	-	-	-	50
Ethmoid Cornu	1064	-	-	-	-	-	-	-
Hyomandibular	170	597	-	-	-	-	-	34
Interoperculum	67	-	-	-	-	-	-	-
Lateral Ethmoid	62	-	-	-	-	-	-	-
Maxilla	49	376	33	-	-	-	-	55
Operculum	120	253	-	3	-	-	5	15
Otolith	-	-	-	-	-	8	-	1
Palatine	95	-	-	-	-	-	-	1
Parasphenoid	27	-	-	-	-	-	-	6
Pectoral Spine	185	16	-	-	-	-	-	15
Pharyngeal Arch	1	967	-	-	-	-	-	12
Premaxilla	176	1	16	-	3	-	-	19
Preoperculum	62	32	-	-	-	-	-	2
Pterotic	3	-	-	-	-	-	-	-
Pterygiophore	16	-	-	-	-	-	-	126
Quadrate	1061	180	-	-	-	-	-	16
Suboperculum	-	2	-	-	-	-	-	-
Supracleithrum	55	38	-	-	-	-	-	-
Supraethmoid	37	-	-	-	-	-	-	-
Urohyal	47	8	-	-	-	-	-	2
NON-DIAGNOSTIC ELEMENTS								
Ray	-	-	-	-	-	-	-	1052
Rib	-	-	-	-	-	-	-	3937
Scale	-	-	-	-	-	-	-	2819
Vertebrae	-	-	-	-	-	-	-	12202
Undetermined	-	-	-	-	-	-	-	9995
Unidentifiable	-	-	-	-	-	-	-	25419

Table 9-2: Frequency of Skeletal Elements by Species

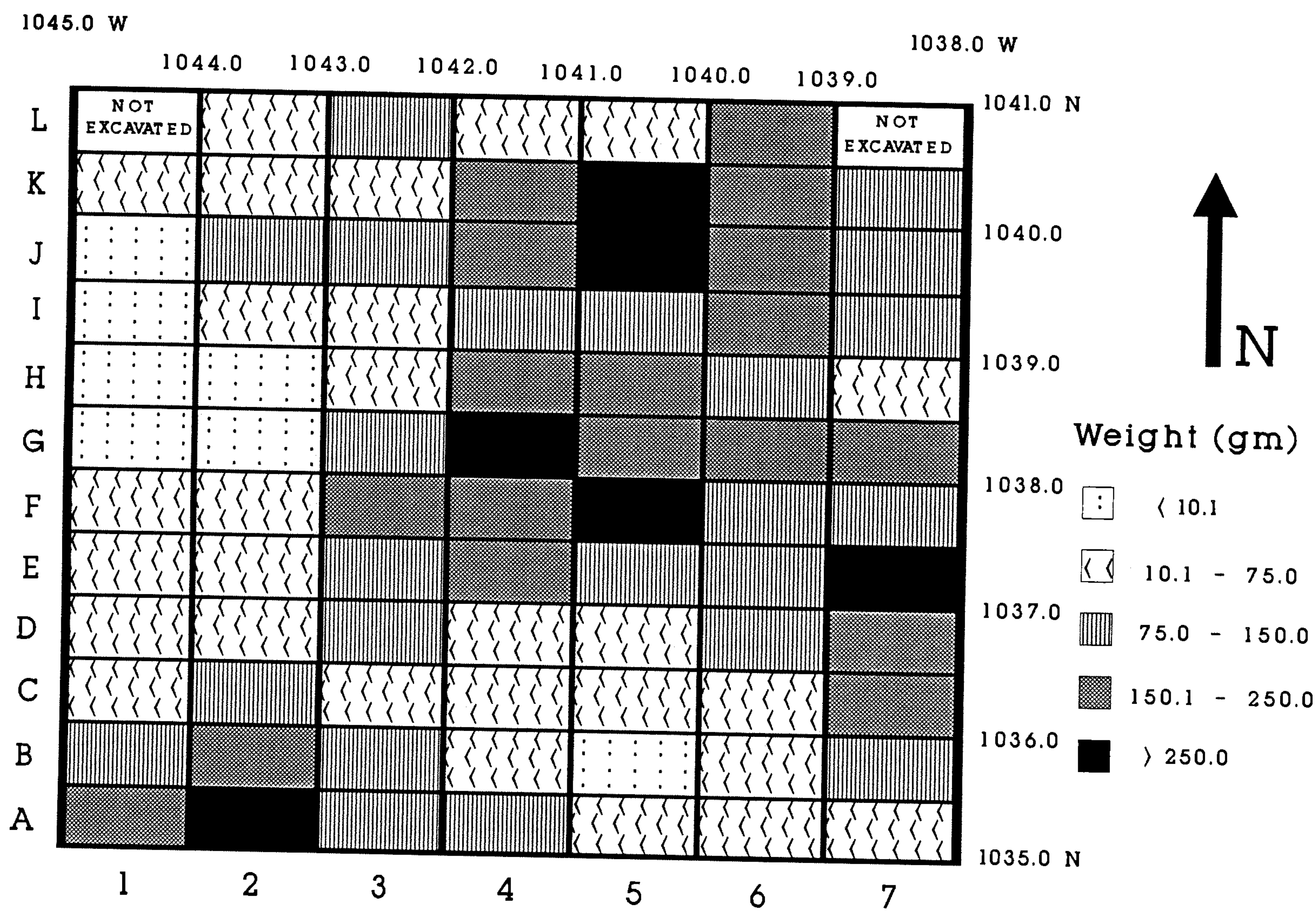


Figure 9-5: Distribution of Fish Remains (by weight)

9.7.2 Scales, Otoliths, and Vertebrae

The presence of a large number of scales in the archaeological sample could mean that they were being removed from the entire body at an early stage in the processing, or they could have accumulated from the disarticulated heads of the individuals present in the entire assemblage. The scale types included both ctenoid and cycloid scales, but the majority of the scales were in too poor condition to warrant exhaustive study. Ctenoid scales are thin scales that bear a patch of tiny spine-like prickles (ctenii) on the exposed (posterior) surface. Cycloid scales are more or less rounded scales that are flat and bear no ctenii.

An arbitrary sample was examined and the identified species included *Esox lucius*, *Stizostedion*, and *Hiodon* (E. Moody 1993:pers.comm.). It should be noted that both the Ictaluridae family (catfish) and *Acipenser fulvescens* (lake sturgeon) do not appear on this list because the former do not have scales and the latter has bony scutes that are very distinctive. Even members of the Catostomidae family, as well as *Aplodinotus grunniens*, do not have scales on their head region.

Nine specimens of otoliths were identified. Eight of these were from *Aplodinotus grunniens* and one was from *Esox lucius*. Detailed analysis of the vertebrae has not been undertaken.

9.7.3 Marks and Processing

Very few fish remains were charred or calcined, suggesting that they were not being cooked or receiving any other primary firing. Those bones that were burned were probably the result of accidental or unintentional firing.

Cut-marks appeared on several specimens, most commonly on the pectoral spines, cleithrums, and coracoids, as well as some dentaries, which are all located along both sides of the fish and which would require some cutting in order to dismember them from the body. The heads were decapitated at the first and second pterygiophores to remove the spinal rays, and then severing the underlying spinal column at the point of the complex vertebra, or posterior skull. The tail fins were likely removed as well, but the enormous numbers of ribs, rays, and spines recovered made it difficult to identify the majority of them since they are difficult to distinguish.

The high number of articulated specimens of skeletal elements recovered suggest that, specifically, the heads were left intact during the filleting and processing stage. There appears to be little or no breakage of the skulls in order to retrieve the parts inside, i.e., the brain. This highlights the degree, or extent of the fish processing. Also from the articulated specimens, and from the size range of the skeletal elements, which tended towards the medium- and large-scale, it appears that adults were primarily being selected, and therefore there exists a size selection within species, by the people harvesting this particular catch.

From the data presented in Appendix 9-II and from Table 9-2, we note the frequency of different elements according to the separate body regions - skull, appendages, and tail. The degree to which the fish were being cleaned and processed may be considered by examining the skull region of the

Ictalurus punctatus (Figure 9-6) and compare that to the frequency of elements recorded in Appendix 9-II. In the 1992 archaeological sample, it appears that the heads were cut off at the first or second pterygiophore and the immediate underlying complex vertebra which is located at the beginning of the spinal column. As the liver is located high up in this region, directly behind the pectoral fin and cleithrum (Figure 9-2b), and easily accessible when cleaning the fish, thus, retrieving the liver would require no additional butchering. The 1992 archaeological sample had a relatively high proportion of pectoral spines and cleithrums, as well, and so the fishermen might be removing the catfish liver for consumption or for some other use.

The major aspect to fish processing, therefore, and perhaps the most pertinent question to the archaeologist is what skeletal elements would be left according to the method of fish processing. Among the specimens of the 1992 archaeological sample, bones of the gill cover, jaws and mouth cavity; fused cranial complex and other miscellaneous bones of the neurocranium; hyomandibular, ceratohyal and branchial arches; pectoral spines and shoulder girdle are all present, suggesting that these parts were severed from the body, and the remainder of the fish kept for some other purpose. No real distinction between the use of different filleting techniques for the various fish species found at The Forks can be determined at this time.

9.7.4 Seasonality

All seven species found in the sample are available year round. However, their availability throughout the year is somewhat dependent upon their spawning season. Spawning seasons for the fish found at The Forks vary throughout the year (Appendix 9-I). Also, particularly with fish, the season when food was sometimes eaten is not always the same time as when it was caught. Fish caught in the fall would be prepared and smoked for consumption throughout the winter, when it could also be kept frozen in the snow. In general, dried fish made up the diet for groups living in this region for the first two months of winter (Jenness 1977:61).

There is no indication from the species composition of the season for the site occupation, and more detailed analyses using more sophisticated technical methods need to be undertaken to obtain this information. No detailed analysis of specific skeletal elements such as scales and otoliths was undertaken. This would require an analysis of the growth rate as determined from the annual rings formed on specific skeletal elements (i.e., understanding the poikilothermic conditions associated with individual species of fish, since every one would have distinct and different characteristics from another). Indeed, Casteel (1972:405) noted that "...we are not yet able to account for the histo-physiological and environmental bases of this phenomenon, nor are we capable of illustrating the exact mechanisms at this time. It appears that each species will have to be dealt with individually, both in contrast to other species and with regard to populations of the same species in various regions." Further preparatory work is underway for more detailed analytical studies using specific skeletal elements such as scales, otoliths, and vertebrae from the 1992 sample.

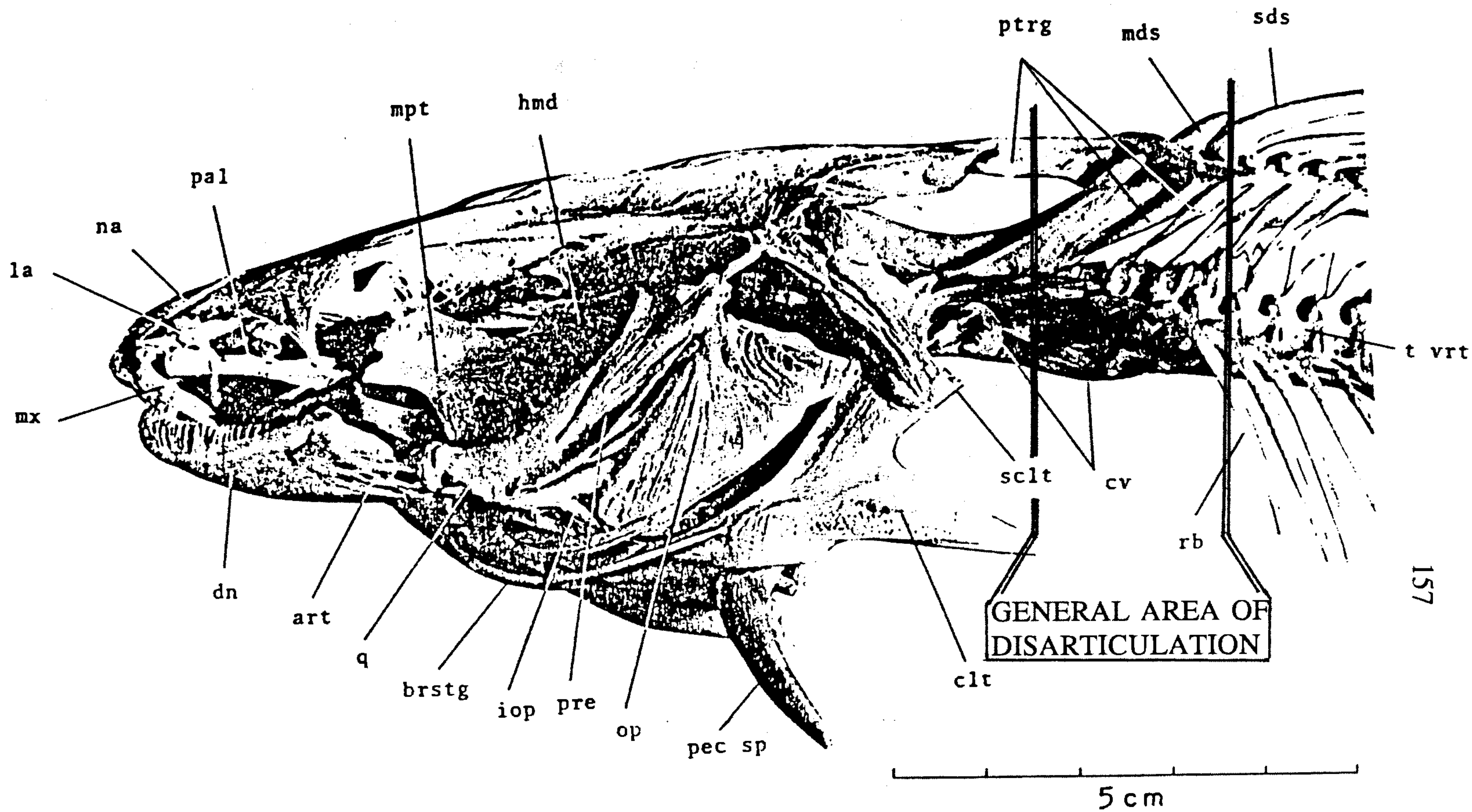


Figure 9-6: Lateral view of left side of the anterior portion of an Ictalurus punctatus (Channel Catfish) skeleton showing the area of disarticulation of the skull from the rest of the body during processing (based upon Mundell 1975:7).

art	articular
brstg	branchiostegals
clt	cleithrum
cv	complex vertebra
dn	dentary
hmd	hyomandibular
iop	interopercle
la	lacrimal
mds	modified first dorsal spine
mpt	metapyerygoid
mx	maxilla
na	nasal
op	opercle
pal	palatine
pec sp	pectoral spine
pre	preopercle
ptrg	pterygiophores
q	quadrate
rb	ribs
sclt	supracleithrum
sds	second dorsal spine
t vrt	trunk vertebrae

9.7.5 Review of the Results

The analysis of the fish remains from the 1992 excavations at DlLg-33 was accomplished by examining the specimens found at the site and comparing them with known examples from reference collections in museums and other institutions. Fortunately fish species in the Red River have not changed a great deal from their biological appearance 3000 years ago.

We can also be confident that, given the extensive field recovery techniques applied during excavation, the fish remains account for approximately eighty percent of the archaeological sample recovered from this area. This is an accurate assessment in that the particular location excavated was probably a fish processing area and many of the artifacts would be related to this activity. The stringent field recovery methods also resulted in a substantial amount of various skeletal elements from different species of fish. We can be confident also that all of the meaningful species of fish represented in the archaeological sample have been identified, and that no obscure bone elements from foreign waters, i.e., that could have been traded in or introduced by some other means, are present in the collection that would suggest the fish (as evident from their remains) originated from any other source but the Red and Assiniboine Rivers immediately below the excavated area. To that end, we have a unique opportunity to study a large sample of a Precontact fish community at this location and the fishing methods used by the site occupants. This is significant in itself, but together with the types of features and the kinds of other material culture that were uncovered during the excavation, the entire assemblage portrays an emerging new scenario of the people living in this region during the Late Archaic Period.

Perhaps the most apparent indication from the analysis is the presence of specific species of fish, verifying their distribution at the date set for the site. Introduction of certain new species, the time periods for which some are known, have resulted in the modern fish populations in the rivers being slightly different from the communities of fish that existed 3000 years ago when the site was occupied. Similarly, the absence of fish species which may now be extinct in Manitoba waters suggest that they were not present during this time period. In general, though, the composition of the fauna as well as the relative frequencies of the fishes still appears to be similar to that which one might find in the area today. The Forks sample of fish species has the potential of being used to further study the changes over a great length of time in fish ecology in the Red River watershed.

In order to shed further light on the nature and significance of the 1992 fish remains, and to more fully understand the presence in the archaeological assemblage, a further review of various aspects of fishing is presented in the following sections.

9.8 Fishing in Native North America

Many people have always included some form of fishing as part of their subsistence activities. The presence of fish in any archaeological assemblage suggests a recognition, to a certain degree, of the human activity necessary in the daily routine of that society, of having to harvest fish for sustenance to survive. Some factors influencing the type of behaviour associated with fishing have been reviewed already in this present report, including the environment, i.e., the range and habitat of species available, and the range and extent in selecting specific species which are the preferred catch (perhaps for reasons of a culturally-perceived favourite, i.e., a delicacy, or more practically because of a necessary protein, mineral, or vitamin intake). An alternative factor could be the unselective harvesting for maximum return in the lean seasons versus selective harvesting in plentiful seasons.

This subsistence pattern is an annual cycle in the sense that there were usually periods of intensive exploitation of specific food resources, and hence different levels of hunting-and-gathering activities at various times throughout the year. This pattern may be regarded as based upon "economic seasons", or times when different food resources became available for exploitation, and are not of equal length nor do they correspond to our modern "four seasons" (Joachim 1976:44-45; Yerkes 1981:535). The instinct for fish to spawn in certain seasons of the year, usually at the same location, and generally in conjunction with the flood cycle of the rivers, provides a means for renewing the fish resource annually, thereby ensuring the availability of food on a seasonal basis.

Diamond Jenness, in speaking of the Aboriginal methods of hunting and fishing recorded at the time of the arrival of early Europeans to the North American continent, describes the Natives' ability to survive in this country as follows:

> *The Indians were keen naturalists within the limitations of their interests. They knew the life histories of the animals they hunted, the different stages of their growth, their seasonal movements and hibernation haunts, and the various foods they sought for sustenance. Difficulties of observation prevented them from gaining as complete a knowledge of the habits of the fish, but they recognized every stage of the salmon from the egg to the adult... Nowhere was the Indian's keenness of observation more displayed than in fishing and hunting... All tribes were not equally proficient in both pursuits; some excelled in hunting, others in fishing; and there were poor hunters, and poor fishermen, in every community... Generally speaking, however, the average Indian, whatever his tribe, possessed more ability in both pursuits than the average white man, because from his earliest childhood he was trained to give the closest attention and study to every outdoor phenomenon* (Jenness 1977:53-54).

Early ethnographic and anthropological reports on the inhabitants of the northern plains cultural region state that the people had little or no use of fish and other small-game resources in their diet (Jenness 1977:61; Lowie 1982:5). For some groups of the northern plains, however, fish made up a substantial part of their subsistence. The Northern Shoshone depended largely on a fish diet (Lowie 1982:7), and, while the Blackfoot are said to have caught fish when other food resources were unavailable, the Blood tribe of the same group were known to be substantial fish-eaters. Diamond Jenness (1977:53-54) writes that the "Cree, who were the most skilful hunters on the continent, regarded fishing as an occupation worthy only of women, and scorned their Chipewyan neighbours, who were keener fishermen but less proficient in hunting moose and caribou." Other accounts of fishing on the Plains suggest that it was simply a sport which amused children mostly, but Mandelbaum (1979:71) pointed out that the Plains Cree often fished with weirs and that fish were regularly eaten as a change from a steady diet of meat.

9.9 Fish As A Dietary Resource

Fish provide the basic nourishment of proteins and vitamins necessary to sustain human life. More specifically, fish do vary in their nutritional content, which would influence the desire to catch certain species in the most economical manner available to make the effort profitable. The decision to catch a certain species of fish may be because of a specific nutritional requirement that the meat or other special organs have to offer. If we examine the contribution to the health of the individual person or the community as a whole, the larger species could be considered to provide a higher food value. For instance, cod (which includes whitefishes) are lowest in fat content of the most common types of fish eaten as food, and fat increases in the different species after that, with the highest in all being the trout family. Fish such as cod would also be valued for their livers, which apparently are delicious in addition to being a source of cod liver oil.

From an ecological perspective, freshwater fish are high in nutrients, proteins, and minerals, and are only deficient in carbohydrates. Most species would provide between 400 and 500 calories per pound, with catfish supplying 1000 calories per pound (Rostlund 1952:5). The fish are in prime condition during the spawning period, although their fat content diminishes somewhat during the summer. The instinct for fish to spawn in certain seasons of the year, usually at the same location, and generally in conjunction with the flood cycle of the rivers, provides a means for renewing the fish resource annually, thereby ensuring the availability of food on a seasonal basis.

The desire for fish is generally looked at from the point of view of a food resource and a dietary supplement. Although the capture of fish is for that primary purpose and, unlike the bison which has come to symbolize much of the entire existence of the Native peoples of the Plains, fish appear to have only that one real use. From a bison you can obtain a variety of food items (fresh meat, dried pemmican, and marrow from the bone), hides for clothing, and hardware supplies - the list is exceedingly long. There may appear to be very little that can be recovered from a fish other than the meat and specific important organs, and perhaps a few specific bones, such as pectoral spines from a channel catfish that could be used as a tool. From ethnographic and anthropological research, it is known that the people would also recover fish roe to use for such things as a medium in paint pigments or for baiting purposes - either other fish or natural fish predators such as eagles. Other known cultural uses of fish material by Aboriginal peoples include employing fish oil for paint bases and fish skin for waterproof clothing and containers. Steinbring (1965) notes the use a sturgeon fish jar. In the Arctic, the eyes from the freshly-caught fish were distributed to the children as candy.

9.10 The Practice Of Fishing

Since the procurement of fish was deemed of important economic value both as a food resource as well as for certain functional by-products, it stands to reason that this importance is further demonstrated by the lengths, or extent, to which the people would go to acquire it, particularly in such large catches as identified in The Forks sample. We have found evidence of fishing at many sites worldwide, but other than in dry sites or waterlogged deposits, fish remains do not often survive in the archaeological record.

Fish can be caught in a variety of ways and since postglacial times, people have employed everything from fishhooks, harpoons, and barbed spearheads, to different types of nets, leisters, basket traps, and dams (or weirs). All are widely used methods throughout the world, and the widespread practice has been developed to different extents depending on where cultural groups lived in relation to water.

We have evidence of large-scale fishing practices in North America dating back to about 4500 B.P. (Jennings 1974:145-147), during the Archaic period along the Atlantic Ocean. The coastal people were constructing large fishweirs in the estuary areas where tidal currents were strong. Given the size of some of the weirs, several days work would have been necessary in order to build such an enclosure, but it would provide an almost inexhaustible supply of food all year round. Fishweirs are stockades or barriers built across the width of a river, often located at the mouth of one river as it empties into another body of water. They generally are constructed of branches or stones in the form of a fence or wall with an apex at the centre to run the fish through, whereby you could spear, net, or even scoop them out by hand. The dependence on fishing by Precontact peoples cannot be underestimated, and coastal peoples on both sides of North America were becoming more sedentary during this time period as a result of this guaranteed food supply. Thus we begin to get some permanent settlements in those regions for certain durations of time with the emphasis on a fishing economy.

Jenness (1977:61-62) summarizes the situation simply by stating that the "Indians of the Atlantic and Pacific shores jigged from the canoes in the bays and gulfs, catching mainly cod, halibut, and salmon; whereas the northern Indians and the Eskimo used their canoes for trolling, and jigged through the ice of the lakes for whitefish, trout, and salmon." Rostlund (1952), on the other hand, noted that for the tribes inhabiting the Upper Great Lakes region, in terms of technological uniqueness and success, their practice compared favourably with ocean fisheries. Calling this fishery the "inland shore fishery" to distinguish it from the ocean coastal fisheries, he writes:

> *I submit that as fishermen, these people from the Great Lakes toward the MacKenzie Valley were second to none in aboriginal North America. As a technical achievement, this deep-water gill-net fishery ranks with the Indian halibut fishing of the northwest coast, both very different from the easy catching of shad or salmon that came pouring up the rivers* (Rostlund 1952:29-30).

The inland shore fishery discussed by Rostlund (1952) was given further study by Cleland (1982), who reviewed the archaeological evidence of the fishery from Late Archaic to Historic times to explore the uniqueness and significance of this traditional activity. Cleland (1982) describes the construction and use of the gill net, which was not only employed in open water, but, according to historic accounts, was effective in fishing through the ice in winter as well. Tribes in this region also speared fish from canoes or in weirs. The Archaic Period is noted for the use of copper by Aboriginal peoples, which was mined in the Lakehead area of Northwestern Ontario, and Northern Minnesota and Wisconsin since about 6000 B.C., and which was manufactured into elaborate gaff hooks that were used on the end of long spears to catch fish (Steinbring 1967, 1971). The gill net fishery developed to such an extent that many early historic accounts note the importance and role that it had in the lifeways of the people inhabiting that region, and "that fish were produced in excess for both winter use by the fishermen and for commercial purposes" (Cleland 1982:763).

Ethnographic accounts and early anthropological studies about the role of fishing among the various cultural groups of the northern plains area have discussed the use of different fishing methods being employed among separate tribes. Of particular importance is the absence of the use of nets among the tribes of this region. Lowie (1982) notes that the Plains Cree used weirs to trap the fish and then scooped them up, and clubbed them, or in the winter speared them in open places in the ice. He also reported the use of basket traps by the Blackfoot, who only fished when necessary. The Mandan and Hidatsa village sites also employed the use of weirs, where catfish remains are abundantly found in association with the other faunal material. G. Hubert Smith (1972:58) reported on fishing at Like-a-Fishhook Village and Fort Berthold, Garrison Reservoir, North Dakota, an Upper Missouri River campsite/village occupied ca 1834 by Hidatsa (Mandan/Arikara?) and European traders. The sedentary inhabitants were dependent upon agriculture and bison hunting for subsistence, but they "were known to fish by weirs and traps made from willow and sinew, hook and line, and nets; the latter learned from whites."

There are obvious environmental factors which could affect the method of fishing by the peoples of the continental interior, relating to the *cultural ecology* of geographic regions. (Cultural ecology is the study of the dynamic interactions between human societies and their environments. Under this approach, cultural is the primary adaptive mechanism used by human societies.) We have noted previously that with groups who live in a coastal area (be it either the Eastern or Western ocean seaboards or the shores of the Great Lakes), where the potential for fish resources is high, elaborate technological strategies have been developed to procure as large catches as needed. In fact, Jenness (1977:53) tells of the Nootka of Vancouver Island, who artificially stocked their rivers by transporting salmon ova from one stream to another. The riverine environments that make up the geographical landscape of the continental interior and northwestern Plains region of the study area present a different cultural ecology and thus the use of different strategies.

The economic potential of fishing in both South and North American riverine environments, in particular in the floodplain zones where there are naturally-created oxbows, sloughs, and backwater lakes, has been demonstrated, with research, by Limp and Reidhead (1979), and subsequently by Garson (1980).

> *When the fish seek shallower water to spawn, the river floods carry them to the margins of the valleys and stock the backwater lakes and sloughs. When the floodwater recede the fish become impounded in these backwater areas where they can be easily captured without the reliance on elaborate fishing gear. Baskets, brush, or just the bare hands could be used to harvest the fish in these natural fish traps* (Yerkes 1980:272).

The efficiency of harvesting in this manner was demonstrated in a modern experiment by Limp and Reidhead (1979), who were able to intensively exploit a floodplain slough (an oxbow remnant) full of fish, using only two logs, by driving them to the shallow end of the slough and scooping them out by hand! They were able to obtain a sufficient yield of fish (45.5 kg) in return for the number of hours that they spent employing the mass-fishing technique (4 man-hours). After examining the fish species caught, they found that few food resources could provide such a high level of n at such a low input of energy or cost of labour when working sloughs (384 hours of prot ... hour of labour.) They conducted their experiment in a Midwestern river valley (in Illinois) in mid-June, and again in mid-July when an unusual late summer flood refilled the slough; however, the second time they harvested only one-tenth of the previous catch. They conclude that "if economically efficient mass-capture techniques were practised in slough fishing, the role of fish in aboriginal subsistence could be very prominent" (Limp and Reidhead 1979:74).

The type of environmental setting that was related to the above research into fish harvesting and the economic potential of riverine areas (Garson 1980; Limp and Reidhead 1979; Yerkes 1980) is similar to the present Forks landscape (and what it might have looked liked during the time of the Archaic occupation), showing a great diversity of riverine, lacustrine, forest, and prairie habitats, and with similar food resources available. The exploitation of the available food resources and their economic potential within a study area, based upon the carrying capacity of the region and the catchment, or habitat boundaries which limits the range from a given site of a nomadic or transhumant group, has been previously demonstrated for Manitoba (Tamplin 1977). Further evidence of fishing technology was recovered during the 1992 Public Archaeology Project as reported on by Greco (Section 6) and Marr (Section 8).

9.11 Fish Processing

There is a further aspect to the practice of fishing and that is the processing of them after they are caught. Once the selected species of fish have been taken from the river, they would be cleaned and prepared for later consumption and, in order for the catch to be transported, it has to be dried, smoked, or salted. Particularly with fish, the season when food was sometimes eaten was not always the same time as when it was caught. Fish caught in the fall would be prepared and smoked for consumption throughout the winter, when it could also be kept frozen in the snow.

Ethnographic accounts of fish processing have demonstrated that different fish species are cleaned and handled in different ways. Thus, at the filleting stage, individual fish would be processed accordingly, which means that different skeletal elements would be treated in a separate manner as well. This should hopefully be reflected in the archaeological record. Not all fish is taken for human consumption; some species may be harvested to feed domestic dogs, in which case they may not require the same type of processing, if at all. The following discussion refers to those fish species which are obtained for human consumption only.

Processing of fish does not stop at the filleting stage. Carpenter (1984) describes five steps involved in the smoking process: fish preparation (i.e., their filleting), brining, drying, the actual smoking, and finally, storage. There are two general methods of smoking: cold smoking and hot smoking. *Cold smoking* is a traditional method used for many hundreds of years by fishing communities to preserve large catches. In this preparation process fish are dried at low temperatures 20-25° C (70-80° F) for one to two weeks, laid out on racks or tables in large smoking huts. This is a big operation, and common to marine or coastal societies which depend heavily on fish from the sea. In all likelihood, it is not the method practised by the early Native inhabitants at The Forks.

The alternative, or second, method is *hot smoking*, where the temperatures are in the 50-60° C range and the process requires much less time than cold smoking; in this case, four to ten hours depending on the size of the fish. However, the final product usually requires further treatment for proper preservation for later consumption.

The coarser-fleshed, fatty fish such as catfish, sucker, and burbot tend to make better candidates for smoking than the leaner species such as walleye, perch, and jackfish, since the fat and oil in the flesh offer more substance to which the smoke can adhere to aid in the smoking process. The fish would be freshly caught, and filleted, but with the skin or scales perhaps left on. Thick fillets are scored on the flesh side with parallel cuts into the flesh every centimeter or so. The fillets are then laid on racks over the hearth, skin side down (Figure 9-7). A second method described for preparing large fish is to eviscerate them and cut the fillets down to the tail, leaving them attached there. Once you have scored them, you can hang them over a rod to smoke (Figure 9-8).

A variety of tools would be employed in the processing, constituting a tool kit necessary to carry out the filleting in an efficient manner. When skinning jackfish (*Esox lucius*) fillets, Carpenter (1984:4) recommends nothing less than "a very sharp knife with at least a five-inch (thirteen-centimeter) blade." Some of the lithic tools recovered in association with the fish remains should be examined with this function in mind.

The foregoing discussion is meant to provide background information on the possible cultural activity and related human behaviour that resulted in the deposition of fish remains. The process involved in filleting and smoking would be something that the people would have taken into consideration when planning the fishing harvest. This serves to highlight the economic importance of a major, scheduled event in the lives of these people.

9.12 Comparisons With Other Excavations

In order to understand and interpret the archaeological remains of a site, it is useful to compare the cultural material with the results of both similar faunal studies and with other excavations within the study region. This also allows the readers to draw their own conclusions about the evidence.

Previous research with archaeological fish material excavated at The Forks has not been fully completed and so our knowledge is only fragmentary. Accumulated information reveals some correlations between the practice of fishing and different groups of people who once inhabited the area. An analysis of the fish remains from the 1988 Canadian Parks Service excavations at the North Point Interpretive Node revealed that, of the five occupation levels identified, fish were dominant in two of them, the Fur Trade Period (1800-1850) and the Blackduck occupations (1560-1220 years BP) (Stewart 1992). Also, a diversity in the species present was noted, with the vast majority probably being caught on the spawning runs in the spring. The large size and number of channel catfish represented in the 1988 sample suggest that this species was the most preferred catch.

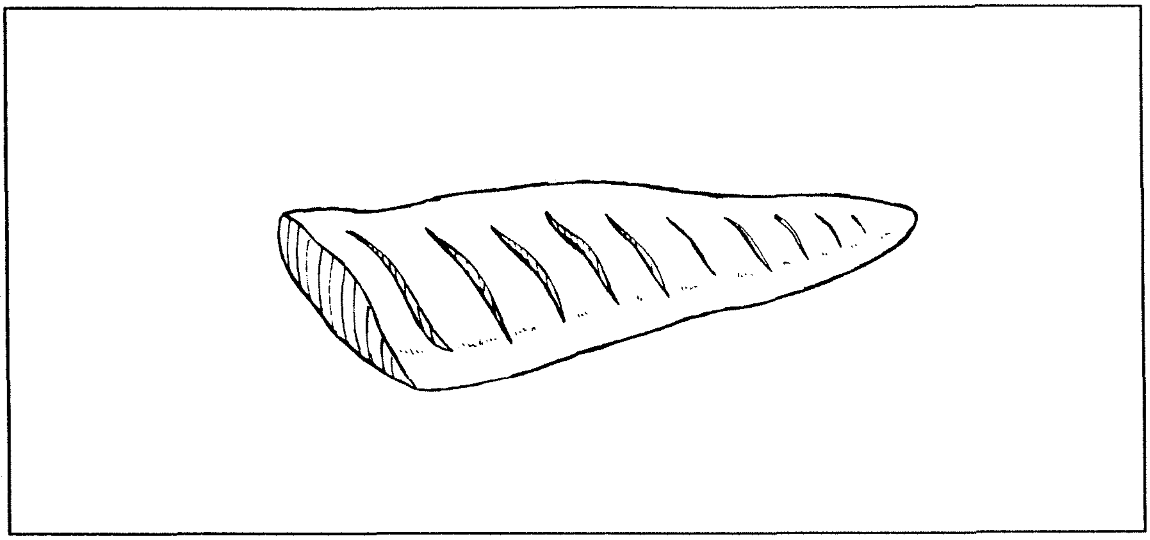


Figure 9-7: Sketch of Fillet Prepared for Smoking (from Carpenter 1984:137).

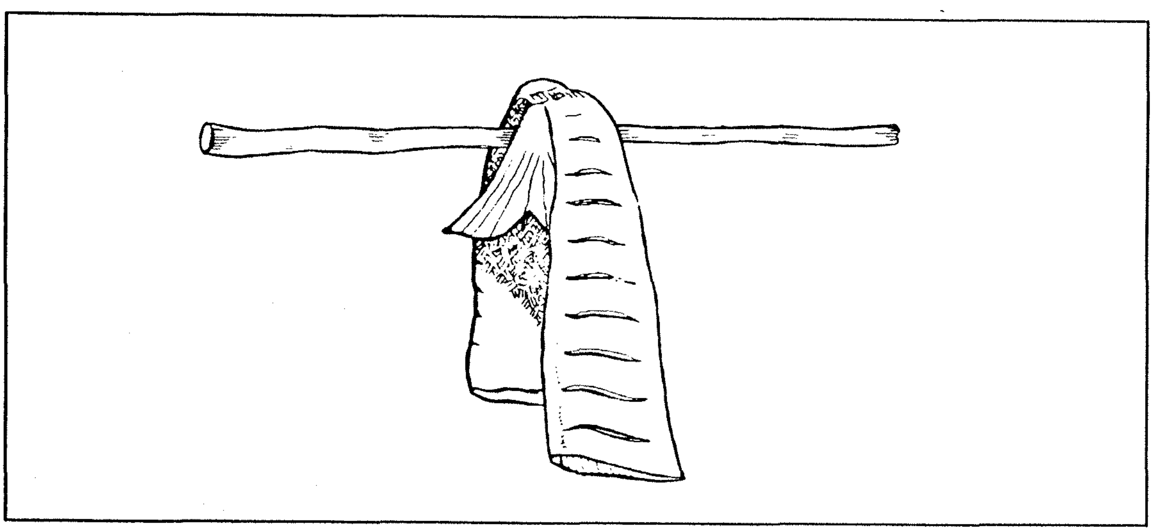


Figure 9-8: Alternative Method of Preparing Larger Fish (from Carpenter 1984:137).

In a different study of faunal remains from Fort Gibraltar I (1810-1816) and Fort Gibraltar II (1817) occupations at The Forks, Pam Smith (1985) identified fish as representing over fifty percent of the faunal remains recovered, with catfish again being the most common species. Other species represented included sturgeon (the second most popular), goldeye/mooneye, lake whitefish, walleye, sauger, and drum. A small number of individuals were identified overall (MNI = 19), for all time periods represented by the sample, which were likely caught at various times throughout the year.

There has been very little else reported on fishing stations in the study area during the time period in question (the Archaic), although fish remains have been recorded at a great many sites throughout the later cultural occupation periods of this province. Unfortunately though, the remains of fish from these excavations are identified only as "fish" with no further identification or interpretation, making it difficult to compare our results with the information presented in other excavation reports (cf. MacNeish 1958).

Research was undertaken on the fish remains from the Aschkibokahn Site (FbMb-1) in west-central Manitoba, a spring and fall camp dating to two occupations, A.D. 800 and 1250-1600, where large quantities of fish material were recovered during two field excavation seasons (Hanna 1981, Snortland-Coles 1979). This research focused on the analysis of fish scales to aid in determining a number of goals, one of which was to confirm that the site was a spring fishing station. At this site the group would trap the spawning fish in the Spring with

> *...weirs placed across the mouths of the rivers and then harvested using bone harpoons, leisters, or possibly nets. This activity may have been repeated during the Fall to capture whitefish. The harvested fish were then cleaned, using lithic knives and flakes, and placed on drying racks over smoldering hearths to preserve the meat. Some may have been cooked in ceramic vessels for immediate consumption. At the same time, fish predators, such as the eagle, may have been captured as a byproduct of the fish harvest* (Snortland-Coles 1979: 135).

The site produced a great amount of fish material, with specific species including *Stizostedion vitreum*, *Esox lucius*, *Coregonus* spp., *Catostomus commersoni*, and *Perca flavescens* (Hanna 1981:29).

The Lebret Site in nearby southeastern Saskatchewan is a stratified, multi-component campsite situated in the Qu'Appelle River valley between two natural freshwater lakes, located near the same grassland/parkland geographic interface of the northern plains identified at The Forks. The environmental setting at both sites would be similar, showing a great diversity of riverine, lacustrine, forest, and prairie habitats, with similar food resources available, and believed to be principally inhabited by similar bison-hunting cultural groups. The site contained fish remains in all occupation levels dating to the earliest known habitation about 1000 B.C. A number of fish spears made of bone, along with the typical northern plains projectile points, were recovered. Fish remains constituted between 20 to 50 percent of the entire faunal assemblage, with whitefish, a fall spawner, being the most prominent species. Smith (1991:47) states that fish were the staple food of the site inhabitants, and that archaeological evidence "demonstrates that, for 3,000 years and as recorded by historical observers, spring and probably fall occupations at fish camps were most common."

Work elsewhere in the mid-continent of North America has revealed a great deal of new insight into fishing practices in places where fishing was generally not considered a major dietary resource (that is, not located on a coastal or marine region). Yerkes (1981:272-274) recognized two different fishing strategies among groups occupying separate geographical zones in Illinois: "Prehistoric populations inhabiting the two biotic provinces that include most of the Midwest were believed to have evolved two basic types of subsistence strategies that led to the establishment of settled villages by the Middle Woodland period." Those groups inhabiting the Canadian Biotic province developed an inland shore fishery at lakeside villages throughout the Upper Great Lakes, while the Middle Woodlands peoples occupying alluvial bottom lands exploited the abundant floral and faunal resources of that riverine environment, in particular focusing on wild and domestic seed plants, with maize eventually becoming a staple food. Early studies had indicated that the important subsistence activity was the collection of the seed-producing plants, but subsequent investigation revealed that fish was a staple in the Woodland diets prior to the emergence of maize horticulture.

Yerkes (1981), in a study of the fish scales from the Pipe Site in eastern Wisconsin, a Middle Woodland Period occupation, discovered that the site was occupied throughout most of the year, and that there was a pattern of seasonal abundance of different fish species based on relative frequencies of recoveries in fish species found in the seasonally-attached storage pits.

The growing movement to consider fish remains as a significant component of the archaeological record has led to more detailed analyses of these important remains. Interpretation of the results, leading to an indication that lake and seaside fishing encampments tend to be occupied on a more permanent basis than hunting camps, since the food supply, when combined with collecting other marine resources such as shellfish or in conjunction with specific plant gathering and harvesting, is both reliable and nutritious.

9.13 Summary and Conclusions

From the present study of the fish remains at The Forks it is established that at least seven species of fish are represented. From the distribution of the fish remains, it is apparent that this area was the location for fish processing, and not the result of human activity relating to either midden or living floor debris. This gives us a first-hand look at the practice of fishing and their processing prior to them being "marketed", and concerns us more with the total diet, and the resource exploitation methods, and not necessarily the general daily intake of fish consumption.

There does not appear to be any specific species selection other than what could be harvested from the river at that particular time. Due to the large catch of fish (that is, from the numbers of individuals present), mass harvesting techniques were likely employed. The nature of the archaeological sample suggests that the fish remains derive from the river below, with the fish being caught in a pond enclosure or backwater slough, which could have been either a natural creation or a man-made weir. This activity is comparable to a communal bison hunt, complete with building the pound enclosure or maybe stone runs of the sort commonly noted on the Plains, along with the social organization surrounding such cultural events as described in the historical accounts by early European explorers to this region. Weir construction is known to be extensively used throughout the study area, with fences of sticks and brush being placed across the rivermouth, many in such an elaborate and extensive design that they take the cooperation and combined effort of the entire community to build. "Whatever its construction, whether of timber, brush, or stones, the community weir, like the buffalo or caribou pound, was a powerful factor in welding the different families of Indians into a single, social unit" (Jenness 1977:65).

For it to be transported, fish needs to be dried, smoked, or salted. The assumption here is that the fish were being caught and processed for consumption at a later date. The presence of the fish remains around the hearth features suggests that a smoking process occurred. The specific kinds of skeletal elements found among the sample suggest that the skull and spinal parts of the fish were being cut off, and randomly discarded at the same location, for the apparently sole purpose of obtaining the meat in the procurement of food, although secondary exploitation of the fish, such as collecting roe, bait, potential tools, and so on would likely take place at the same time. No elements were found to be significantly present or absent to indicate that they were being collected for a special purpose. In particular, the pectoral spines of the catfish, which are often referred to in the literature as being used as bone awls, showed no signs of being used for such, but may still have been collected in some numbers for later use.

With respect to the methodology used in this particular study, no detailed analysis of specific skeletal elements such as scales and otoliths was undertaken; and studies of that nature are not without their own inherent problems (cf. Hanna 1981; Martin 1980; Yerkes 1981). Further preparatory work is required before a successful attempt can be made at using specific skeletal elements such as scales, otoliths, and vertebrae for more detailed analytical studies. The focus of this study was on the identification of all fish material as to their skeletal element (or object name) and the associated genus and species (or artifact type). Preliminary research is being currently undertaken to make a more detailed study of the fish scales and otoliths.

Although the bones in the archaeological sample from The Forks were, in general, fairly well-preserved, some species of fish were identified only by certain skeletal elements. This may be the result of differential rates of preservation as well the nature of some bone structures in the fish; for example, lake sturgeon (*Acipenser fluvescens*) is composed of cartilaginous material and not bone, and therefore is usually identified at archaeological sites by the bony scutes which cover their body. This could be particularly true, too, in the case of burbot (*Lota lota*) which, as any sport fisherman can tell you, have very few bones present, and therefore may be underrepresented at the site. In the case of freshwater drum (*Aplodinotus grunniens*), its presence in the archaeological sample at The Forks is based primarily upon the recovery of otoliths. Field methods resulted in a substantial recovery of minute-size artifacts, including many fish skeletal elements of extremely small scale. We can be confident that the archaeological sample is fairly representative of the original assemblage that was deposited by the inhabitants of the site at the time of occupation.

Preliminary laboratory processing of archaeological fish remains in the field can be optimized by having good reference material, encompassing a wide range of species, available on location. The 1992 Forks archaeological fish assemblage provided an excellent sample from which to create two archaeological reference collections, for use during future projects. They would also be available for other researchers doing work at Manitoba sites. These reference collections could be expanded to include an illustrated guide to accompany them. Additional reference specimens could be added, through future projects, in order to fully represent the species of fish that were extent at The Forks during the Archaic Period.

The two reference collections developed through this study are separated on the basis of indexing: the first collection of fish faunal material is divided by genus and species, where possible, or to the Family taxonomic level. The second collection is organized by skeletal element, with several different species being represented for individual bone parts. Hence, the first collection demonstrates the recovered elements for a specific taxon and the second collection allows some comparison to be made for similarities and differences of particular elements.

The importance of fishing to a community can only be understood in a holistic perspective of the total diet, including all other faunal and floral food resources. The abundance of fish remains in comparison to recoveries in other artifact categories does not give much indication of the relative importance of fish in the inhabitants' diet *per se*, but the presence of the fish demonstrates that a great deal of subsistence activities were focused on the large-scale capture of fish for later consumption.

In comparing the amount of fish remains to other faunal and floral food resources recovered during The Forks 1992 excavations, it would seem that there was a near total diet of fish. This is unlikely given the presence of faunal remains indicating utilization of several other species. The fish, then, were caught in order to supplement the diet of those people who caught them, and probably preserved for future use. The area excavated, however, only represents an unknown portion of the entire site, with a very localized activity - seasonal fish harvesting and processing - taking place.

The interpretive picture, based upon the fish remains, is that the people who left them behind were involved in a major subsistence activity which would have taken up their time for at least a couple of weeks, either during the Late Spring/Early Summer or Late Fall. The length of occupation could have been longer since the riverine environment would have provided an abundant source of food resources. One has to concur with Brian Smith (1991:45), who states that "the choice of fish rather than to hunt bison had practical applications for the maintenance of plains Indian lifeways. Because of this, we must now conclude that the bison, while still a very popular food source, did not totally shape the lifeways of these groups."

Through additional analysis of the fish remains, a major contribution can be made by adding to knowledge of local Precontact fish populations and, given the previous unintentional disregard for detailed analyses of fish remains from an archaeological site in general, at sites within the Province as a whole. Comparisons with recoveries of fish remains identified from previous excavations such as Late Woodland (Blackduck) or Historic (Fort Gibraltar I & II) occupation zones, would be useful: to explore different fishing practices of various cultures, or to examine the ecology of a Precontact fish population for change through time, etc. Preliminary work has begun to further study various aspects of the archaeological sample, including determining the age growths rates of particular species, detailed thin-section studies of the otoliths, and an analysis of the scales in order to evaluate distribution of fauna, fish size, and season of catch. The ecological importance of fish and the human exploitation patterns connected with the economic industry has not, as yet, been fully understood, and previous research has perhaps brought about the assumption that fish had a less visible role in the diet of early peoples inhabiting this region. There must be more strenuous efforts made to thoroughly study fish remains at archaeological sites, and in particular at Archaic sites where archaeologists need to re-examine the evidence to better understand the importance of the role of fishing.

9.14 References

Brinkhuizen, D.C. and A.T. Clason

1986 Fish and Archaeology: Studies in Osteometry, Taphonomy, Seasonality and Fishing Methods. *BAR International Series* No. 294, Oxford.

Carpenter, David

1984 *Fishing in the West: A Guide to Alberta, Saskatchewan and Manitoba.* Western Producer Prairie Books, Saskatoon. [Second Edition - 1986]

Casteel, Richard W.

1972 Some Archaeological Uses of Fish Remains. *American Antiquity* 37(3):404-419.

1974a A Method for Estimation of Live Weight of Fish from the Size of Skeletal Elements. *American Antiquity* 39(1):94-98.

1974b On the Remains of Fish Scales from Archaeological Sites. *American Antiquity* 39(4):557-581.

1976a *Fish Remains In Archaeology and Palaeoenvironmental Studies.* Academic Press, New York.

1976b "Fish Remains from Glenrose" In The Glenrose Cannery Site, R.G. Matson (Ed.), National Museums of Canada, National Museum of Man, Archaeological Survey of Canada, *Mercury Series* No.52, pp. 82-87.

Chaplin, Raymond E.

1971 *The Study of Animal Bones from Archaeological Sites.* Seminar Press, London.

Clarke, R. McV., R.W. Boychuk and D.A. Hodgins

n.d. Fishes of the Red River at Winnipeg, Manitoba. Unpublished Canadian Technical Report of Fisheries and Aquatic Sciences.

Cleland, Charles E.

1982 The Inland Shore Fishery of the Northern Great Lakes: Its Development and Importance in Prehistory. *American Antiquity* 47(4): 761-784.

Fagan, Brian M.

1981 *In The Beginning: An Introduction To Archaeology*. Little, Brown & Company (Canada) Limited, Toronto. [Fourth Edition]

Filisky, Michael

1989 *Peterson First Guide to Fishes of North America*. Houghton Mifflin Company, Boston.

Garson, Adam G.

1980 Comment Upon The Economic Potential of Fish Utilization in Riverine Environments and Potential Archaeological Biases. *American Antiquity* 45(3):562-567.

Hanna, Margaret G.

1981 An Analysis Of Fish Scales From Aschkibokahn FbMb-1 West-Central Manitoba. *Manitoba Archaeological Quarterly* 5(3):20-38.

Huddleston, Richard W. and Lloyd W. Barker

1978 Otoliths and Other Fish Remains from the Chumas Midden at Rincon Point (SBa-1) Santa Barbara - Ventura Counties, California. Natural History Museum of Los Angeles County, Los Angeles. *Contributions In Science* No. 289.

International Garrison Diversion Study Board

1976 *Appendix C: Biology Committee Final Report - Environmental Impact Assessment, Alternatives and Recommendations*. Report to the International Joint Commission, Winnipeg.

Jenness, Diamond

1977 Indians of Canada. National Museum of Canada, *Bulletin* No. 65, *Anthropological Series* No. 15. [Seventh Edition]

Jennings, Jesse D.

1974 *Prehistory of North America.* McGraw-Hill, Inc., New York. [Second Edition]

Joachim, M.A.

1976 *Hunter-gatherer Subsistence and Settlement: A Predictive Model.* Academic Press, New York.

Limp, W. Frederick and Van A. Reidhead

1979 An Economic Evaluation of the Potential of Fish Utilization in Riverine Environments. *American Antiquity* 44(1):70-78.

Lowie, Robert H.

1982 *Indians of the Plains.* American Museum of Natural History/McGraw-Hill, New York. [Tenth Edition. Originally published - 1954]

Lukens, Paul W.

1970 Description and Analyses of Vertebrate Faunal Material from the Tailrace Bay Site. In *Archaeological Investigations in the Grand Rapids, Manitoba, Reservoir 1961-62* by William J. Mayer-Oakes. University of Manitoba, Department of Anthropology, *Occasional Papers* No. 3. University of Manitoba Press, Winnipeg.

MacNeish, Richard S.

1958 An Introduction to the Archaeology of Southeastern Manitoba. National Museum of Canada, *Bulletin* No. 157, *Anthropological Series* No. 44. Ottawa.

Mandelbaum, David G.

1979 *The Plains Cree: An Ethnographical, Historical and Comparative Study. Canadian Plains Studies* 9. Canadian Plains Research Center, University of Regina.

Manitoba Department of Natural Resources

1992 *Manitoba Sport Fishing Guide.* Winnipeg.

n.d.a *When Fishermen Meet.* Winnipeg.

n.d.b *Notes on Warmwater Fish.* Winnipeg

Martin, Terrance J.

1980 Animal Remains from the Winter Site, A Middle Woodland Occupation in Delta County, Michigan. *Wisconsin Archaeologist* 61(1):91-99.

1981 Animal Remains From The Gros Cap Site: An Evaluation Of Fish Scales Versus Fish Bones In Assessing The Species Composition Of An Archaeological Assemblage. *Michigan Archaeologist* 27(3-4):77-86.

Matthews, William J. and David C. Heins (Eds.)

1987 *Community and Evolutionary Ecology of North American Stream Fishes*. University of Oklahoma Press, Norman.

Mayer-Oakes, William J.

1970 *Archaeological Investigations in the Grand Rapids, Manitoba, Reservoir 1961-62*. University of Manitoba, Department of Anthropology, *Occasional Papers* No. 3. University of Manitoba Press, Winnipeg.

McPhail, J.D. and C.C. Lindsey

1970 *Freshwater Fishes of Northwestern Canada and Alaska*. Environment Canada, Fisheries and Marine Service, Fisheries Research Board of Canada, *Bulletin* 173. Ottawa.

Moyle, Peter B. and Joseph J. Cech, Jr.

1988 *Fishes: An Introduction to Ichthyology*. Prentice-Hall, Inc., Englewood Cliffs. [Second Edition]

Mundell, Raymond L.

1975 *An Illustrated Osteology of the Channel Catfish*. National Park Service, Midwest Archaeological Center, Lincoln.

Olsen, Stanley J.

1968 Fish, Amphibian and Reptile Remains From Archaeological Sites: Part I - Southeastern and Southwestern United States. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 2.

Pannella, Giorgio

1971 Fish Otoliths: Daily Growth Layers and Periodical Patterns. *Science* Vol. 173:1124-1127.

Robison, Henry W.

1992 *Canadian Nature Guides Freshwater Fish*. Smithmark Publishers Inc., New York.

Rostlund, Erhard

1952 *Freshwater Fish and Fishing in Native North America*. University of California Publications in Geography. University of California Press, Berkeley.

Scott, W.B. and E.J. Crossman

1973 *Freshwater Fishes of Canada*. Environment Canada, Fisheries and Marine Service, Fisheries Research Board of Canada, *Bulletin* 184. Ottawa.

Smith, Brian J.

1991 "The Historical and Archaeological Evidence for the Use of Fish as an Alternate Subsistence Resource among Northern Plains Bison Hunters" In *Aboriginal Resource Use in Canada: Historical and Legal Aspects*. Kerry Abel and Jean Friesen (Eds.), *Manitoba Studies in Native History* VI:35-49. University of Manitoba Press, Winnipeg.

Smith, G. Hubert

1972 Like-a-Fishhook Village and Fort Berthold, Garrison Reservoir, N.D. U.S. Department of Interior, National Parks Service, *Anthropological Papers* No. 2. Washington.

Smith, Pamela J.

1985 *Faunal Analysis of The Forks (Winnipeg) (21K1 to 21K6)*. Environment Canada, Parks Canada, *Microfiche Report Series* 277.

Snortland-Coles, J. Signe

1979 The Duck River or Aschkibokahn Site of West-central Manitoba: The Role of the Northern Marsh in the Subsistence of Late Woodland Peoples. Manitoba Department of Tourism and Cultural Affairs, Historic Resources Branch, *Papers in Manitoba Archaeology Final Report* No. 7. Winnipeg.

Steinbring, Jack

1965 The Sturgeon Fish Jar. *Manitoba Archaeological Newsletter* 2(3):3-6.

1967 A Copper "Gaff Hook" From Ontario. *Wisconsin Archaeologist* 48(4):345-358.

1971 The Littlefork Burial: New Light on Old Copper. *The Journal of the Minnesota Academy of Science* 37(1):8-15.

Stewart, Catherine

1992 "Fauna From Historic/Prehistoric Site of Forks, Manitoba." Paper presented to the 25th Annual Meeting of the Canadian Archaeological Association, London.

Tamplin, Morgan John

1977 "Prehistoric Occupation and Resource Exploitation on the Saskatchewan River at The Pas, Manitoba." Unpublished Ph.D. Thesis, Department of Anthropology, University of Arizona, Tucson.

Villee, C.A., E.P. Solomon, C.E. Martin, D.W. Martin, L.R. Berg, and P.W. Davis

1989 *Biology*. Saunders College Publishing, Philadelphia. [Second Edition]

Yerkes, Richard

1980 Archaeological Investigations Of Prehistoric Fishing Practices In Illinois. *Wisconsin Archaeologist* 61(2):271-279.

1981 Fish Scale Analysis At the Pipe Site (47Fd10) Fond du Lac County, Wisconsin. *Wisconsin Archaeologist* 62(4):533-557.

APPENDIX 9-I

Summary Documentation on Fishes of Manitoba *

Order:
ACIPENSERIFORMES

Family:
Acipenseridae

Genus/Species:
Acipenser fulvescens

Common Name:
Lake Sturgeon

Identification: "Primitive" features include bony plates in the skin called "scutes". Large (2.4 m/9 ft.), and often grayish in colour. Their snout is conical, with four barbels (subequal and smooth, not fringed). The lower lip has two lobes, and the tail has an upper lobe that is larger than the lower one (heterocercal). Its skeleton is made of cartilage rather than bone. Averages a weight of about 90 kg (200 lbs).
Distribution: Found sporadically in lakes and large rivers throughout the province, but because of their slow reproductive rate the sturgeon population has been quickly depleted due to overharvesting and hydro-electric development. Sturgeon were once plentiful in Lake Winnipeg and the Nelson, Winnipeg, Red, and Assiniboine Rivers. Sturgeon Creek in the west end of Winnipeg was once a sturgeon spawning ground. Only northern rivers such as the Nelson and Saskatchewan, and the Winnipeg River in the south, now harbour sturgeon.
Location: Rivers; rapids
Spawning Season: In spring in shallow water, often at the base of falls, and usually when the water temperature reaches 13° to 18°C. Sturgeon spawn in about their 20th year of life, when they reach a length of about one meter. Subsequently, mature females only spawn every 5 to 7 years.
Affects On Habitat: Barriers to migration, e.g., dam or weir construction.
Comments: Adults mature at 14-20 years of age, occasionally reaching 150 years. Ranks as one of the largest freshwater fishes of North America.
Cultural Relationship: It is prized for its meat as well as its caviar. The Aboriginal groups in the province harvested them for food and other domestic uses. Early Europeans were intensively harvesting sturgeon by the late 1800s as a popular food item.

Order:
AMIIFORMES

Family:
Salmonidae

Genus/Species:
Coregonus clupeaformis

Common Name:
Lake Whitefish

Identification: Silvery and flat-sided, this fish resembles a herring, but the small adipose fin reveals its kinship to trout. The Lake Whitefish has a small, inferior mouth, thick lips with an overhanging snout and a double flap of skin between the nostrils, and a tongue with teeth but jaws without teeth. It has a slightly hump-backed appearance, forked caudal fin, 19-33 gill rakers, 10-14 anal rays, and 70-97 scales along the lateral line. Size 61 cm (24"), and weighing in the 0.5-1.5 kg range.
Distribution: Found in cool, deep lakes and rivers throughout Manitoba.
Location: Big riverine environments and lakes.
Spawning Season: In autumn over rock and sand bottoms in lakes and streams. In the fall, when the water temperature lowers to 9.5°C, whitefish spawn over the same rocky rubble as tullibee. Cross-breeding does not occur since tullibee spawn a week or two later at colder water temperatures. Eggs hatch in the spring when the lakes thaw, and the young move into deeper water. For the first four years whitefish grow rapidly, reaching commercially acceptable size of 1 kg by the fourth year.
Comments: The diet of whitefish ranges from plankton to insects, small shellfish, and small forage fish. It is primarily a bottom feeder.
Affects On Habitat: Water level fluctuation, nutrient pollution, and increased water temperature.
Cultural Relationship: It is a delicious and important food fish throughout Canada. It is the most important commercial freshwater fish in Canada, and was once the staple of the fishing industry in Manitoba. Environmental deterioration and depletion of stocks, however, have combined to reduce commercial yields in recent years. The whitefish is accepted as a sport fish, but since they have soft mouths, hooks can break free fairly easily.

Order:
CLUPEIFORMES

Family:
Hiodontidae

Genus/Species:
Hiodon alosoides

Common Name:
Goldeye

Identification: Silvery; large mouth with well-developed canine-like teeth on jaws and tongue, and large, golden-yellow eyes. Similar to herring, but dorsal fins are set farther back; in fact, the dorsal fin origin is situated *behind* the origin of the anal fin, and they have no adipose fin. Size about 51 cm (20"), weighing about 1.4 kg (3 lbs).
Distribution: Occurs mostly in Lake Winnipeg, and the Red, Assiniboine, Winnipeg, and Saskatchewan Rivers.
Location: Frequents quiet, turbid water of medium-sized to large rivers, but also found in reservoirs, lakes, and marshes.
Spawning Season: In spring, when the water is about 10°-13°C, mature goldeye move into pools in rivers or backwater lakes of rivers to spawn. By September, goldeye that hatched from semi-buoyant eggs are approximately 10 cm long. Male goldeyes mature in 3-6 years while females take a year longer. It takes about eleven years to reach the average weight of 0.5-0.7 kg.
Comments: Primarily a nocturnal species, the large eyes are adapted to dim light conditions and to turbid habitats. Feeds near the surface on small fish, terrestrial and aquatic insects, and amphibians.
Affects On Habitat: Stream channelization, flooding caused by dam construction.
Cultural Relationship: Prized for its meat, by the late 1800s it became a gourmet dish, and stocks were quickly depleted. They have only recently recovered. They can be caught on a dry fly or a small baited hook.

Order:
CLUPEIFORMES

Family:
Hiodontidae

Genus/Species:
Hiodon tergisus

Common Name:
Mooneye

Identification: Greenish in colour, they are also similar to herring, but have dorsal fins set farther back - the dorsal fin origin is slightly in *front* of the anal origin; it has a fleshy keel, and large silvery eyes. Size 28-38 cm (11-15"), and weighs 0.3-0.9 kg (12 ozs-2.1 lbs).
Distribution: Occurs mostly in Lake Winnipeg and Red and Winnipeg Rivers.
Location: Large, clear rivers and lakes, and seems to be less tolerant of turbid waters than the goldeye.
Spawning Season: In March, April, and May in tributary streams over swift gravel shoals.
Comments: Feeds on aquatic macroinvertebrates and small fish under low light conditions at night or near dusk.
Affects On Habitat: Same as with the goldeye.
Cultural Relationship: Similar to that of the goldeye.

Order:
CLUPEIFORMES

Family:
Esocidae

Genus/Species:
Esox lucius

Common Name:
Northern Pike,
Jackfish

Identification: Dorsal and anal fins are set far back, and it has big toothy jaws with five sensory pores on each side (giving the snout the shape of a duck's bill) - features which give it an advantage when lunging at prey, usually smaller fishes, aquatic mammals, and waterfowl. It has a pattern of small, pale white or yellow oval spots to conceal itself in among water weeds, from which it lunges at its prey. The cheeks are fully scaled, and the upper half of the operculum is also scaled. Size about 1.3 m (52"), and may reach 18 kg (40 lbs).
Distribution: Native to nearly all rivers and lakes in the province, the northern pike also dwells in northern Europe and Asia (the most extensive natural range of any freshwater fish).
Location: Cold, weedy lakes, rivers, streams, and reservoirs with little current and dense aquatic vegetation (e.g., marsh/shore). It hunts by sight, and so prefers clear water.
Spawning Season: An early spring spawner, they move into marshy or heavily vegetated areas as soon as the ice begins to melt, to deposit eggs. The eggs hatch in about 12 days, and the young almost begin feeding on any living thing, including each other. They continue such voracious feeding habits throughout their life.
Comments: The northern pike has the greatest tolerance for cold environments of any esocid. Feeds almost entirely on fish and other vertebrates. They are a solitary fish, and may live up to 24 years of age.
Affects On Habitat: Barriers to migration, loss of marshes, increased turbidity.
Cultural Relationship: Widely sought by anglers as a sport fish, it continues to be an important commercial species, as well. They are easily caught by baited hook and line, but require ingenious methods of filleting due to the numerous bones in the skeleton.

Order:
CYPRINIFORMES

Family:
Ictaluridae

Genus/Species:
Ictalurus punctatus

Common Name:
Channel Catfish

Identification: Their colour ranges from dusty-gray to dark gray-blue, and the young are covered with dark spots, which disappear with age. The catfish has 4 pairs of barbels. It has a deeply forked tail, a free adipose fin, and an anal fin which is rounded with 24-29 rays. Size is about 1.2 m (47") and weighs about 10 kg.
Distribution: Native to southern Manitoba, and common in the Red and Assiniboine Rivers, it has been widely introduced elsewhere on the North American continent.
Location: Usually inhabit large, deep rivers with sand, gravel or cobble bottoms, in slow moving currents. Also found in ponds, lakes, and reservoirs.
Spawning Season: In late spring and summer, at about 25°C in dark nests under rocks, logs, and undercut banks. The male channel catfish fans water over the eggs to aerate and clean them. Once they hatch, he protects the young for several days until they swim off on their own.
Comments: Channel catfish use their barbels like a nose to find food. Often thought of only as bottom-feeders, their food includes not only clams and crayfish from the bottom but also fish, particularly goldeye, and other minnows and insects.
Affects On Habitat: Industrial and municipal waste discharges and barriers to migration affect habitat.
Cultural Relationship: This is the most popular of North American food and sport catfishes, and there is still a very high demand for them as a food product. They can be caught easily by still-fishing with a baited hook, or by nets.

Order:
CYPRINIFORMES

Family:
Catostomidae

Genus/Species:
Catostomus spp.

Common Name:
White Sucker

Identification: Slender, short dorsal fin (11-13 rays), rounded snout with fleshy papillose lips. The area between the eyes is flat, not concave, and the lateral line scales are small in size and number (57-76). Size 46 cm (18"), 2.7-3.2 kg (6-7 lbs).
Distribution: Occurs widely throughout the province, and most of Canada. It has the widest range of any sucker.
Location: Lives on the bottom of lakes, ponds, and streams.
Spawning Season: In spring, they prefer lakes and streams on the gravel or rock.
Comments: Like all suckers, they have thick lips covered with many fleshy growths. With these sensitive "feelers", it probes in the gravel for worms and other small prey, sucking them up with its powerful mouth. Young suckers are a staple food of pike, walleye, and other predatory fish and are an important link in the food chains.
Affects On Habitat: Stream channelization and siltation affect spawning success.
Cultural Relationship: Suckers are not prized as sport fish and, because of their sensitive mouths, they can often avoid detection by hook and line but still retrieve bait. They are known to be used as a commercial food product, and can be easily caught by dip netting during spring spawning runs. Their hardiness and the fact that they are a food source for many other species makes them a suitable live bait.

Order:
CYPRINIFORMES

Family:
Catostomidae

Genus/Species:
Moxostoma spp.

Common Name:
Redhorse

Identification: Convex or straight-edged dorsal fin (14-16 rays), ventral mouth with lower lip distinctly bi-lobed and papillose, its posterior margin forming an acute V-shaped angle. Caudal fins are slate coloured.
Distribution: Occurs widely throughout the province and most of Canada, although in a more limited range than the white sucker.
Location: Large or deep sluggish pools of moderate sized, clear streams and large rivers over rocky or gravely substrates.
Spawning Season: Spring.
Comments: Similar to that of the white sucker.
Affects On Habitat: Same as for the white sucker.
Cultural Relationship: Similar to that of the white sucker.

Order:
GADIFORMES

Family:
Gadidae

Genus/Species:
Lota lota

Common Name:
Burbot, Maria,
Ling cod

Identification: Very elongate in shape, it is often mistaken for an eel. The head is quite flat with tubular nostrils and it has a long, slender chin barbel. The body is supple in appearance with a rounded tail. The pelvic fins are placed far forward, and the 1st dorsal fin is short. Both the 2nd dorsal fin and the anal fin are quite long and narrow, and only the pelvic fins are pale, the other fins being quite darkly mottled. It has very small, smooth scales giving it the impression that it is scaleless. Size is about 96 cm (38") and can reach a maximum weight of 8.4 kg (18 lb 8 oz), but weighs on average just over 1 kg.
Distribution: Occurs throughout Manitoba in both rivers and lakes.
Location: Resides in deep, cool waters, preferably rivers and lakes. They prefer water temperatures below 19°C.
Spawning Season: Spawns in early winter, under the ice, in shallow water over sand or gravel. When the water temperatures are around 1°C, burbot move to their spawning grounds. Balls of 10-12 fish, intertwined and constantly moving, roll across the bottom and deposit their eggs on gravel bars or rocky shoals. The eggs hatch in spring when the water warms to a cool temperature of 6°C.
Comments: This is the only freshwater member of the cod family. They eat aquatic insects and crayfish, as well as other fish.
Affects On Habitat: Water temperature increase and nutrient pollution.
Cultural Relationship: The burbot are known to be a widely-used food resource. They are readily caught in early winter during the spawning runs. The exceptionally large liver can weigh over 1 kg and, when smoked, is rich in nutrition as well as taste.

Order:
PERCIFORMES

Family:
Percidae

Genus/Species:
Stizostedion canadense

Common Name:
Sauger

Identification: Often difficult to distinguish from walleye as both have a round body shape, two separate distinct dorsal fins on the back, strong sharp teeth, and a colouring that shades from a dark olive on the back to a white belly. Sauger, however, have no white on the tail, scaled cheeks, and rows of dark blotches on the dorsal fin. While the first dorsal fins contains black spots, there is no black blotch at the posterior end of the first dorsal. Other features include an elongate body with three to four saddles extending obliquely forward to the middle of the sides and a large mouth with canine teeth and a serrated preopercle.
Distribution: Located throughout the southern half of Manitoba, it is not generally found north of the upper end of Lake Winnipeg.
Location: Inhabits large, shallow, turbid lakes or rivers. Lives in many of the same waters as walleye, but prefer a somewhat more turbid habitat than that of walleye.
Spawning Season: Spawns in early spring over gravel shoals. They may use the same spawning pools as walleye, but at slightly different times. Sauger have been known to spawn immediately after walleye when temperatures are still only about 5°C.
Comments: Feed on small fish and invertebrates over rocky gravel shallows or along sparsely weeded sandy bottoms. Maximum lifespan is seven years.
Affects On Habitat: Stream channelization and siltation affect spawning.
Cultural Relationship: They are an important commercial fish in southern Manitoba fisheries and are often sold as walleye. They can be caught with hook, lure and line, or by still-fishing with minnows.

Order:
PERCIFORMES

Family:
Percidae

Genus/Species:
Stizostedion vitreum

Common Name:
Walleye, Pickerel

Identification: There is a distinctive white tip on the lower lobe of the tail fin, no scales on the cheeks, and a single dark blotch at the base of the spiny dorsal fin. The preopercle is serrated, and the body has dusky, saddle patches on it. Size reaches about 1 m (41"), and about 1-2 kg in weight.
Distribution: Found throughout most lakes and rivers of Manitoba, except in the extreme north. Common in the Red River. Widely stocked in reservoirs.
Location: Generally located in large streams, rivers, and lakes in deep areas over sand, gravel, or rock substrates.
Spawning Season: In the early spring, in streams or lakes on gravel or rock, often when ice still covers the water. Just behind the males, the egg-laden females search out coarse gravel in streams or on shoals in lakes. Given suitable temperature, the eggs hatch in about three weeks.
Comments: Feeds on fishes and a variety of aquatic vertebrates.
Affects On Habitat: Stream channelization and siltation affect spawning success.
Cultural Relationship: This is one of the most desired species commercially and has replaced lake whitefish as the staple of the fishing industry in Manitoba. They are also the most sought after sport species. They can be caught by hook, lure, and line.

Order:
PERCIFORMES

Family:
Sciaenidae

Genus/Species:
Aplodinotus grunniens

Common Name:
Freshwater Drum,
Silver Bass

Identification: A large, silvery or gray fish with a highly developed lateral line system extending on to the caudal fin, a high arching back with a robust body, and a subterminal mouth. They have conjoined spinous and soft dorsal fins, two anal fin spines and a triangular caudal fin. They are often confused with other fish having two dorsal spines, but the first ray of the anal fin is a single, thick, heavy, and stiff spine in the drum, and unlike those on the dorsal spine. The freshwater drum possess extremely strong, flat teeth located in the throat to crush its food. Size is about 89 cm (35"), and usually weighing under 5 kg, although they can grow much larger.
Distribution: Abundant in the southern half of the province, primarily the Red River and Lake Winnipeg and their drainages.
Location: Resides in medium to large shallow lakes and rivers, or else deep pools and large impoundments. Since they prefer large bodies of water, they can adapt to turbid conditions.
Spawning Season: Generally in summer when the water temperature becomes a warm 21°C. The released eggs float to the surface and drift with the wind and current, making it difficult to tell when and where they were spawned. The young hatch approximately 25-30 hours after the eggs are laid.
Comments: Feeds on snails, clams, insect larvae, and other vertebrates such as small fish and crayfish. It has the unique ability to make loud booming sounds by contracting muscles along the walls of the gaseous swim bladder. Its otoliths, or earstones - the stony growths from the inner ear that aids in the fish's balancing system - are relatively large in size.
Affects On Habitat: Siltation and pollution reducing its food supply. Barriers to migration.
Cultural Relationship: They are not a commercial species nor are they a popular sport fish. The meat is quite edible and is often prepared as a soup. Otoliths are sometimes used as lucky charms.

* It should be noted that the above data is a composite of several sources. As information booklets for trophy fishermen were used, the size range for the species are often maximum or record sizes rather than an average of the resident populations. For the reader interested in details about particular species, research references such as Scott and Crossman (1973) and McPhail and Lindsey (1970) should be consulted.

APPENDIX 9-II

Tabulations of Identified Elements Used for
Determination of Minimum Numbers of Individuals

Distribution By Excavation Unit of Catostomidae Dentary

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A1	1	0	0	1
A2	2	3	0	5
A3	1	1	0	2
A5	0	1	0	1
A6	0	0	1	1
B1	2	0	0	2
B2	0	0	1	1
B3	1	0	0	1
B5	0	3	0	3
B7	2	4	0	6
C1	3	2	0	5
C2	2	1	0	3
C3	1	0	0	1
C7	1	6	0	7
D2	0	2	0	2
D3	3	1	0	4
D4	0	1	0	1
D5	1	0	0	1
D6	2	6	0	8
D7	4	1	0	5
E2	3	1	0	4
E3	2	3	0	5
E4	1	2	0	3
E5	0	1	0	1
E6	0	1	0	1
E7	9	8	0	17
F3	5	3	0	8
F4	5	9	0	14
F5	1	1	0	2
F6	2	5	0	7
F7	5	4	0	9
G3	1	1	0	2
G4	0	5	0	5
G5	0	1	0	1
G6	5	2	3	10
G7	20	18	0	38
H3	1	0	0	1
H4	8	7	0	15
H5	5	6	0	11
H6	15	14	0	29
H7	2	1	0	3
I3	1	0	0	1
I4	6	10	0	16
I5	0	4	1	5
I6	2	6	0	8
I7	0	2	0	2
J3	3	4	0	7
J4	4	1	1	6
J5	1	8	0	9
J6	11	8	0	19
J7	6	6	0	12
K4	1	4	0	5
K5	2	4	0	6
K6	5	7	0	12
K7	2	2	0	4
L2	0	1	0	1
L3	0	2	0	2
L4	1	0	0	1
L5	1	1	0	2
L6	8	8	0	16
TOTALS	170	203	7	380

Distribution By Excavation Unit of Ictalurus Dentary

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A1	1	0	0	1
A2	5	1	2	8
A4	1	1	0	2
A5	1	0	0	1
B2	0	0	1	1
B5	1	1	0	2
B7	0	2	0	2
C1	0	1	0	1
C3	0	1	0	1
C5	0	1	0	1
C7	1	0	0	1
D1	0	2	0	2
D4	0	1	0	1
D6	1	1	0	2
D7	1	1	0	2
E4	0	1	0	1
E6	1	0	0	1
E7	1	3	2	6
F4	0	2	0	2
F5	2	0	0	2
F6	1	0	0	1
G2	0	0	1	1
G3	2	1	2	5
G4	1	1	0	2
G5	2	1	0	3
G6	3	4	0	7
H3	0	1	0	1
H4	1	4	0	5
H5	0	2	2	4
H6	2	2	0	4
H7	0	1	0	1
I3	0	0	2	2
I4	0	1	1	2
I5	2	1	0	3
I6	3	5	1	9
J1	0	0	1	1
J3	1	2	1	4
J4	3	1	0	4
J5	5	4	1	10
J6	1	1	1	3
J7	0	1	0	1
K2	1	0	0	1
K4	2	3	0	5
I4 to K5	1	0	0	1
J5 to K6	0	2	0	2
L3	2	0	1	3
L4	0	0	1	1
TOTALS	49	57	57	126

Distribution By Excavation Unit of Ictalurus Angular/Dentary

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A3	0	1	0	1
A7	0	1	0	1
B1	0	1	0	1
C2	1	2	0	3
C4	1	0	0	1
C7	2	3	0	5
D2	0	1	0	1
D6	1	0	0	1
D7	1	1	0	2
E4	1	0	0	1
E6	2	1	0	3
F3	2	1	0	3
F4	1	0	0	1
F5	2	3	0	5
F6	1	1	0	2
G3	2	1	0	3
G4	1	5	0	6
G5	3	1	0	4
G6	1	2	0	3
G7	0	1	0	1
H5	3	1	0	4
H6	1	0	0	1
I5	0	2	0	2
J3	1	0	0	1
J4	1	0	0	1
J5	1	2	0	3
J6	2	0	0	2
K5	2	3	0	5
K6	1	2	0	3
J5 to K6	0	1	0	1
K7	1	0	0	1
L6	0	1	0	1
TOTALS	35	38	0	73

Total of Ictalurus Dentary and Angular/Dentary

	Left	*Right*	*Indeterm.*	*Total*
Dentary	49	57	57	126
Angular/Dentary	35	38	0	73
TOTALS	84	95	57	199

Distribution By Excavation Unit of Sitzostedion Dentary

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A2	0	1	0	1
A3	0	0	1	1
B2	1	1	0	2
B7	0	1	1	2
D7	2	1	0	3
E1	1	1	0	2
F7	1	0	1	2
G1	0	0	1	1
G4	0	2	0	2
G6	0	1	0	1
G7	3	1	0	4
H4	1	1	0	2
H7	1	0	0	1
I3	0	0	1	1
I4	0	0	1	1
I5	0	0	1	1
I6	0	0	1	1
I7	0	1	0	1
J5	0	0	1	1
J6	1	2	0	3
K4	1	0	1	2
I4 to K5	2	0	0	2
TOTALS	12	12	12	36

Distribution By Excavation Unit of Esox Lucius Dentary

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A2	0	1	1	2
A4	0	1	1	2
B3	0	1	0	1
C1	0	1	0	1
C5	0	1	0	1
C6	0	1	0	1
D7	1	1	0	2
E3	0	1	0	1
F4	2	0	0	2
H4	0	1	0	1
H5	0	1	0	1
I7	0	1	0	1
K7	0	0	1	1
L6	1	0	1	2
TOTALS	4	11	4	19

Distribution By Excavation Unit of Aplodinotus Grunniens Otoliths

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A7	1	0	0	1
G5	0	0	1	1
H5	0	1	1	2
I4	1	1	0	2
J4	0	1	0	1
J6	1	0	0	1
TOTALS	3	3	2	8

Distribution By Excavation Unit of Hiodon Operculum

Unit	*Left*	*Right*	*Indeterm.*	*Total*
J4	0	1	0	1
K4	0	1	0	1
K6	1	0	0	1
TOTALS	1	2	0	3

Distribution By Excavation Unit of Lota Lota Premaxilla

Unit	*Left*	*Right*	*Indeterm.*	*Total*
A2	1	0	0	1
TOTALS	1	0	0	1

10.0 SHELLFISH AND SNAIL RECOVERIES

The shellfish and snail recoveries encompassed culturally derived and naturally deposited specimens. The culturally derived specimens provided food resources as well as raw material for manufacturing tools and/or decorative items. This tripartite chapter examines the identity of the freshwater clams (Section 10.1), the artifacts manufactured from the shell (Section 10.2), and the aquatic snails and fingernail clams resulting from riverine flooding (Section 10.3).

During the excavations, all freshwater clam specimens were recovered and curated. As part of the curation process, weights were obtained for each catalogue number. The distribution of the culturally derived molluscs is plotted in Figure 10-1.

10.1 MUSSEL IDENTIFICATION

by *Lionel Robert and Terry A. Dick*

10.1.1 Introduction

Five catalogue numbers from Zone 1 and 83 catalogue numbers from Zone 3 were made available for identification. Many of these were flakes which were impossible to identify but some of the fragments were identifiable if a key taxonomic character, however obscure, was present. Specimens were identified to the lowest taxonomic level. This resulted in the identification of five species representing two sub-families within the freshwater clam family (Table 10-1).

SCIENTIFIC NAME	COMMON NAME
Unionidae	Pearly Mussel Family
Ambleminae	Button Shell Sub-family
Amblema plicata	Three-Ridge
Lampsilinae	Lamp Mussel Sub-family
Actinonaias caranata	Mucket
Lampsilis radiata siliquoidea	Fat Mucket
Ligumia sp.	Sand-Shell
Potamilus alatus (*Proptera alata*)	Pink Heel-Splitter

Table 10-1: Identified Mussel Species

10.1.2 Methodology and Materials

Methods used in the identification included taxonomic keys of Burch (1975a, 1975b) and Clarke (1981). The key characteristics were the pseudocardinal teeth and shape and sculpture of the shell. On some of the fragments the nature of the growth rings were used in identification (Table 10-2). Sex determination was done using shell shape for the Lampsilinae and *Potamilus*. As *Amblema plicata* does not show any external sexual dimorphism, no sexes were reported (Table 10-3).

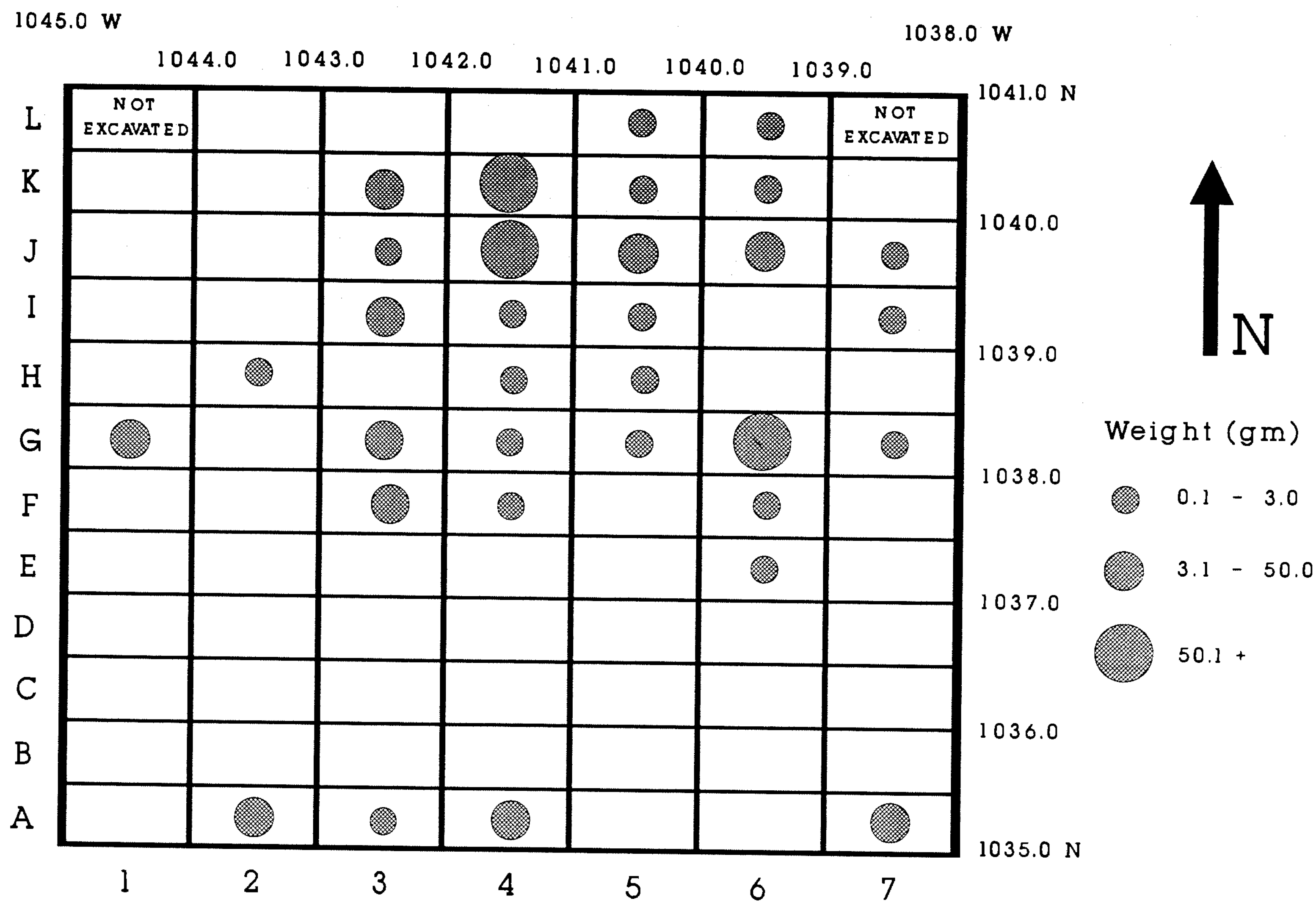


Figure 10-1: Distribution of Freshwater Clam Remains (by weight)

NO.	IDENTIFICATION	ELEMENT	NO.	IDENTIFICATION	ELEMENT
ZONE 1					
108	Lampsilinae	left valve	1700	?	flake
509	*L. r. siliquoidea*	left valve	7611	Lampsilinae?	fragments
965	Unionidae	fragment			
ZONE 3					
268	?	flakes	6411	*Amblema plicata*	right valve
815	*Ligumia* or *Potamilus*	fragment	6819	?	flake
894	?	fragments	6861	Lampsilinae	flakes
895	Lampsilinae	right valve	7232	*A. p.* form *periplicata*	right valve
919	*Ligumia* or *Potamilus*	flake	7566	Lampsilinae	fragment
1054	*Ligumia* or *Potamilus*	fragment	7639	*Ligumia* or *Potamilus*	right valve
1343	Lampsilinae	fragment	7691	*A. p.* form *periplicata*	left valve
1417	?	fragment	7909	*Ligumia* or *Potamilus*	fragments
1440	*A. p.* form *periplicata*	right valve	8009	?	flakes
1468	*Potamilus alatus*?	left valve	8129	*L. r. siliquoidea*	right valve
2169	*Actinonaias carinata*?	fragment	8130	*Potamilus alatus*	left valve
2413	?	flakes	8284	Lampsilinae	left valve
2452	?	fragment	8342	Lampsilinae	fragment
2513	*A. p.* form *periplicata*	left valve	8526	Lampsilinae	right valve
2553	?	flakes	8580	Lampsilinae	fragment
2556	*A. p.* form *periplicata*	left valve	8618	Lampsilinae	fragments
2557	*A. p.* form *periplicata*	right valve	8727	Lampsilinae	fragment
2558	*A. p.* form *periplicata*	left valve	8779	Lampsilinae	fragment
2625	?	fragment	8827	*Amblema plicata*	left valve
2626	?	fragment	8861	*Ligumia* or *Potamilus*	fragment
2683	?	flakes	8926	*Ligumia* or *Potamilus*	left valve
3381	Lampsilinae	fragment	9300	*Amblema plicata*	right valve
3544	*Ligumia* or *Potamilus*	fragment	9301	*Ligumia* or *Potamilus*	flakes
3604	*Ligumia* or *Potamilus*	fragment	9352	*A. p.* form *periplicata*	right valve
3784	*Potamilus alatus*	left valve	9451	*Amblema plicata*	right valve
3909	*A. p.* form *periplicata*	left valve	11038	*Amblema plicata*	left valve
4216	*A. p.* form *periplicata*	right valve	11039	*Ligumia* or *Potamilus*	fragment
4561	*A. p.* form *periplicata*	right valve	11040	*L. r. siliquoidea*	left valve
4632	*L. r. siliquoidea*?	fragment	11041	*Potamilus alatus*	left valve
4713	*Ligumia* or *Potamilus*	fragments	11042	*Ligumia* or *Potamilus*	fragment
4739	*Amblema plicata*	right valve	11043	*Potamilus alatus*	worked
5005	Lampsilinae	fragment	11044	Lampsilinae	right valve
5115	Lampsilinae	fragment	11045	*Ligumia* or *Potamilus*	fragment
5200	*Potamilus alatus*	right valve	11046	*Potamilus alatus*	left valve
5248	Lampsilinae	left valve	11047	*Potamilus alatus*	left valve
5308	?	flake	11048	*Amblema plicata*	left valve
5318	*Actinonaias carinata*	right valve	11049	*Amblema plicata*	fragment
5319	*A. p.* form *periplicata*	right valve	11050	*A. p.* form *periplicata*	left valve
5438	*A. p.* form *periplicata*	left valve	11051	*A. p.* form *periplicata*	fragments
6050	?	fragments	11052	?	flakes
6262	*L. r. siliquoidea*	left valve	11054	*A. p.* form *periplicata*	left valve
6340	*A. p.* form *periplicata*	right valve	11055	*Amblema plicata*	fragment

Table 10-2: List of Identified Mussels

CAT. NO.	IDENTIFICATION	AGE	SEX	WEIGHT (gm)
509	*L. r. siliquoidia*	6	F	8.1
6340	*Amblema plicata*	15	?	28.8
5319	*A. plicata*	14	?	28.4
5318	*Actinonaias carinata*	?	?	37.7
5438	*A. plicata*	45-50	?	48.6
4739	*A. plicata*	28	?	34.4
4561	*A. plicata*	26-30	?	30.0
3909	*A. plicata*	35-37	?	33.6
2558	*A. plicata*	23	?	31.3
2557	*A. plicata*	12	?	34.0
2556	*A. plicata*	13	?	24.6
2513	*A. plicata*	9	?	25.3
9352	*A. plicata*	35-37	?	36.8
8827	*A. plicata*	20	?	34.7
8129*	*L. r. siliquoidia*	14	F	8.7
7691	*A. plicata*	43-46	?	39.9
7232#	*A. plicata*	26	?	51.2

Table 10-3: Age, Sex, and Weight of Mussels[1]

* Since there was only one shell we counted external growth rings (likely an overestimation).

\# Shell to be used in display; external ring count only.

[1] Ranges for ages are given in cases where shells were deteriorating and growth rings were difficult to count from the sections.

Age determination was done on complete shells only and primarily on the *A. plicata* as these shells were preserved enough for sectioning and polishing. Some of the thinner shells could not be polished due to the quality of the shells.

10.1.3 Discussion

The complete shells were primarily *Amblema plicata*. Interestingly, these complete half-shells (mostly *A. plicata*) were of similar size but showed little evidence of being modified for human use, i.e., wear or sculpturing. However, one small fragment (DlLg-33:92A-4632A, *P. alatus*) clearly showed evidence of shaping, perhaps for decoration. We speculate that the *A. plicata* was used for food and the shells for scooping or eating and assume that the left shell (valve) would be used by a right-handed person. As there was no evidence that the left valve appeared more frequently than the right valve, their presence appears to be random. The presence of carbon and soot on the shells could indicate that the mussels were cooked over a fire and after eating the shells were discarded.

The similar size of all shells in the collection can be explained as follows:

(1) Smaller mussels are found in fast flowing shallow water and would be readily accessible to harvesting by wading; and

(2) Mussels grew slowly during this period and were therefore of small size.

While it is difficult to compare samples of *A. plicata* collected from the Assiniboine River in 1992 and 3000 years ago due to the small sample from The Public Archaeology Project (1992), there are some trends worth noting. The average age of the *A. plicata* samples from The Forks dig are 25.3 years and average weight is 34.4 gms (Table 10-3). The average age of samples of *A. plicata* of similar length from the Assiniboine River (1992) is 9.0 years and the average weight is 38.8 gms. Assuming the samples collected from The Forks Public Archaeology Project came from the Assiniboine River, these data suggest that *A. plicata* is growing 2 to 3 times faster today than 3000 years ago. This is not surprising as prairie rivers are much more productive today versus 3000 years ago due to agricultural runoff and increased urbanization.

10.2 WORKED SHELL

by *Pam Goundry*

10.2.1 Introduction

Among the recoveries, perhaps some of the most interesting artifacts were shell beads and shell bead blanks. Nine discoidal specimens of worked freshwater clamshell were curated, seven of which have had a hole drilled through them. The artifacts were recovered from several units, with three specimens deriving from Unit G4 (Figure 10-2). Two specimens of shell showing evidence of carving and apparently representing residual scrap were also recovered, DlLg-33:92A-11043 [4632A] (Section 10.1.3) and DlLg-33:92A-8862. These, plus the undrilled blanks, suggest that bead manufacturing was occurring at this location.

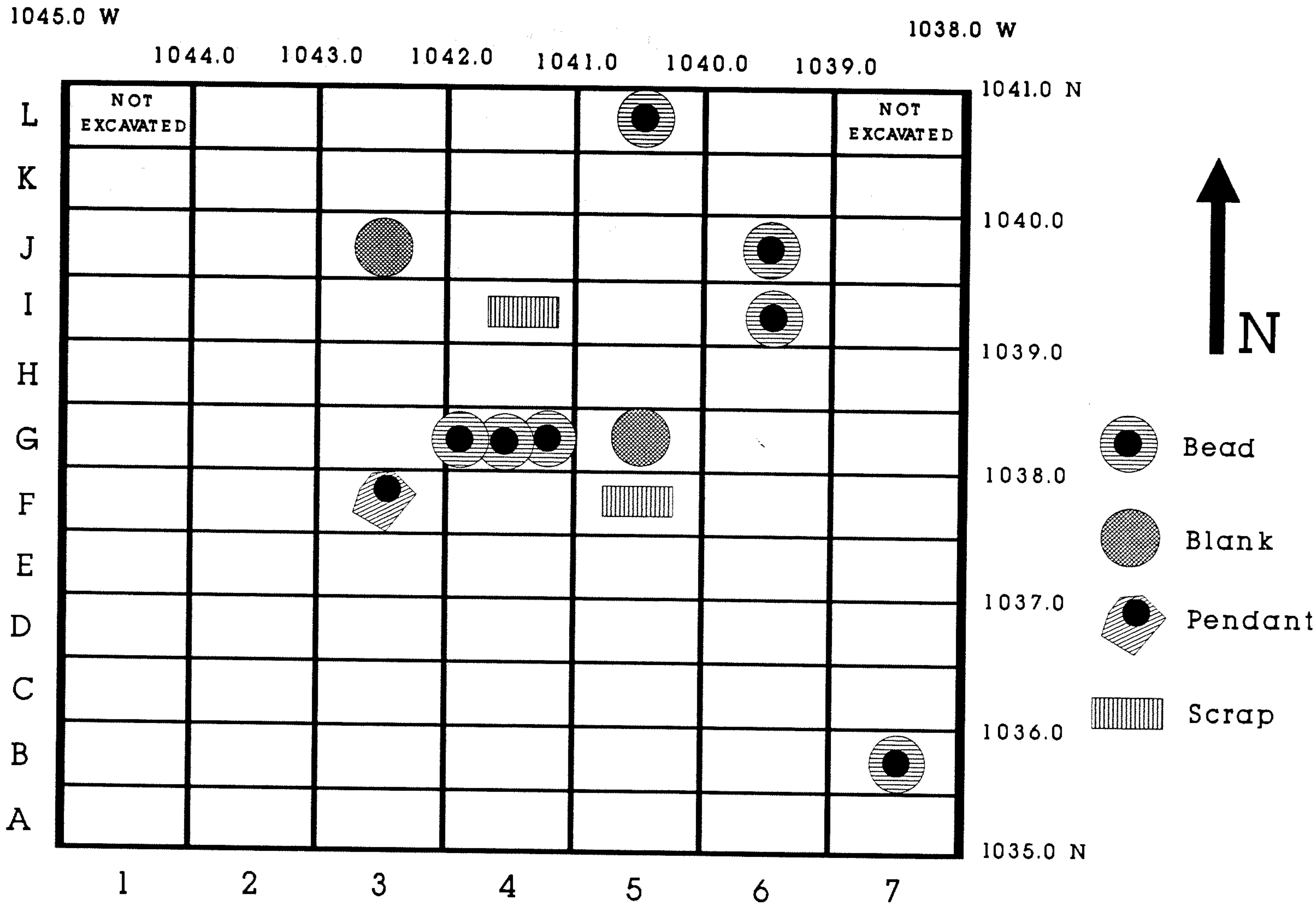


Figure 10-2: Distribution of Worked Shell

10.2.2 Description

The two scrap fragments indicate intentional cutting. The specimens have straight edges which cut across natural breakage lines. This is particularly evident in DlLg-33:92A-8862, which is a narrow rectangle. Other specimens may have resulted from shell manufacturing processes but post-depositional conditions caused a great deal of exfoliation and disintegration of small fragments.

The relevant data regarding the beads and blanks has been compiled in Table 10-4. It can be noted that the artifacts are fairly uniform in configuration with both the drilled and undrilled specimens having similar dimensions (Plate 10-1). The plate reference letters (a - j) follow the catalogue number in Table 10-4.

Several things should be noted regarding the description of these beads and bead blanks. Firstly, they are not all perfectly round. The shapes range from ovoid to a relatively circular shape. The edges of the beads and blanks are not all smooth - rather, many have an irregular bumpy surface. A few of the specimens show evidence of edge grinding, either for smoothing or shaping. Thus, the irregular edges, especially those of DlLg-33:92A-3154, 4957, and 9176, may be intentional and be the result of carving rather than micro-fractures of the shell during the manufacturing process.

Many of the specimens are very concave in cross-section. This characteristic is most apparent in DlLg-33:92A-5156 and 6232 and is due to the curvature of the parent material. This concaveness would depend on the portion of the parent shell from which the bead was carved, i.e., the closer to the hinges the sharper the curvature. The artisans may have chosen to carve beads from the stronger, thicker, curved portion of the shell rather than from the flatter, more fragile edge section.

The primary bore hole on all of the bead specimens was drilled from the interior surface with only two specimens having evidence of minimal drilling from the external side of the bore. This would make sense in that the interior surface appears to be the stronger side of the shell. In addition, the convex outer surface of the shell can be supported by placement on a semi-rigid surface, such as wood, and thereby reduce the probability of shattering during the drilling process. The bore holes were located at the centre of the bead or slightly off-set, except for three specimens (DlLg-33:92A-4958, 9176, and 9335). The location of the bore hole may be related to the final shape, i.e., DlLg-33:92A-9335 is rectangular. It also may be the result of re-shaping the artifact if one edge chips and that portion of the bead is re-carved as may be the case with DlLg-33:92A-4958 and 9176.

Two specimens, DlLg-33:92A-6232 and 8969 have been classified as shell bead blanks. The diameter of DlLg-33:92A-6232, 15.4 mm, is within the range of the beads, while the diameter for bead blank DlLg-33:92A-8969, 12.9 mm, is the smallest diameter of all the specimens. In terms of the thickness of these two blanks, DlLg-33:92A-6232 at 1.3 mm is within the range of all specimens while DlLg-33:92A-8969 is the thickest artifact (2.4 mm). Both blanks are complete with smooth edges and DlLg-33:92A-8969 shows some evidence of edge grinding.

CAT. #	ARTIFACT	CONDITION	DIAMETER	THICK	SHAPE	EDGE	BORE	DRILLING	BORE SITE
1182 (a)	Bead	Broken	18.8	1.3	Ovoid	Linear chords	3.7	Internal	Medial ?
2524 (b)	Bead	Broken	13.8	2.0	Circular	Smooth; Ground	3.8	Both Sides	Medial ?
3154 (c)	Bead	Complete	13.3	1.3	Circular	Irregular bumpy	2.9	Internal	Medial
4957 (d)	Bead	Complete	15.3	1.9	Circular	Irregular bumpy	3.4	Internal	Slight Off-set
4958 (e)	Bead	Complete	13.7	1.1	Circular	Crenulate	3.1	Internal	Off-set
5156 (f)	Bead	Complete	15.8	2.2	Circular	Crenulate	3.8	Both Sides	Slight Off-set
6232 (g)	Bead Blank	Complete	15.4	1.3	Circular	Smooth	-	-	-
8969 (h)	Bead Blank	Complete	12.9	2.4	Elliptical	Smooth; Ground	-	-	-
9176 (i)	Bead	Complete	13.5	1.4	Circular	Irregular bumpy	3.3	Internal	Offset
9335 (j)	Pendant	Chipped	L=14.6 W=13.7max 11.1min	2.2	Rectanguloid	Smooth; Ground	2.7	Internal	Top Margin

Table 10-4: Description of Shell Beads, Bead Blanks, and Pendant

DlLg-33:92A-9335 was originally identified as a shell bead. On further examination, it is possible that this artifact may be an irregular-shaped rectangular shell pendant. It is small in size with the length being 14.6 mm and the width tapering from 13.7 mm at the top to 11.1 mm at the bottom. The bore hole is 2.7 mm in diameter and is drilled from the internal to the external surface at the apex of the artifact. The artifact is broken across the drill hole but otherwise appears to be complete.

The species of shell from which the beads, bead blanks, and pendant were made could not be identified. Most landmarks used for species identification are in the hinge region. The artifacts were made from shell taken from the ventral portion of the valve and therefore, contained no identifying characteristics.

It should be noted that two other similar specimens were recovered from adjacent archaeological projects. DlLg-33/89B-2143, a broken discoidal bead (10 mm diameter, 1.9 mm thick, bore diameter of 3.5 mm) was recovered from the Ramp B locus during the mitigation of the Assiniboine Riverfront Quay (Kroker and Goundry 1993:127). The hole, on this artifact, was drilled from both sides. A second complete shell bead (DlLg-33:92C-111), was recovered during mitigation actions for the Johnston Terminal Refurbishment Project (Quaternary n.d.). This specimen is circular with an irregular ragged edge. The dimensions are 12.1 mm diameter, 1.7 mm thick, and a bore diameter of 3.7 mm. Again, the hole was bored from both directions.

10.2.3 Literature Review

A cursory review of the literature reveals that similar shell artifacts have been recovered at sites both south and west of The Forks. Many of these sites occur on or near rivers: the Red, the Assiniboine, the Qu'Appelle, the Rainy, the Missouri, the Knife, the James and the Republican. This region encompasses Saskatchewan, North Dakota, Minnesota, South Dakota, and Nebraska.

At the Long Creek Site in southeastern Saskatchewan (Wettlaufer *et al.*, 1960), shell beads and bead blanks were found at three different levels. In Level 1 there were three bead blanks and one bead recovered (no measurements were noted). This level was called the Hidatsa-Fall River Culture and dated A.D. 1500-1600 (1960:30-32). In Level 3, ascribed to the Besant Culture and dated at 377 ± 325 AD, a single shell bead was recovered. No measurements are listed, however the authors note that "The perforation is made from one side only and shows signs of wear, probably from having been strung" (1960:42). In Level 8, described as the Oxbow Culture (2693± 150 B.C.), a broken irregular piece of drilled shell was recovered (1960:62, 68). The bore hole on this specimen has been drilled from both sides. This artifact may be a portion of a pendant but it is really too broken to tell.

Also, beads have been recorded as being recovered from Stoney Beach and Long Lake in southcentral Saskatchewan (Orchard, 1946:105, 108). Orchard depicts two irregular "pearl beads and discs" and only suggests that these might be gaming pieces. No measurements were provided and the photograph indicates that the Lake Midden (Long Lake) specimens may be thicker than those recovered from The Forks. These artifacts derive from a ceramic horizon.

At the Elbee Site (a Plains Village site - ca A.D. 1100 to 1400) on the Knife River in North Dakota two beads were recovered (Ahler *et al.*, 1984). One, a complete specimen, is 9.5 mm in diameter, 1.5 mm thick with a 2.0 mm bore hole. The other bead is broken but measures 10 mm in diameter and is 2 mm thick with a bore hole of 4 - 5 mm. In addition to the beads, six shell disks were recovered. These range in size from 18 to 21 mm in diameter and 1.8 - 4.5 mm thick. The finds at the Elbee Site are interesting in that Ahler et al. (1984:187) feel that the six disks cannot be considered shell beads, based on the variation in size. Rather those researchers suggest that the disks were "...used...as markers in a game or similar recreational activity." The measurements of these 'gaming disks' fall directly into the range of measurements of the shell beads identified at The Forks.

Sites on the Missouri River and where the Knife River meets the Missouri in North Dakota produced a variety of shell artifacts including circular or elliptical shell disks ranging from 14 - 20 mm in diameter and disk beads ranging from 5 - 30 mm in diameter with thicknesses of 4 - 5 mm, and hole diameters of 1 - 5 mm (Lehmer 1978:302-308). The range of diameters and bore holes encompass the range of measurements of The Forks specimens. The only difference appears to be that the Lehmer specimens are thicker. In addition, shell pendants were recovered. Lehmer describes these as being triangular, rectangular, or irregular in shape. The two rectangular specimens were 20 x 10 mm and 29 x 13 mm in size with both being 2 mm thick and having bore holes 2 mm in diameter. The pendants from these Knife River Phase (A.D. 1780-1845) sites in North Dakota are both much larger in size than the possible pendant from The Forks. Unfortunately there are no photographic plates in Lehmer's report with which to compare.

At the Naze site on the James River in North Dakota one washer-shaped bead with a diameter of 5.1 mm, a thickness of 1.1 mm, a central hole, and a ground edge was recovered (Gregg *et al.* 1987:404). This single bead was an isolated find at this site as, according to the researchers, "neither beadmaking debris or other modified shell artifacts were identified" (1987:404). In addition, the researchers hypothesized that "...the thinness [of the bead] resulted from weathering or some other erosive process" (1987:404). However, the thickness of this artifact falls directly into the parameters of thickness for The Forks bead specimens. This report also mentions that "washer-shaped beads were recovered from probable Middle Plains Woodland contexts at the Beeber site (32LM235) during investigations carried out in 1975 and 1984" (Gregg *et al.* 1987:404).

Webster, in Stoltman *et al.* (1973), writing on the NonCeramic artifacts from Laurel Culture sites excavated prior to 1961 in Northern Minnesota, discusses the find of shells beads in the McKinstry Mound located on the Little Fork River which runs into the Rainy River. Two necklaces of discoidal shell beads (3000 beads) was recovered in conjunction with two burials. A typical bead from McKinstry Mound 1 measured 10 mm in diameter and was 4 mm thick (Stoltman *et al.* 1973:107). Webster suggests that these beads were manufactured from the columellae of conch shells, which would derive from the Gulf of Mexico and the Caribbean. Webster assigns these to the Blackduck Phase. Three other beads were recovered from McKinstry Mound 2 and described only as being "...unlike the ones described above..." (Stoltman 1973:110). Webster does say these three beads were manufactured from clamshell and found, in the burial, with copper and snail shell beads. These last three beads sound more like the specimens recovered from The Forks. The Laurel period in Northern Minnesota dates from 100 B.C. to A.D. 600-800, with the Blackduck period post A.D. 1000.

At the Black Partizan Site (A.D. 1400-1700) on the Missouri River in South Dakota, Caldwell (1966:70-71) describes a single disk bead, 12.8 mm in diameter, 2.3 mm thick with a bore hole of 3.0 mm. This bead is slightly smaller in diameter than The Forks shell beads but it falls directly within the range of the thicknesses and the bore hole diameters. Caldwell suggests that the material of the Black Partizan specimen could be *Lampsilis luteolus*. Robert and Dick (Section 10.1.1) have identified the Lampsilinae family as being present in the mussels recovered from The Forks 1992 project and specifically, *Lampsilis radiata siliquoidea*.

In addition to the bead from the Black Partizan Site, Caldwell (1966:70-71) also identifies shell pendants. One, in particular, is somewhat similar to DlLg-33:92A/9335. Caldwell's pendant measures 27.0 mm in length, 15.2 mm in width, and 2.2 mm in thickness. This pendant is uniform in size and longer than The Forks pendant. However, DlLg-33:92A/9335 is close in the width measurement at its larger end and identical in thickness to the Black Partizan Site pendant. Caldwell also suggests that the material used for the Black Partizan Site pendant was possibly *Actinonaias ligamentina*. Robert and Dick have identified the presence of *Actinonaias carinata* in the 1992 assemblage. This species has only recently been found to occur in Manitoba (Robert 1993:pers. comm.).

At the Dodd Site on the Missouri River in South Dakota, Lehmer (1954:70, 72) noted that shell beads and shell disks were recovered. The beads were discoidal in shape and the mean diameter was 10 mm with a mean thickness of 4 mm. These were again smaller in diameter but slightly thicker than the shell beads from The Forks. The disks were described as being 21 mm and 37 mm, both larger than the bead blanks from The Forks. In addition, Lehmer (1954:70, 72) describes a shell disk, 32 mm in diameter, which he suggests is a pendant that has been "drilled for suspension." According to the drawing of this artifact, the bore hole is centrally located. In Lehmer's report on The Knife River Phase (1978:304), he describes a shell bead that is 30 mm in diameter with a centrally placed hole. It is probable that his earlier specimen is also a bead rather than a pendant. Two cultural periods are represented at the Dodd Site: Initial Middle Missouri (A.D. 950 - 1300) and Post-Contact Coalescent (Post A.D.1650).

At the Massacre Canyon Site on the Republican River in Nebraska, Kivett (1952:23-24, 82) describes two groups of beads recovered from a Woodland occupation. The first group consists of disk beads, in association with a burial. Some are bead blanks. The diameters range from 13-17 mm, with thicknesses of 3-11 mm. The majority are drilled from the interior. The second group of beads is described as being slightly larger than a 25¢ piece, 3 - 5 mm thick, with perforations 2 -5 mm in range. The perforations are biconical although the inner surface appears more reamed out than the external surface. The photographic plate of these beads show them to be somewhat smoother on the edges and more evenly circular in shape than those from The Forks. The Group 1 beads from Massacre Canyon are within the same diameter range as The Forks sample although some of the Group 1 beads appear to be quite a bit thicker. The Group 2 specimens are thinner and thus are similar to The Forks beads but their diameters appear to be slightly bigger.

10.2.4 Discussion

From the foregoing literature review, it can be noted that the beads, bead blanks, and pendant recovered from The Forks are not a unique find. These artifacts occur in other locations at various time periods. With the exception of the Long Creek Level 8 (Oxbow) recovery, the majority of the reports reviewed derive from Postcontact or Precontact ceramic occupations. The Forks specimens, dating 3000 B.P., appear to be the oldest recovery in the northcentral plains, to date.

As is evident, this class of artifact transcends both temporal and apparent cultural boundaries. It appears to have maintained an extraordinary longevity, extending from the Archaic (The Forks, Long Creek) through to Postcontact archaeological sites (Knife River Phase). Ethnographic documentation shows that shell was used extensively throughout North America as a material for decorative purposes. In addition to personal adornment (Karklins 1992:105, 119), shell ornamentation often connoted economic status (Yenne 1986:92, 187). Not only were shell beads used to decorate the individual or her/his clothing but shell was used to decorate items such as baskets (Dockstader 1973:210; Yenne 1986:126).

Aspects of manufacture such as edge grinding has been noted on shell specimens from the Elbee Site, Knife River sites, and the Black Partizan site. Again, there does not seem to be temporal or geographical parameters to this facet. Three artifacts from The Forks, DlLg-33:92A-2524, 8969, and 9335, have some evidence of grinding. The presence or absence of this trait may be a matter of personal idiosyncrasy rather than adherence to a cultural norm. Alternatively, the edge grinding may depend upon the ultimate use of the artifact, i.e., smooth edges for buttons versus unground edges where an irregular circumference is seen as the finished product (crenulate, etc.).

While it seems likely that these artifacts represent decorative items, it has been speculated that they could have been used as fish lures. The preponderance of the entire artifact assemblage indicates a strong orientation towards fishing and fish processing by the occupants of this location (Sections 6, 8, and 9). Identification by association provided impetus to the supposition that the shell artifacts were fishing paraphernalia. However, no evidence of fish hooks were found - a prime requirement for line fishing requiring lures. Secondly, lures broken during usage would be lost in the water and the percentage of recovered broken artifacts would be minimal. The percentage of broken specimens is 30% of the total amount (counting the pendant). Because of this high percentage it is unlikely that the drilled shell specimens would be lures. Therefore, until further evidence can be found which may support this speculation, these artifacts are interpreted as decorative beads.

10.3 NATURALLY DEPOSITED SPECIMENS

by *Sid Kroker*

10.3.1 Introduction

Freshwater snails and fingernail clams have the potential of providing palaeoenvironmental data about the climatic regimen, the quality of the water, the type of bottom of the riverbed, and possible aquatic and shoreline vegetative habitats. With these potentialities in mind, specimens were collected during the excavations. However, in contrast to the freshwater clam specimens, only representative samples of the aquatic snails and fingernail clams were collected.

In the Zone 1 stratum, 119 catalogue numbers consisting of 343 specimens were curated. Recoveries from Zone 3 were 178 catalogue numbers (574 specimens). This class of specimens was sparse in Zone 3B with only 3 catalogue numbers (3 specimens) present.

The similarity of the morphology between several species precluded detailed identification. The complexity of the ecological niches represented by various species require the attention of a specialized researcher. The specialized nature of this facet of malacology resulted in under-utilization of the potential of this class of recovery for palaeoecological analysis. At the present level of analysis, only broad identifications will be attempted.

10.3.2 Identifications

Within the assemblage, three broad identifications could be made. The family of fingernail or pea clam (Sphaeriidae) are part of the mollusc order (Pelecypoda) and are miniature clams. The average size was about half the size of a dime. The aquatic snails (Gastropoda) consisted of two major families - conical spiral snails (Lymnaeidae) and flat coiled snails (Planorbidae).

Based upon distribution maps (Clarke 1981), two genera of Sphaeriidae could be present at The Forks. These contain at least twenty possible species. Seven probable and two more possible species of *Sphaerium* could be present. The genus *Pisideum* has thirteen species whose range includes The Forks. Most, but not all, prefer vegetative area with a mud substrate. Within the Lymnaeidae, fourteen species representing nine genera could occur at the site. All but one of these species prefer vegetated mud substrates. A similar situation applies to the Planorbidae where eleven species representing five genera have ranges which include The Forks. All species prefer muddy substrates with vegetation.

10.3.3 Zone 1 Distribution

Recoveries from Zone 1 consisted of six Sphaeriidae valves from four units, 150 Lymnaeidae specimens, 135 Planorbidae specimens, and 40 specimens that could not be identified beyond Gastropoda. The Sphaeriidae occurred in the northeast portion of the excavation area, with a minor presence in the extreme southwest (Unit B2). Both families of the gastropods had similar distributions: a major concentration centred around Unit I7 and minor presences in the northwest portion of the area and across the southern section of the excavation area.

10.3.4 Zone 3 Distribution

Only fourteen specimens of Sphaeriidae were recovered, along with 97 Lymnaeidae. The dominant taxon was Planorbidae with 418 specimens. Forty-five specimens were too fragmented to be identified beyond Gastropoda. The densities of these taxa are portrayed in Figure 10-3.

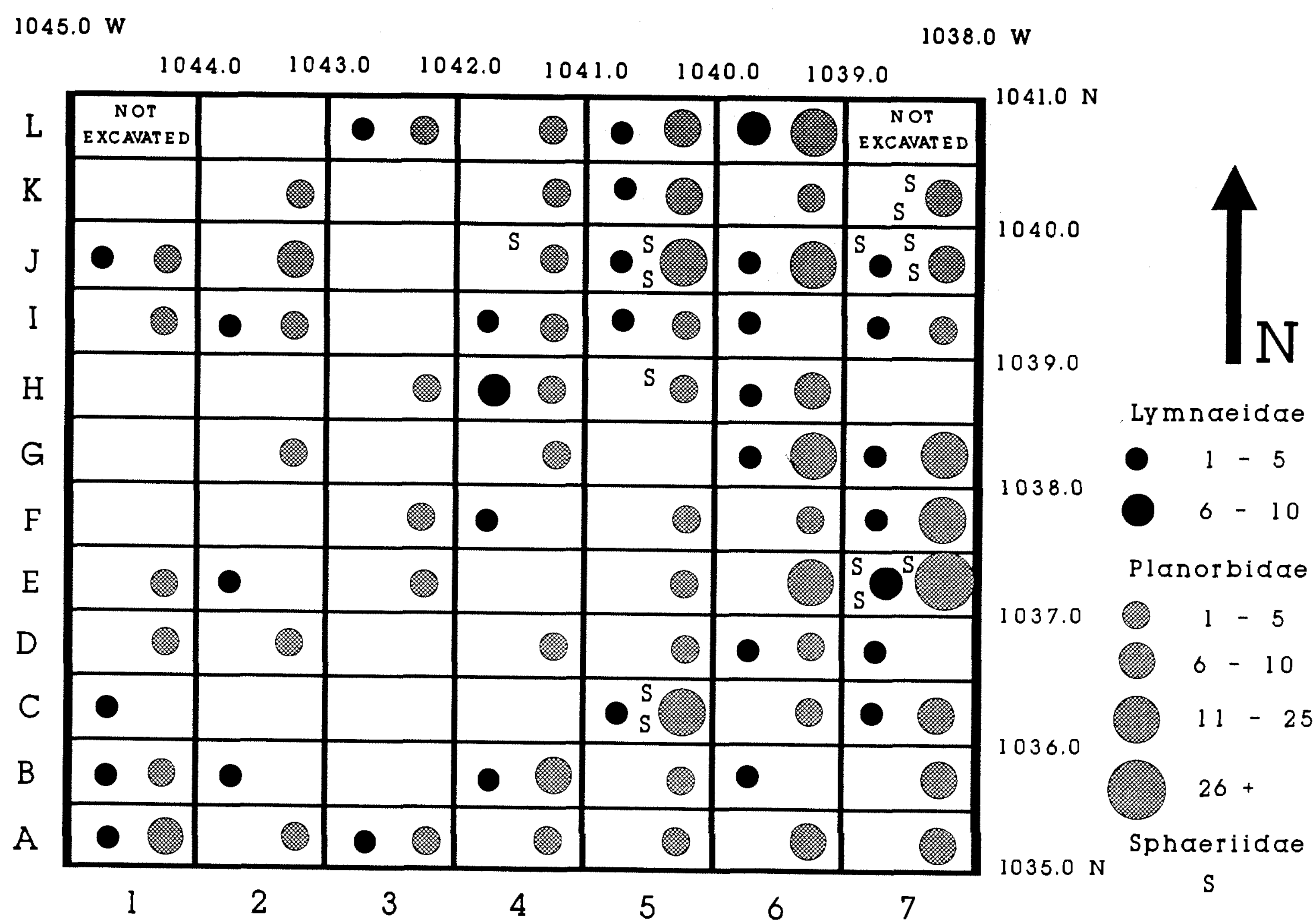


Figure 10-3: Zone 3 Distribution of Fingernail Clams and Aquatic Snails

Because of the representative sampling, the distribution map is subjective. If only one or two specimens were observed during the water-screening operation, they would have been both collected. However, if scores of specimens were present, only a small selection would have been curated. Given this caveat, the map still shows a degree of patterning. There are two distinct clusters of Sphaeriidae - in the northeast and east-central portions of the area. While both Lymnaeidae and Planorbidae occur across the site, the densest concentrations are in the eastern half.

10.3.5 Discussion

The presence of the Sphaeriidae specimens can be assumed to result from riverine flooding and incorporation in the silt deposition related to spring floods. Also, predicated upon a riverine transport, the distribution could indicate original depressions or swales at the location which trapped receding flood waters, thereby concentrating the frequency of specimens.

A similar explanation could account for the presence of the gastropods. However, an alternative explanation for the presence, particularly for gastropods, could be the harvesting of aquatic vegetation by the occupants of the site. Most species of aquatic snails prefer habitats with moderate to dense vegetation and could have been carried to the site while attached to the plants. The patterns of distribution suggest that most of the specimens are located to the northeast of the linear hearth and around Unit E7. If this is the case, the probable use of the aquatic plants would have been as damp material placed upon the fires to create smudges for mosquito alleviation or as a flavouring agent for the smoking of the processed fish.

10.4 References

Ahler, Stanley A., Carl R. Falk, Lauren Ritterbush and Julieann Vannest

1984 Archeological Investigations at the Elbee Site, 32ME408, Knife River Indian Villages National Historic Site. University of North Dakota, Department of Anthropology and Archeology, *Contribution* No. 29. Grand Forks.

Burch, J.B.

1975a *Freshwater Sphaeriacean Clams (Mollusca: Pelecypoda) of North America*. Rev. ed. Hamburg, Michigan: Malacological Publications.

1975b *Freshwater Unionacean Clams (Mollusca: Pelecypoda) of North America*. Rev. ed. Hamburg, Michigan: Malacological Publications.

Caldwell, W.W.

1966 The Black Partizan Site. Smithsonian Institution, Bureau of American Ethnology, River Basin Surveys, *Publications in Salvage Archaeology* No. 2. Lincoln, Nebraska

Clarke, Arthur H.

1981 *The Freshwater Molluscs of Canada*. National Museum of Natural Sciences. National Museums of Canada. Ottawa.

Dockstader, Frederick J.

1973 *Indian Art of the Americas*. Museum of the American Indian, Heye Foundation. New York.

Gregg, Michael L. (Ed.)

1987 *Archeological Excavation at the Naze Site (32SN246)*. Department of Anthropology, University of North Dakota. Grand Forks. Prepared for the U.S. Department of the Interior.

Karklins, Karlis

1992 *Trade Ornament Usage Among the Native Peoples of Canada. A Source Book*. Environment Canada, National Historic Sites Parks Service, Studies in Archaeology, Architecture and History. Ottawa.

Kivett, Marvin F.

1952 Woodland Sites in Nebraska. Nebraska State Historical Society. *Publications in Anthropology* Number One. Lincoln.

Kroker, Sid and Pamela Goundry

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay*. The Forks Renewal Corporation, Winnipeg.

Lehmer, Donald J.

1954 Archeological Investigations in the Oahe Dam Area, South Dakota, 1950-51. Smithsonian Institution, Bureau of American Ethnology, River Basin Surveys, *Bulletin* 158. Washington.

Lehmer, Donald J., W. Raymond Wood, and C.L. Dill

1978 *The Knife River Phase*. Department of Anthropology and Sociology, Dana College, Blair, Nebraska and American Archaeology Division, College of Arts and Sciences, University of Missouri-Columbia, Columbia, Missouri.

Orchard, W.J.

1946 *Kitchen Middens (Prehistoric Campsites)*. School Aids and Text Book Pub. Co. Ltd., Regina.

Quaternary Consultants Ltd.

n.d. Archaeological Mitigation for the Johnston Terminal Refurbishment Project. Report on file with Marwest Management Canada Ltd., The Forks Renewal Corporation, Manitoba Culture, Heritage, and Citizenship, Historic Resources Branch. (In preparation)

Stoltman, James B., Paul W. Lukens, Jr. and David L. Webster

1973 The Laurel Culture in Minnesota. Minnesota Historical Society. *Minnesota Prehistoric Archaeology Series*, No. 8. St. Paul.

Wettlaufer, B., W.J. Mayer-Oakes, B.A. McCorquodale, A. La Rocque, J.S. Clayton and W.K. Janzen

1960 The Long Creek Site. William J. Mayer-Oakes (Ed.). Saskatchewan Museum of Natural History. *Anthropological Series* No. 2. Regina.

Yenne, Bill

1986 *The Encyclopedia of North American Indian Tribes*. Bison Books Limited. London, England. [Reprint - 1992]

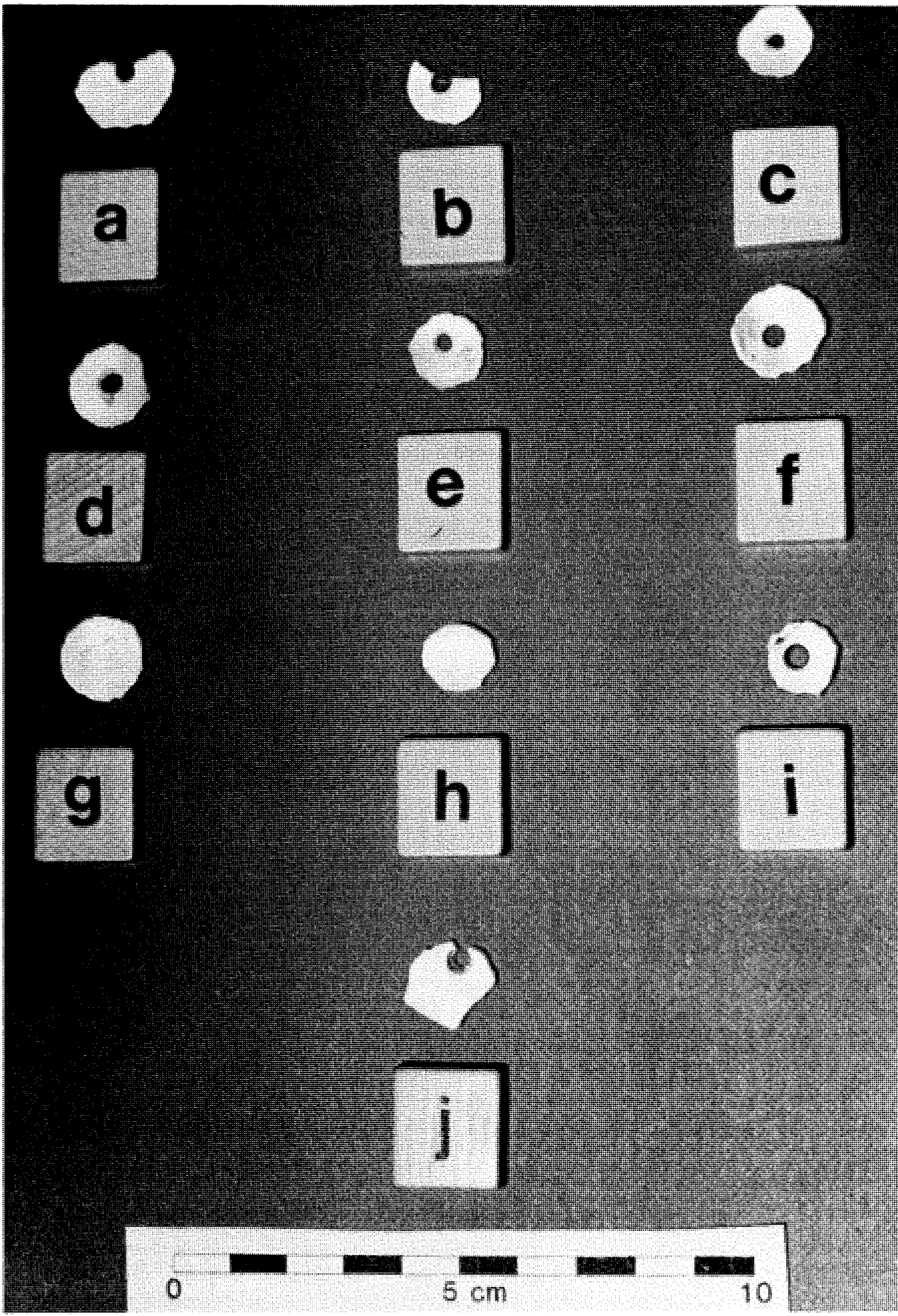


Plate 10-1: Shell Beads, Bead Blanks, and Pendant

11.0 INTERPRETATION

by *Sid Kroker*

Archaeological interpretation is an attempt at finding the best fit between a series of activities or events that may have happened and the archaeological recoveries. Most activities that occurred in the past resulted in some residue that become incorporated in the soil and thus became part of the archaeological record. The everyday act of cooking a meal can provide several types of residue: the charcoal and ash from the burned wood, the bones from the meat that was part of the meal, the particular placement of rocks which surrounded the fire, etc. From all of these different types of evidence, an understanding of the event is slowly compiled. The charcoal can be identified to indicate which types of trees were burned and therefore how hot the fire was. Plant seeds can also indicate part of the diet. Identification of the bones can show what species were available and how the meat was butchered. Every recovery provides a tiny portion of the picture of the event.

11.1 The Hudson's Bay Flour Mill

The Flour Mill was demolished in 1907 and all surface indications of its presence were eliminated, first by the demolition and clearing activities and then by the deposition of about one meter of cinders and gravel during the railroad period. While recorded in historical archives, the exact placement of the structure was unknown until the 1988 North Assiniboine Node Assessment. During that project, the infilled cellar of the main structure was located. Using a 1906 insurance plan (Guinn 1980a:Figure 71) and a series of maps of the railyard (Guinn 1980a:Figure 43 [1877];Guinn 1980a:Figure 62 [1888];Guinn 1980a:Figure 65 [1895];Guinn 1980a:Figure 68 [1895];Guinn 1980a:Figure 70 [1903];Guinn 1980a:Figure 74 [1904]), the extent and placement of the remainder of the complex could be plotted on the map of The Forks.

Guinn (1980:115) notes that the steam-powered grist mill was erected in 1874 at a cost of $27,552.00 and was situated beside the riverboat warehouses. Berkowski (1987:52) has the date of construction as 1876, but both authors agree on the size of the three and one-half story (60 feet high) structure (57 x 37 feet). The attached, one story engine shed, measuring 38 x 44 feet (Berkowski 1987:52), can be seen in early photographs (Berkowski 1987:Figure 10; Guinn 1980a:Figure 52; Guinn 1980a:Figure 60). This component of the mill is attached to the south and west sides of the main structure (Guinn 1980a:Figure 62) with a tall smokestack, estimated at 90 feet, on the south side. This shed is listed by Guinn as both 26 x 43 feet (1980:142) or 44 x 50 feet (1980:143). His reference was to an 1890 HBC inventory which details its construction as brick with a shingle roof and an iron smokestack. The 1906 insurance map provides measurements of an L-shaped structure 44 x 50 feet).

When constructed, the mill was leased to J. H. McLane, a former river boatman, who operated the industry until 1881 when the Hudson's Bay Company took over direct management. Co-incident with the change in management, the complex was renovated and modernized. Other changes were made in 1885 (Guinn 1980a:142). These must have been internal, as portrayal of the complex on the 1888 map is the same as the 1877 map. Some of this modification, during either of the two episodes could have been the rebuilding of the engine shed in brick, inasmuch as the earlier photographs show it to be a frame construction. Also, the concrete floor of the cellar, located in 1988 (Kroker 1989:165-166), could have been poured during one of these renovations. This concrete pad was assumed to be the central square depicted on the 1906 insurance map (Figure 11-1) and, as such, was used as the focal point for all subsequent mapping of the former locations of the structures on current maps.

During the 1988 archaeological investigation, it had been assumed that the pilings encountered in Trench 6 represented the foundation supports of one of the walls of a building of the mill complex (Kroker 1989:168-170). Based upon the 1906 measurements, it was posited that this would be the north wall of the original mill (Kroker 1989:Figure 18). However, the mill was constructed in 1874 (or 1876) and the recently obtained dendrochronology analysis of the pilings give dates of 1881 and 1888 (Section 5). This gives rise to certain contradictory possibilities:

(A) the cellar, discovered in 1988, is not the square in the centre of the structure on the 1906 insurance map, as hypothesized;
(B) the pilings could have been put in place during the re-building of the engine room, prior to 1890, in which case they would represent the north wall of the new brick structure;
(C) the pilings represent a foundation from a structure, built after 1888 (cf. Guinn 1980a:Figure 62) and prior to the 1890 inventory. The only structure that fits this timeframe is the 30 x 60 feet Feed Storage Building, adjoining the mill on the west side;
(D) the original mill structure was rebuilt, or moved, onto a foundation composed of the observed pilings; or
(E) the dendrochronology dates do not represent the true dates of construction.

In considering these possibilities, Option E must be rejected as the fit of the piling tree ring curves are extremely close to the Winnipeg master curve. If the trees had been obtained from an extra-local area, the climate in this other region would have had to have been identical to the Winnipeg climate but occurring a decade or more earlier.

It is unlikely that a stable building, in continuous operation, would be dismantled without any reference to the event occurring in the archival literature (Option D). The possibility of moving the structure sideways onto a more stable foundation is feasible, although unlikely as the mill is a massive structure filled with heavy machinery. The same objection would apply to jacking up the building and placing a new piling foundation underneath it. If either of these were the case, the operation could have occurred in conjunction with the re-building of the engine room, prior to 1890. A minor lateral displacement would not be noted on area maps.

The possibility that the pilings represent the Feed Storage Building (Option C) would mean that the entire complex would be displaced eastward by at least fifty feet from the location on the 1906 insurance map. This would place the linear warehouse/office component close to the Canadian Northern Railway mainline track as depicted on the 1903 map (Guinn 1980a:Figure 70). However, the discrepancy between the 1903 map and the 1906 is the distance between the mill and the warehouse/office - 20 feet on the insurance map and 90 feet on the 1903 map. In addition, the

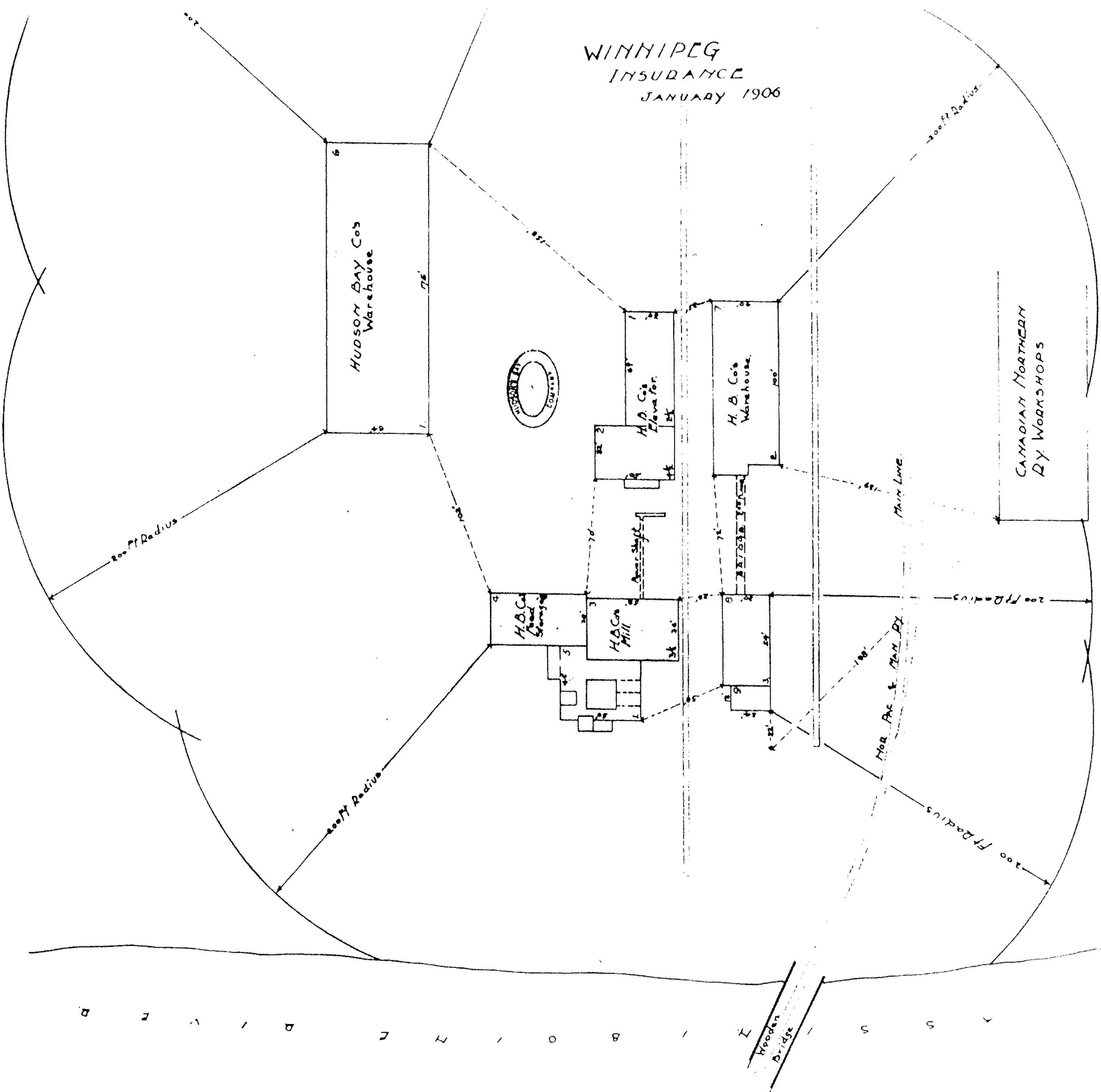


Figure 11-1: 1906 Insurance Map of HBC Flour Mill Complex (from Guinn 1980a)

acceptance of this possibility would require the presence of another structure immediately south of the Feed Storage Building - a structure not shown on any map or noted in the inventory.

After rejecting the above three possibilities, Options A and B must be considered. Option B would fit with the dates provided by the dendrochronological analysis. If Option B is accepted, then Option A becomes implicit as the corner of the concrete cellar pad was located at 1021N/1040W (Kroker 1989:Figure 15) and the pilings occur at 1035N/1037-1039W (Kroker 1989:Figure 16; this report: Figure 4-2). The distance between the concrete pad and the line of pilings is 14 meters (44 feet) - the maximum width of the engine room structure. Given the numerous discrepancies between the archival texts and the graphic portrayals (compare Guinn 1980a:142-143 and Guinn 1980a:Figure 71) in terms of building dimensions and heights, it is quite possible that both Option B and Option A are partially correct.

11.2 Zone 1

As has been previously noted, budgetary considerations precluded detailed analysis of the recoveries from Zone 1 at this time. The horizon, due to stratigraphic similarity to Ramp A (Kroker and Goundry 1993:117, 125), has been tentatively dated to 2200 years ago. The recoveries were relatively sparse in comparison to those from Zone 3 and Zone 3B.

To date, identification of the charcoal indicated that the dominant species was ash, followed by elm and maple. Seeds from bindweed and hazel were recovered and, as they were uncharred, may be natural deposits indicating the local vegetation. The lithic artifacts and the faunal remains have yet to undergo detailed analysis.

A preliminary speculation is that this horizon represents a short-term occupation by a small group of people. Alternatively, the recoveries could represent the periphery of a more extensive, denser cultural deposit caused by the occupation of a larger group for a longer period.

11.3 Zone 3 and Zone 3B

Based upon the stratigraphic relationship of Zone 3 and Zone 3B, it would appear that these are two distinct occupations, separated by a short period of time. Other evidence, deriving from the 1988 investigations, suggest that the site was repeatedly visited, perhaps on a seasonal basis (Kroker 1989:176).

11.3.1 The Environment

The area adjacent to The Forks has probably always supported a riverine gallery forest. At different periods, this forest would be in different stages of succession, depending upon climatic condition and major events such as floods and fires. The vegetation would probably have been similar to that which is observed today in unaltered areas along the Red River (Morgan 1989; Shay *et al.* 1991). While the frequency of individual species would have definitely varied over time, the basic composition of the forest would have been relatively uniform. Major arboreal species include bur oak (*Quercus macrocarpa*), Manitoba maple (*Acer negundo*), black and green ash (*Fraxinus nigra, F. pennsylvanica*), elm (*Ulmus americana*), basswood (*Tilia americana*), cottonwood, aspen, and poplar (*Populus deltoides, P. tremuloides, P. balsamifera*), and willows (*Salix amygdaloides, S. interior*). Shrubs and herbs would be present as an understory within the forest, with aquatic vegetation in and along the rivers.

The charcoal analyses confirm the presence of most of these species within the archaeological context of the site (Section 7). The occupants would have used available resources, selecting specific plants for specific uses. Basswood is the only tree species from the above listing which was not noted in the charcoal recoveries. A single conifer fragment was recovered, probably indicating wood which had been brought to the site by northern or eastern visitors.

Only two species were identified through the seed analysis. Hedge bindweed, or wild morning glory (*Convolvulus sepium*), is, and would have been a component of the gallery forest understory. The presence of uncharred seeds probably is the result of natural deposition. A similar case may be made for the presence of the uncharred hazel (*Corylus* sp.) specimens. Conversely, they may indicate utilization of this species as a food source.

11.3.2 The People

The first step in attempting to identify the occupants of the site is to examine those tools which seem to be culturally diagnostic, that is, the items that most members of the group made in a similar fashion and shape. Decorative styles of pottery are often used as a cultural indicator, in conjunction with tools such as projectile points. With the occupation of this site pre-dating the development of pottery in Manitoba, the primary cultural indicators become the projectile points.

In the various archaeological investigations which have excavated components of the Archaic horizon [North Assiniboine Node Assessment (Kroker 1989); Stage I Construction (Kroker and Goundry 1990); Assiniboine Riverfront Quay (Kroker and Goundry 1993); and Johnston Terminal Refurbishment (Quaternary n.d.)], only five projectile points have been recovered. Four of these were excavated during this project and the fifth was recovered during the 1988 investigations. Examination of these artifacts shows that there are four different lithic materials and three very distinct styles.

The material types derive from widely separated areas: the Swan River chert from western Manitoba, the rhyolite from the Canadian Shield to the north and east, and the Knife River Flint from North Dakota. The quartzite, from which two artifacts are made, probably derives from glacial deposits and, as such, cannot be sourced. When the styles of the projectile points are considered, there is again regional separation: the two Hanna-like points being representative of a Plains culture (Plate 6-4a,b), the Shield Archaic specimen (Plate 6-4e) being similar to artifacts recovered from Shield Archaic occupations within the Boreal Forest, and the third style (Plate 6-4c) which does not readily fit into the current typologies. The broken blade (Plate 6-4d) appears to most closely resemble the upper portion of the blade of the third style.

It has already been noted that the two Hanna-like projectile points are made of different materials and exhibit different flaking patterns, probably indicating manufacture by different members of the same cultural group. Both of these specimens (DlLg-33:92A-1348 and 1713) closely resemble the point from Childs Lake, depicted by Badertscher (1982:Plate 32c) as well as others in a collection by Arden McConnell (Badertscher 1982:Plate 44). These western specimens come from a locality adjacent to the Assiniboine River as it curves northward by the Duck Mountains. This style of point, with what appear to be regional variants, is also noted in Alberta, Montana, and Wyoming. The dominant lithic material in the Duck Mountain area would be Swan River Chert. The presence of one of these types of projectile points in Knife River Flint indicates either a visitation to the quarry sites in North Dakota by one or more members of the group or trade interaction with individuals accessing the Knife River Flint quarries.

The Shield Archaic point (DlLg-33/88D-1345) has a strongly convex base - one of the main identifying characteristics of this type recorded throughout the Boreal Forest Area, especially to the east and north. It, also, is made of an extra-local material - Swan River chert, which again suggests trade interaction with western groups or travel to the sources to obtain this lithic material.

The third style, represented by one complete specimen (DlLg-33:92A-6104) and, perhaps, by the incomplete blade fragment (DlLg-33:92A-1349), is more difficult to place in a geographic or cultural context. While it has some attributes similar to the Hanna-like points (asymmetric notching, slightly convex base), the longer, narrower, ovate-lanceolate blade indicates considerable divergence from the Hanna norm. A closer fit occurs with some of the Larter Phase projectile points recovered from LM-8 at Caribou Lake, on the east side of Lake Winnipeg (Buchner 1979:Plate 7q,x,y). The complete specimen (DlLg-33:92A-6104) is made from the same grey-brown quartzite as one of the Hanna-like points (DlLg-33:92A-1713). The broken specimen is composed of rhyolite, a material which would be available in the Canadian Shield along the east side of Lake Winnipeg.

As a point of speculation, this third, unnamed style could be the result of the fusion of two technologies. As noted, the basal attributes show some convergence with those of the Hanna type. The blade characteristics have a degree of affinity with those of the earlier Raddatz side-notched projectile points. A cultural horizon containing this type of projectile point, in association with Old Copper artifacts at LM-8, was dated at 1920 $\pm$ 190 B.C. and 1710 $\pm$ 75 B.C. (Buchner 1979:90). In fact, one projectile point resembling this style occurred in the same horizon (Buchner 1979:33, Plate 5e) and Buchner states that "it is possible that this point is a representative of the assemblage of the subsequent occupation (*Larter Phase*) occupation at the site, but and examination of its context revealed no evidence that it was intrusive at this depth."

If this speculation has validity, it would indicate the operation of two different processes: the continuity of an earlier blade type by the descendants of the Raddatz/Old Copper peoples and the adoption of a hafting technology borrowed from grasslands-adapted peoples, i.e., the Hanna peoples. This would imply the development of a distinct technology by a group of peoples whose homeland lies within the Parkland ecotone, but who utilize the southern fringes of the Boreal Forest and who maintain a degree of interaction with the Plains cultures.

her line of evidence for this speculation derives from the presence of the bone toggling on (DlLg-33:92A-3517) at The Forks. A copper unilateral unibarbed insertion type of harpoon ... ecovered from LM-8 (Buchner 1979:35, Plate 6a). The photograph of this harpoon shows a degree of similarity with the 1992 single-sided unibarbed specimen:

Length - LM-8/6a = 8.5 cm; 3517 = 5.2 cm;
Width - LM-8/6a = 0.7 cm; 3517 = 0.75 cm.

The differences consist of the cross-section - the copper specimen is square to rectangular while the bone artifact is circular - and the angle of the barb with the shaft - LM-8/6a is acute while 3517 is nearly perpendicular. The variances could be the result of working with different materials or due to *cultural drift* (the gradual change of characteristics of an artifact over time).

Continuing with the speculation, the presence of the bone harpoon suggests a riverine/lacustrine subsistence orientation in conjunction with land mammal hunting and plant harvesting. Both sites that yielded a harpoon (LM-8 and The Forks) are adjacent to water which would provide access to aquatic resources. Further to the locational distribution of this style, projectile points recovered during surface collection at the Maskwa River Site at the confluence with the Winnipeg River show a degree of similarity (Saylor 1976:Figure 15 (119-A-50), Figure 17 (119-A-70)). To determine whether or not these various projectile points do conform to a single type, it is necessary for detailed re-examination of the assemblages from Archaic sites throughout eastcentral Manitoba, with special reference to those along the Winnipeg, Wanipigow, and Manigotogan Rivers.

11.3.3 The Activities

The primary activity at The Forks appears to have been fishing and fish processing. Based upon the preponderance of fish remains within the faunal recoveries (80%), it would appear that mass harvesting techniques were being used to optimize the catch and to provide an adequate supply for future need. The butchering patterns of the fish, as well as the presence of hearths - particularly the linear hearth - suggest that the catch was being smoked, probably as fillets suspended over the fires. The use of heating stones, along with burning wood, would maintain a steady heat. Natural herbs may have been added to the fires to provide a flavouring aspect to the smoking process.

Many of the lithic tools, especially the scrapers, could have been used during the fish processing activities. The bifacial knives would have been used to butcher the fish and to cut the fillets while the scrapers would have been used to remove the scales. The presence of lithic detritus suggests that tools were manufactured or resharpened at the location, as needed. Primary manufacture apparently occurred elsewhere, as minimal numbers of cortical flakes occurred in the horizon. This could suggest that primary lithic manufacture took place at another location at The Forks or that it had occurred prior to the arrival of the peoples at the site. Some of the expedient bone tools may also have been used during the fish processing activities - mammal long bone splinters could have been used to separate fillets which are hung over drying rods.

Even with the primary focus upon fish-related activities, considerable evidence of the use of other animals exists. Large and medium mammal butchering remains are present, concentrated around the hearth areas. This could suggest that, in addition to smoking fish, the fires were used as a cooking site. The relative lack of many skeletal elements of the mammals would suggest that primary processing took place at other loci of the occupation area. For example, large quantities of bison long bone elements were recovered from the Archaic horizon during mitigative activities in conjunction with the Johnston Terminal Refurbishment (Quaternary n.d.).

Other than food-related activities, evidence has been recovered which would suggest that this locus was a busy place: woodworking and/or boneworking (pièce esquillées, wedges, gravers); hideworking (scrapers, awls, needles); bead manufacture (beads, bead blanks, scrap); bone tool manufacture (scrap); etc. All of these activities may not have been occurring at the same time, as the horizon may be the result of the accretion of the residue of several visitations. However, the activities could well have been taking place while individuals tended the fires and maintained a watch on the fish smoking and drying process. One can visualize several people at the area, some scaling and cutting up the fish, others watching the fires and resharpening tools, others shaping the wood used for the drying racks and still others checking the fish to ensure that they had been adequately smoked to prevent spoilage of the winter's food supply.

11.4 References

Badertscher, Patricia M.

1982 Archaeological Investigations at EjMg-2, Childs Lake, Duck Mountain Provincial Park. Department of Cultural Affairs and Historical Resources. *Papers in Manitoba Archaeology, Final Report* No. 14. Winnipeg.

Berkowski, Gerry

1987 *The Forks: Post 1870.* Environment Canada, Canadian Parks Service, *Microfiche Report Series* 381.

Buchner, A.P.

1979 The 1978 Caribou Lake Project, Including a Summary of the Prehistory of East-Central Manitoba. Manitoba Department of Cultural Affairs and Historical Resources, Historic Resources Branch, *Papers in Manitoba Archaeology, Final Report* No. 8.

Guinn, Rodger

1980a The Red-Assiniboine Junction: A Land Use and Structural History, 1770-1980. Environment Canada, Parks Canada, *Manuscript Report Series* No. 355.

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation. Winnipeg.

Kroker, Sid and Pamela Goundry

1990 *Archaeological Monitoring of the Stage I Construction Program*. The Forks Renewal Corporation, Winnipeg.

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay*. The Forks Renewal Corporation, Winnipeg.

Morgan, John P.

1989 A Natural Survey of Riverbanks: Winnipeg Core Area. In *Time and the River: a Conceptual Interpretive Plan for the Riverbanks of Winnipeg's Core Area*. Volume 3. Crocus Heritage Resource Planning and Hilderman, Witty, Crosby, Hanna and Associates, Winnipeg.

Quaternary Consultants Ltd.

n.d. Archaeological Mitigation for the Johnston Terminal Refurbishment Project. Report on file with Marwest Management Canada Ltd., The Forks Renewal Corporation, Manitoba Culture, Heritage, and Citizenship, Historic Resources Branch. (In preparation)

Saylor, Stanley

1976 The Maskwa River Site. Manitoba Department of Tourism, Recreation and Cultural Affairs, Historic Resources Branch, *Papers in Manitoba Archaeology, Preliminary Report* No. 1.

Shay, C.T., S. Coyston, H. Isfeld and M. Waddell

1991 Palaeobotanical Studies at The Forks: Analysis of Seeds, Charcoal and Other Organic Remains. *Manitoba Archaeological Journal*, Vol. 1, No. 1.

12.0 ADMINISTRATION

by *Sid Kroker*

12.1 History of The Forks Public Archaeology Project

In the initial year, 1989, the administrative mechanism for the Public Archaeology Project consisted of a Policy Coordinating Committee comprised of senior representatives from the three funding agencies (Canadian Parks Service [CPS], The Forks Renewal Corporation [FRC], Historic Resources Branch [HRB]), and a Site Coordinating Committee made up of operational personnel from these agencies with representation from the Manitoba Archaeological Society [MAS] (Kroker, Goundry *et al.* 1990:6-7). Based upon the extremely positive results of the 1989 Pilot Public Archaeology Project, the administrative group planned a similar program for 1990.

The 1990 Operations Committee fulfilled the same role as the 1989 Site Coordinating Committee and consisted of Paul Melanson (Interim Board), Leo Pettipas (HRB), Ellen Lee (CPS), Al Baronas (FRC), Linda Seyers (MAS) and Sid Kroker (1989 Project Director). During February and March 1990, the Operations Committee developed a program and projected budget for submission to the three primary funding agencies. The proposed program was a modified version of the 1989 proposal (Kroker, Goundry *et al.* 1990:Appendix A). During the development of the proposal, the recommendations from the 1989 project (Kroker, Goundry *et al.* 1990:34-36) were adopted and the fiscal ramifications determined. The budget recommended by the committee envisioned a 16-week field program: twelve weeks of general public programming, two weeks for school programming, two weeks for set-up and take-down of the site. Subsequent post-field season research, analysis and publication costs, up to May 1991, were included (Kroker *et al.* 1991)

During 1990, public meetings (March and October) resulted in the formation of a community-based, non-profit association to take charge of the delivery of public archaeology programs at The Forks. The October meeting saw the election of a Founding Board of Directors for The Forks Public Archaeology Association (FPAA). An Operations Committee was struck to develop plans for the 1991 project.

In consultation with the 1990 Project Director and administrative personnel of the three primary funding agencies, a proposal and budget for the 1991 project were developed and submitted to the Board of Directors for approval. Based upon confirmed funding, the proposal consisted of a ten-week public project, including 13 days of school programming. The proposal, as in the previous years, included set-up, field season, and tear-down with the attendant post-season analysis and report writing components. After approval was granted by the Board, the necessary administrative arrangements were devised. The FPAA contracted Quaternary Consultants Ltd. (QCL) to deliver the program, with Sid Kroker seconded as Project Director. Lateral contracts between QCL and Canadian Parks Service and between QCL and The Forks Renewal Corporation were executed. Under these contracts, QCL administered the funds from CPS and FRC, while FPAA administered the grant from HRB, upon which QCL would draw under an invoicing arrangement.

12.2 1992 Project Development

The administrative mechanisms developed for the 1991 project had worked well and were continued for 1992. Equivalent contracts for administrative and fiscal responsibility were executed between the relevant agencies. The level of programming was predicated upon confirmed and anticipated funding, resulting in a projected season of six weeks of public participation and three weeks of school participation. Naturally, the projected budget included the project set-up and tear-down costs, as well as analysis and report preparation expenses.

12.3 1992 Project Funding

The project, ultimately, was funded by three agencies: The Forks Renewal Corporation ($45,000.00), Canadian Parks Service ($40,000.00), and Historic Resources Branch of Manitoba Culture, Heritage and Citizenship ($20,000.00). In addition to monetary contributions, each agency contributed assistance in supplies and services. At the completion of the field component of the project, artifact analysis was undertaken by individual analysts. These individuals used facilities and reference collections at the Manitoba Museum of Man and Nature, the University of Manitoba, and Quaternary Consultants Ltd.

A major economic problem arose from relying on an anticipated grant from the Access to Archaeology Program, administered by Canada Department of Communications. Application had been made by FPAA, under the terms of reference, in February 1992 and a decision on the success of the application was to be rendered by mid-June. By July 1, the announcement date had passed, but encouraging statements were received from the grant program staff. Therefore, it was decided to set the Public Archaeology Program dates and implement a portion of the project which had been targeted for funding under this application, i.e., the salaries of the two Site Interpreters and the Participant Coordinator/Educator, as well as a major portion of the expenses of operating the school programs. Remedial action plans were developed for several funding scenarios; including cut-backs of days of operation, shortened work-weeks for staff, and elimination of the school program. As August progressed and frequent calls to Ottawa elicited only "Hang on, the awards will be announced soon", the options became limited. Every day of the program was fully booked and cancellations of days were not feasible. Maintenance of the rigorous standards of excavation could only be continued by the maintaining the current level of staffing. Given the considerable number of visitors (35,000 in seven weeks), curtailment of the hours of the Site Interpreters was also not a tenable option.

In late June, all 95 schools on the contact list were telephoned and apprised of the situation that funding was incomplete but hoped for. The teachers were told that on September 4, a phone-in, first come-first served, booking would take place for whatever hands-on slots would become available. On September 3, still no information about the success, failure, or even status of the grant application could be obtained from Communications Canada. In consultation with the FPAA Board of Directors and some personnel from the funding agencies, the Project Director decided to offer a limited school program of six days. This duration was chosen on the expectation of receiving about one half of the funding applied for. On September 7 (a date readily recognized by the student of recent Canadian history), informal notification that the application was unsuccessful was received from a parliamentary aide of a Member of Parliament who had been seeking a response on our behalf. At this point, it was too late to break our commitments to the teachers and students and the school program began on September 9. This saga of delay, procrastination and obfuscation, resulted in an expended shortfall of $18,800.00. The ramification of this shortfall produced several project restraints which will be detailed in further sections.

In addition to contributions by the funding agencies, the project levied a moderate participant registration fee of $12 for the first day and $6 for subsequent days. The fee was levied to cover a portion of the operating costs and to demonstrate to funding agencies that there was a movement towards fiscal self-sufficiency. The fee was collected on-site by the Coordinator when the participants arrived for their allocated days.

The fiscal administration of the 1992 project was similar to that of the previous years (Kroker, Goundry *et al.* 1990, Kroker *et al.* 1991, Kroker *et al.* 1992). Quaternary Consultants Ltd. (QCL) was the contracting agency and handled all disbursements. Invoices for expenditures on salaries, capital expenses, reimbursable expenses, and secondment fees were directed to the appropriate agencies.

A finalized budget statement will be provided to the three funding agencies at the completion of the project fiscal operation. To date, the expenditures have been constrained and the budget shortfall has been reduced considerably. Suffice it to say, that the project will end the 1992 operating year with a deficit, although much less than that which was present at the end of the field season.

12.4 Project Staffing

The Project Team consisted of eleven people. The personnel and their positions are delineated in Table 12-1. The Project Director (Sid Kroker), a consultant archaeologist with Quaternary Consultants Ltd (QCL), was retained as the Site Archaeologist by The Forks Renewal Corporation. The Forks Renewal Corporation seconded Sid Kroker to act as the Project Director. The staff positions were funded from the monetary contributions of the three agencies (CPS, FRC, HRB). Some staff changes occurred during the field season. Individuals denoted with an asterisk left the position and were replaced by the following person.

The duties of each of the staff positions are detailed below. Implicit in these descriptions is the requirement for professional ability, public interaction, and educational skills.

Director: responsible for overall administration of the project, including budget administration, liaison with funding and regulatory agencies and the media.

Coordinator/Educator: responsible for booking and scheduling all individuals and groups who wished to participate; responsible for the third component of the school program.

Site Supervisor: in charge of the project in the absence of the Project Director; responsible for day-to-day site operations, with particular reference to all aspects of the excavation component - supervision of excavation personnel and participants; excavation procedures; maintenance of field and photography records, etc.; liaison with laboratory staff; supervision of Site Interpreters.

Field Archaeologists (4): responsible for day-to-day supervision and instruction of participants; maintenance of field records.

Laboratory Archaeologists: responsible for day-to-day supervision of participants; artifact preparation and identification.

Computer Cataloguer: part-time position, responsible for all data entry, maintenance of artifact records, editing of database.

Site Interpreters (2): responsible for providing information about the project and the discoveries to the general public.

Director	Sid Kroker
Site Supervisor	Barry Greco
Field Archaeologists	Paul Speidel
	Laura MacLean
	Lee-Anna Smith
	Catherine Flynn
Lab Archaeologists	Kate Peach*
	Zoë Kogan*
	Geoff Marr
	Eric Simonds
Computer Cataloguer	Pam Goundry
Participant Coordinator	Signi Frederickson
Site Interpreters	Gilbert Chartrand
	Marti Brauner

Table 12-1: Staff Positions and Incumbents

The 1992 Public Archaeology Program has had differing degrees of staff involvement over the course of the project. The staff began at staggered intervals and were employed for different periods. The Project Director has been involved from initial planning (February 1992), through the entire project, to the publication of this report. Other staff members have been involved for shorter durations. The Site Supervisor assisted in the organization of the project two weeks before the beginning of the program. The Participant Coordinator began her duties one and a half weeks before the public programming was initiated on July 23. The other staff members began to set up the operation on July 13 (one working week before the public program). The Site Interpreters also assisted in site set-up, along with preparations for their positions (becoming familiar with archaeological method and the history of The Forks). All positions, except the computer cataloguer, were terminated at the end of the field season (September 30). The cataloguer continued as a part-time position until all 83,000 artifacts had been entered on the CHIN database and the data had been proofed. During the analysis portion of the project, the cataloguer updated the database as the analysts refined the identifications of the recovered artifacts.

12.5 Analysis and Report Preparation Component

During the field season, it was evident that a wide range of artifacts were being recovered. Detailed analysis of each class would require specialized knowledge and it was not considered viable to have only one analyst. Accordingly, the analysis of the artifacts was tendered among the archaeological community. The recoveries were divided by class and stratigraphic zone. In the tender call, there were ten lots, consisting of:

a. Zone 1 lithic artifacts
b. Zone 1 floral artifacts
c. Zone 1 mammal and bird recoveries
d. Zone 1 fish recoveries
e. Zone 1 shellfish recoveries
f. Zone 3 lithic artifacts
f. Zone 3 floral artifacts
g. Zone 3 mammal and bird recoveries
h. Zone 3 fish recoveries
i. Zone 3 shellfish recoveries

Some lots received several bids, while others received only one response. The successful bids were determined on adequacy of proposed methodology, detail of proposed analysis, projected timeframe for completion and proposed fee. The resultant analytic fees for the entire assemblage could not be borne by the existing budgetary constraints. Accordingly, the analysis of the recoveries from Zone 1 was placed into abeyance until additional revenue could be generated. In two artifact classes, the successful bidder had proposed combining lots from the two zones. In both cases, it was felt that it was reasonable to have the more comprehensive analysis completed as the economic savings of deferring the minor portion of artifacts from Zone 1 was not significant. Accordingly, this report presents the results of the examination of the floral and shellfish artifacts from the two zones. In the other classes, the analysis of the material awaits funding which is being sought from different sources.

12.6 Kiosk Operations

The Kiosk was housed in the large trailer at the site and was operated by the Coordinator, in conjunction with her other duties. The Kiosk was considered a separate entity with its own budget, even though it functioned as an ancillary component of the 1992 Public Archaeology Project.

In 1989, the Kiosk was primarily an information centre with limited opportunity for volunteers and public visitors to purchase publications and T-shirts. The day-to-day operations were undertaken by the Data Management Officer along with his other duties. The administration of the 1990 venture was undertaken by the Manitoba Archaeological Society, through the MAS Kiosk Committee. During 1991 and 1992, the Kiosk operated as the project information centre as well as a retail outlet. Distributional material relating to the project and other archaeological opportunities was available for the public. A portion of the display space in the Kiosk area was used by the Manitoba Archaeological Society.

Within the retail aspect of operations, the Kiosk sold various publications and project-related souvenirs. The publications consisted of titles published by The Forks Public Archaeology Association, Manitoba Archaeological Society, and The Forks Renewal Corporation. The souvenirs consisted of specially imprinted items: caps, buttons, and T-shirts. These materials had been provided for sale by The Forks Public Archaeology Association, Manitoba Archaeological Society, and The Forks Renewal Corporation.

Final accounting of the Kiosk component has been completed. Gross income was $1062.00. Debits consisted of $334.57 for returns to vendors, resulting in a net return of $727.43. The 1992 gross income was comparable to that of 1991. As the Kiosk was operated by the Coordinator, with some assistance from other staff members, retail opportunities occurred only when the Coordinator's presence was not required on her primary duties or when other staff were temporarily available.

12.7 Public Involvement

The public component of the project was designed to accommodate all degrees of interest, as well as to provide a teaching experience for students within the Social Sciences curriculum.

12.7.1 Participants

As soon as announcements were made that individuals could register to participate in the 1992 Public Archaeology Program, intense public interest was evident. A high percentage of the registrations for the entire summer were made during the first few days. The booking procedure was the same as in the previous years. Individuals registered for their selected days by telephoning the Coordinator. During the field season, on-site registration also occurred. Confirming letters, with project information, were sent to all registrants.

Participation by the general public was limited to three days per participant in order to accommodate as many people as possible. Members of The Forks Public Archaeology Association were entitled to register for five days. During the summer, 167 individuals (Appendix B) worked with the professional staff at the project. Some people booked their days as a block, while others spread their participation out over the summer in order to experience the evolution of a dig.

12.7.2 School Programming

As previously noted, the 1992 project could not meet the expressed interest of the school system. Six days in September were allocated to hands-on educational programming for students in the elementary grades. During these days, provisions were made for twice daily in-depth lecture programs. Both components were immediately over-subscribed, creating an extensive waiting list.

The hands-on program was identical to that offered to the general public participants. School class sizes were limited to 30 students, although some variation was acceptable. The classes were divided into three groups. Each group of students received a period of hands-on instruction in the excavation area, an equivalent period participating in laboratory activities and a third component which consisted of a short historical lecture tour using the Wall Through Time and an exercise on archaeological site reconstruction. This component was undertaken by the Coordinator.

The 6 days of hands-on school programming were filled by 8 schools (Appendix B) and involved 194 students of Grades 4 through 8. Nine schools (Appendix B), encompassing 423 students, received the in-depth lecture program.

The accessing of the in-depth lecture program is steadily diminishing, inasmuch as many of the teachers have already had classes participate in this portion of the school program in previous years. Most prefer to have their classes participate in the hands-on component. Failing that, the teachers will often bring their classes to the site as general visitors and view the project in an observatory manner, as well as providing the history/archaeology lecture themselves. By using the Wall Through Time and the excavation site as back-drops, they are able to tailor the presentation to the needs of their specific class.

12.7.3 Public Observatory Component

The Public Archaeology Program attracted thousands of visitors. During the course of the summer operations, 37,291 people came to observe the project. This translates to about 5000 visitors per week during the seven weeks of the program. These individuals watched the progress of the staff and participant excavators, obtained the most recent information from the site interpreters, collected the brochures about the project (available in English, French, Cree, and Saulteaux), and visited the lab to examine the artifacts that were being processed and view the displays. Many signed the Guest Book located on the viewing platform at the excavation area (Tables 12-2, 12-3, 12-4, Appendix C). They also visited the kiosk to view the current displays, purchase publications or souvenir items, or just chat with the staff.

In spite of a cool, rainy summer, the number of visitors increased considerably from the lesser visitations of 1991. There seem to be several reasons for this increased attendance. First, the project, sited in the Archaeological Preserve, immediately adjacent to the Market Plaza, was highly visible. Secondly, newspaper articles and television news clips about the project raised the awareness of Winnipegers and visitors. Thirdly, over the previous years, hundreds of people have participated and friends and relatives had been informed about the project, so that the word-of-mouth advertising has reached thousands.

LOCALITY	INDIVIDUALS	FAMILIES
Winnipeg	1756	93
Other: O V Jewitt Daycare Centre		
Wild Honey Children Centre		
Rural Manitoba (Appendix C)	480	39
Provinces and Territories		
Alberta	229	14
British Columbia	286	7
New Brunswick	17	-
Newfoundland	9	-
Nova Scotia	16	-
North West Territories	8	2
Ontario	499	38
Prince Edward Island	1	-
Quebec	65	2
Saskatchewan	129	8
Yukon	3	-
TOTAL	3498	203

Table 12-2: Canadian Visitors Who Signed the Guest Book in 1992

The numbers of visitors as evidenced by the guest book, has rebounded from the low level of 1991 and is equivalent to the frequency recorded during the 1989 and 1990 projects. If one looks at the statistics in numbers of individuals per week of operation, this season is the most highly visited of the past four seasons.

LOCALITY	INDIVIDUALS	FAMILIES
Alaska	3	-
Arizona	8	-
Arkansas	3	-
California	50	1
Colorado	9	1
Florida	20	-
Georgia	3	-
Idaho	2	-
Illinois	13	-
Indiana	3	1
Iowa	6	1
Kansas	2	-
Kentucky	3	-
Maryland	2	1
Massachusetts	3	-
Michigan	8	-
Minnesota	102	8
Missouri	5	2
Nebraska	18	-
Nevada	2	-
New Hampshire	1	1
New Jersey	3	-
New Mexico	3	1
New York	11	2
North Carolina	1	-
North Dakota	48	4
Ohio	5	-
Oklahoma	6	-
Oregon	2	-
Pennsylvania	11	-
South Carolina	1	-
South Dakota	8	2
Tennessee	5	-
Texas	20	1
Vermont	2	-
Virginia	4	-
Washington	12	-
Washington, D.C.	-	1
West Virginia	4	-
Wisconsin	10	-
Wyoming	3	-
Unspecified State	2	-
TOTAL	427	26

Table 12-3: American Visitors Who Signed the Guest Book in 1992

LOCALITY	INDIVIDUALS	FAMILIES
Antigua	1	-
Australia	21	-
Austria	1	-
Bangladesh	2	-
Belgium	5	-
Bora Bora	1	-
China	1	-
Colombia	1	-
Costa Rica	1	-
Czechoslovakia	1	-
Denmark	-	1
England	76	4
Fiji	1	-
France	9	-
Germany	43	-
Guatemala	1	-
Holland	5	-
Ireland	5	-
Italy	2	-
Japan	5	-
Kenya	2	-
Malaysia	2	-
Mexico	1	-
Morocco	3	-
Netherlands	4	1
New Guinea	2	-
New Zealand	5	-
Nicaragua	1	-
Northern Ireland	1	-
Norway	1	-
Phillipines	3	-
Portugal	1	-
Romania	1	-
Russia	1	-
Scotland	15	-
Singapore	1	-
Slovenia	1	-
South Africa	2	-
Sweden	3	-
Taiwan	3	-
Tanzania	1	-
Wales	5	-
West Indies	1	-
Zaire	1	-
TOTAL	243	6

Table 12-4: International Visitors Who Signed the Guest Book - 1992

12.8 References

Kroker, Sid, Pamela Goundry, Leigh Hambly and Karen Lawlor

1990 *The Forks (1989) Pilot Public Archaeology Project: Administrative Report.* Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Kroker, Sid, Barry B. Greco and Kate Peach

1992 *1991 Investigations at Fort Gibraltar I: The Forks Public Archaeology Project.* The Forks Public Archaeological Association, Inc., Winnipeg.

Kroker, Sid, Barry B. Greco and Sharon Thomson

1991 *1990 Investigations at Fort Gibraltar I: The Forks Public Archaeology Project.* Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

13.0 BIBLIOGRAPHY

Adams, G., K. Lunn, M.A. Tisdale and P.J. Priess

1990 Archaeological Investigations at The Forks National Historic Site, Winnipeg: Mitigation of the North Point Development. Canadian Parks Service, *Research Bulletin* No. 283.

Ahler, Stanley A., Carl R. Falk, Lauren Ritterbush and Julieann Vannest

1984 Archeological Investigations at the Elbee Site, 32ME408, Knife River Indian Villages National Historic Site. University of North Dakota, Department of Anthropology and Archeology, *Contribution* No. 29. Grand Forks.

Archibold, O.W.

1981 Buried Viable Propagules in Native Prairie and Adjacent Agricultural Sites in Central Saskatchewan. *Canadian Journal of Botany* 59:701-706.

Archibold, O.W. and L. Hume

1983 A Preliminary Survey of Seed Input into Fallow Fields in Saskatchewan. *Canadian Journal of Botany* 61:1216-1221.

Ashworth, Allan C. and Alan M. Cvancara

1983 Paleoecology of the Southern Part of the Lake Agassiz Basin. In *Glacial Lake Agassiz*. James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Badertscher, Patricia M.

1982 Archaeological Investigations at EjMg-2, Childs Lake, Duck Mountain Provincial Park. Department of Cultural Affairs and Historical Resources. *Papers in Manitoba Archaeology, Final Report* No. 14. Winnipeg.

Balmer, Ann L.

1983 *Zooarchaeology in the South Central Canadian Shield: An Assessment of the Current Use and Potential with an Example from Lake of the Woods*. Masters Thesis, University of Manitoba, Winnipeg.

Banfield, A.W.F.

1974 *The Mammals of Canada*. University of Toronto Press, Toronto. [Reprinted - 1987]

Berkowski, Gerry

1987 *The Forks: Post 1870*. Environment Canada, Canadian Parks Service, *Microfiche Report Series* 381.

Blong, R.J. and R. Gillespie

1978 Fluvially Transported Charcoal Gives Erroneous ^{14}C Ages for Recent Deposits. *Nature* 271:739-741.

Brinkhuizen, D.C. and A.T. Clason

1986 Fish and Archaeology: Studies in Osteometry, Taphonomy, Seasonality and Fishing Methods. *BAR International Series* No. 294, Oxford.

Brose, David S.

1970 The Archaeology of Summer Island: Changing Settlement Systems in Northern Lake Michigan. University of Michigan, Museum of Anthropology, *Anthropology Papers* No. 41. Ann Arbor.

Brumley, John H.

1975 The Cactus Flower Site In Southeastern Alberta: 1972-1974 Excavations. National Museum of Man, Archaeological Survey of Canada, *Mercury Series* No. 46. Ottawa.

Bryant Jr., V.M.

1974 The role of Coprolite Analysis in Archaeology. *Bulletin of the Texas Archaeological Society*, 45:1-28.

Buchner, A.P.

1979 The 1978 Caribou Lake Project, Including a Summary of the Prehistory of East-Central Manitoba. Manitoba Department of Cultural Affairs and Historical Resources, Historic Resources Branch, *Papers in Manitoba Archaeology, Final Report* No. 8.

Burch, J.B.

1975a *Freshwater Sphaeriacean Clams (Mollusca: Pelecypoda) of North America.* Rev. ed. Hamburg, Michigan: Malacological Publications.

1975b *Freshwater Unionacean Clams (Mollusca: Pelecypoda) of North America.* Rev. ed. Hamburg, Michigan: Malacological Publications.

Burt, William H.

1976 *A Field Guide to the Mammals of America North of Mexico.* Third Edition, Houghton Mifflin Co., Boston.

Caldwell, Warren W.

1966 The Black Partizan Site. *Smithsonian Institution, River Basin Surveys, Publications in Salvage Archaeology*, No. 2. Lincoln, Nebraska.

Carpenter, David

1984 *Fishing in the West: A Guide to Alberta, Saskatchewan and Manitoba.* Western Producer Prairie Books, Saskatoon. [Second Edition 1986]

Casteel, Richard W.

1972 Some Archaeological Uses of Fish Remains. *American Antiquity* 37(3):404-419.

1974a A Method for Estimation of Live Weight of Fish from the Size of Skeletal Elements. *American Antiquity* 39(1):94-98.

1974b On the Remains of Fish Scales from Archaeological Sites. *American Antiquity* 39(4):557-581.

1976a *Fish Remains In Archaeology and Palaeoenvironmental Studies.* Academic Press, New York.

1976b "Fish Remains from Glenrose" In The Glenrose Cannery Site, R.G. Matson (Ed.), National Museums of Canada, National Museum of Man, Archaeological Survey of Canada Paper, *Mercury Series* No.52, pp. 82-87.

Chaplin, Raymond E.

1971 *The Study of Animal Bones from Archaeological Sites.* Seminar Press, London.

Clarke, Arthur H.

1981 *The Freshwater Molluscs of Canada*. National Museum of Natural Sciences. National Museums of Canada. Ottawa.

Clarke, R. McV., R.W. Boychuk and D.A. Hodgins

n.d. Fishes of the Red River at Winnipeg, Manitoba. Unpublished Canadian Technical Report of Fisheries and Aquatic Sciences.

Cleland, Charles E.

1982 The Inland Shore Fishery of the Northern Great Lakes: Its Development and Importance in Prehistory. *American Antiquity* 47 (4): 761-784.

Coutts, R.

1988 *The Forks of The Red and Assiniboine: A History, 1734-1900.* Environment Canada, Canadian Parks Service.

Darlington, David

1980 The Analysis of the Use-Wear Patterns On Artifacts From 48 FR 440, The Bison Basin Site, Fremont County, Wyoming. *The Wyoming Archaeologist*, Vol. 23, No.2.

Deck, D.M.

1989 Wood Charcoal Remains from the Lockport Site, Manitoba. Unpublished M.A. Thesis, University of Manitoba.

1990 Analysis of Wood Charcoal Remains from The Forks North Point Site. Unpublished Report.

Denig, Edwin Thompson

1928 *Indian Tribes of the Upper Missouri.* Edited with notes and biographical sketch by J.N.B. Hewitt. Smithsonian Institution, Bureau of American Ethnology, 46th *Annual Report*. Washington, D.C.

Densmore, Frances

1929 *Chippewa Customs.* Smithsonian Institution, Bureau of American Ethnology Bulletin 86. Washington, D.C.

Dockstader, Frederick J.

1973 *Indian Art of the Americas*. Museum of the American Indian, Heye Foundation. New York.

Ellis, Chris J., Ian T. Kenyon and Michael Spence

1990 The Archaic. In The Archaeology of Southern Ontario To A.D. 1650. Chris J. Ellis and Neal Ferris (Eds.). Ontario Archaeological Society, *Occasional Publication of the London Chapter*, No. 5.

Fagan, Brian M.

1981 *In The Beginning: An Introduction To Archaeology*. Little, Brown & Company (Canada) Limited, Toronto (Fourth Edition)

Fenton, Mark M., S.R. Moran, James T. Teller and Lee Clayton

1983 Quaternary Stratigraphy and History in the Southern Part of the Lake Agassiz Basin. In *Glacial Lake Agassiz*. James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Filisky, Michael

1989 *Peterson First Guide to Fishes of North America*. Houghton Mifflin Company, Boston.

Forks Renewal Corporation, The (FRC)

1988 *The Forks Archaeological Impact Assessment and Development Plan (The Forks Archaeological Plan)*. The Forks Renewal Corporation, Winnipeg.

Frison, George C.

1978 *Prehistoric Hunters of the High Plains*. Academic Press, New York.

Fritts, H.C.

1976 *Tree Rings and Climate*. Academic Press, New York.

Garson, Adam G.

1980 Comment Upon The Economic Potential of Fish Utilization in Riverine Environments and Potential Archaeological Biases. *American Antiquity* 45(3):562-567.

Gibbon, Guy E.

1973 The Sheffield Site: Oneota Site on the St. Croix River. *Minnesota Historical Society, Series* No. 10. St. Paul.

Gilbert, B. Miles

1973 *Mammalian Osteo-Archaeology: North America*. University of Missouri, Columbia, Missouri.

Gilmore, Melvin Randolph

1919 Uses of Plants by the Indians of the Missouri River Region. Smithsonian Institution, Bureau of American Ethnology, Thirty-third *Annual Report*. Washington, D.C.

Gregg, Michael L. (Ed.)

1987 *Archeological Excavation at the Naže Site (32SN246)*. Department of Anthropology, University of North Dakota. Grand Forks. Prepared for the U.S. Department of the Interior.

Griffin, David E.

1977 Timber Procurement and Village Location in the Middle Missouri Subarea. *Plains Anthropologist* 22(78), Part 2, Memoir 13. Trends in Middle Missouri Prehistory: A Fest Schift Honoring the Contributions of Donald J. Lehmer. Raymond Wood (Ed.).

Guinn, Rodger

1980a The Red-Assiniboine Junction: A Land Use and Structural History, 1770-1980. Parks Canada, *Manuscript Report Series* No. 355.

1980b An Historical Assessment of Four Structures in the Canadian National Railways East Yards, Winnipeg, Manitoba. Parks Canada, *Research Bulletin* No. 126.

Hanna, Margaret G.

1981 An Analysis Of Fish Scales From Aschkibokahn FbMb-1 West-Central Manitoba. *Manitoba Archaeological Quarterly* 5(3):20-38.

Hart, Jeffrey A.

1981 The Ethnobotany of the Northern Cheyenne Indians of Montana. *Journal of Ethnopharmacology* 4:1-55.

Howard, James H.

1977 *The Plains-Ojibwa or Bungi: Hunters and Warriors of the Northern Prairies with Special Reference to the Turtle Mountain Band. Reprints in Anthropology*, Volume 7. J. & L. Reprint Company, Lincoln, Nebraska.

Huddleston, Richard W. and Lloyd W. Barker

1978 Otoliths and Other Fish Remains from the Chumas Midden at Rincon Point (SBa-1) Santa Barbara - Ventura Counties, California. Natural History Museum of Los Angeles County, Los Angeles. *Contributions In Science* No. 289

International Garrison Diversion Study Board

1976 *Appendix C: Biology Committee Final Report - Environmental Impact Assessment, Alternatives and Recommendations*. Report to the International Joint Commission, Winnipeg.

Jenness, Diamond

1977 Indians of Canada. National Museum of Canada, *Bulletin* No. 65, *Anthropological Series* No. 15. [Seventh Edition]

Jennings, Jesse D.

1974 *Prehistory of North America*. McGraw-Hill, Inc., New York. [Second Edition]

Joachim, M.A.

1976 *Hunter-gatherer Subsistence and Settlement: A Predictive Model*. Academic Press, New York.

Johnson, Elden

1969 *The Prehistoric Peoples of Minnesota*. Minnesota Historical Society, St Paul, Minnesota.

Karklins, Karlis

1992 *Trade Ornament Usage Among the Native Peoples of Canada. A Source Book*. Environment Canada, National Historic Sites Parks Service, Studies in Archaeology, Architecture and History. Ottawa.

Keeley, Lawrence H.

1980 *Experimental Determination of Stone Tool Uses*. The University of Chicago Press, Chicago.

Kivett, Marvin F.

1952 Woodland Sites in Nebraska. Nebraska State Historical Society. *Publications in Anthropology* Number One. Lincoln.

Kroker, Sid

1989 *North Assiniboine Node Archaeological Impact Assessment.* The Forks Renewal Corporation, Winnipeg.

Kroker, Sid and Pamela Goundry

1990 *Archaeological Monitoring of the Stage 1 Construction Program.* The Forks Renewal Corporation, Winnipeg.

1993 *Archaeological Monitoring and Mitigation of the Assiniboine Riverfront Quay.* The Forks Renewal Corporation, Winnipeg.

Kroker, Sid, Pamela Goundry, Leigh Hambly and Karen Lawlor

1990 *The Forks (1989) Pilot Public Archaeology Project: Administrative Report.* Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Kroker, Sid, Barry B. Greco, Arda Melikian and David K. Riddle

1990 *The Forks (1989) Pilot Public Archaeology Project: Research Report Excavations at 21K (Fort Gibraltar 1).* Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Kroker, Sid, Barry B. Greco and Kate Peach

1992 *1991 Investigations at Fort Gibraltar 1: The Forks Public Archaeology Project.* The Forks Public Archaeological Association, Inc., Winnipeg.

Kroker, Sid, Barry B. Greco and Sharon Thomson

1991 *1990 Investigations at Fort Gibraltar 1: The Forks Public Archaeology Project.* Canadian Parks Service, The Forks Renewal Corporation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Last, William M. and James T. Teller

1983 Holocene Climate and Hydrology of the Lake Manitoba Basin. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Lehmer, Donald J.

1954 Archeological Investigations in the Oahe Dam Area, South Dakota, 1950-51. Smithsonian Institution, Bureau of American Ethnology, River Basin Surveys, *Bulletin* 158. Washington.

Lehmer, Donald J., W. Raymond Wood, and C.L. Dill

1978 *The Knife River Phase.* Department of Anthropology and Sociology, Dana College, Blair, Nebraska and American Archaeology Division, College of Arts and Sciences, University of Missouri-Columbia, Columbia, Missouri.

Lenius, Brian J. and Dave M. Olinyk

1990 The Rainy River Composite: Revisions to Late Woodland Taxonomy. In The Woodland Tradition in the Western Great Lakes: Papers Presented to Elden Johnson. Guy E. Gibbon (Ed.). University of Minnesota *Publications in Anthropology*, No. 4. Minneapolis, Minnesota.

Limp, W. Frederick and Van A. Reidhead

1979 An Economic Evaluation of the Potential of Fish Utilization in Riverine Environments. *American Antiquity* 44(1):70-78.

Loewen, Brad and Gregory Monks

1986 A History of the Structures at Upper Fort Garry, Winnipeg, 1835-87. Environment Canada, Canadian Parks Service, *Microfiche Report Series* No. 330.

Lowie, Robert H.

1982 *Indians of the Plains.* American Museum of Natural History/McGraw-Hill, New York. [Tenth Edition. Originally Published - 1954]

Lukens, Paul W.

1970 Description and Analyses of Vertebrate Faunal Material from the Tailrace Bay Site In *Archaeological Investigations in the Grand Rapids, Manitoba, Reservoir 1961-62* by William J. Mayer-Oakes. University of Manitoba, Department of Anthropology, *Occasional Papers* No. 3. University of Manitoba Press, Winnipeg.

MacDonald, George W.

1985 Debert: A Paleo-Indian Site in Central Nova Scotia. National Museum of Canada, *Anthropological Papers* No. 16. [Original Publication - 1968].

MacLaren Plansearch Inc./Quaternary Consultants Ltd.

1988 Mitigation of Limestone Project Impacts on Heritage Resources: Phase III Report. On file with Manitoba Hydro and Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

MacNeish, Richard S.

1958 An Introduction to the Archaeology of Southeastern Manitoba. National Museum of Canada, *Bulletin* No. 157, *Anthropology Series* No. 44. Ottawa.

Mandelbaum, David G.

1979 *The Plains Cree: An Ethnographic, Historical, and Comparative Study. Canadian Plains Studies* 9. Canadian Plains Research Center, University of Regina.

Manitoba Culture, Heritage and Recreation, Historic Resources Branch

1989 *A Glossary of Manitoba Prehistoric Archaeology*. Manitoba Culture, Heritage and Recreation, Historic ResourcesBranch, Winnipeg.

Manitoba Department of Natural Resources

1992 *Manitoba Sport Fishing Guide*. Winnipeg.

n.d.a *When Fishermen Meet*. Winnipeg.

n.d.b *Notes on Warmwater Fish*. Winnipeg

Manitoba Museum of Man and Nature

1986 *Guides and Manuals for Processing Archaeological Materials*. E.L. Syms (Ed.). Winnipeg, Manitoba.

Martin, Terrance J.

1980 Animal Remains from the Winter Site, A Middle Woodland Occupation in Delta County, Michigan. *Wisconsin Archaeologist* 61(1):91-99.

1981 Animal Remains From The Gros Cap Site: An Evaluation Of Fish Scales Versus Fish Bones In Assessing The Species Composition Of An Archaeological Assemblage. *Michigan Archaeologist* 27(3-4):77-86.

Matthews, William J. and David C. Heins (EDs.)

1987 *Community and Evolutionary Ecology of North American Stream Fishes*. University of Oklahoma Press, Norman.

Mayer-Oakes, William J.

1970 *Archaeological Investigations in the Grand Rapids, Manitoba, Reservoir 1961-62*. University of Manitoba, Department of Anthropology, *Occasional Papers* No. 3. University of Manitoba Press, Winnipeg.

McAndrews, John H.

1982 Holocene Environment of a Fossil Bison from Kenora, Ontario. *Ontario Archaeology*, 37:41-51.

McLeod, K. David

1987 *Land Below the Forks: Archaeology, Prehistory and History of the Selkirk and District Planning Area*. Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

McPhail, J. D. and C. C. Lindsey

1970 *Freshwater Fishes of Northwestern Canada and Alaska*. Environment Canada, Fisheries and Marine Service, Fisheries Research Board of Canada, *Bulletin* 173. Ottawa.

Miksicek, C.H.

1987 Formation Process in the Archaeobotanical Record. In *Advances in Archaeological Method and Theory*, pp. 211-247. M.B. Schiffer (Ed.). Academic Press, New York.

Moore, Sarah M.

1985 Modified Bone and Antler from On-A-Slant Village (32M026). *Journal of North Dakota Archaeological Association*, Vol. 2:37-66.

Morgan, John P.

1989 A Natural Survwey of Riverbanks: Winnipeg Core Area. In *Time and the River: a Conceptual Interp[retive Plan for the Riverbanks of Winnipeg's Core Area*. Volume 3. Crocus Heritage Resource Planning and Hilderman, Witty, Crosby, Hanna and Associates, Winnipeg.

Moyle, Peter B. and Joseph J. Cech, Jr.

1988 *Fishes: An Introduction to Ichthyology*. Prentice-Hall, Inc., Englewood Cliffs. [Second Edition]

Mundell, Raymond L.

1975 *An Illustrated Osteology of the Channel Catfish*. National Park Service, Midwest Archaeological Center, Lincoln.

Nieuwhof, Peter

1990 "The Lauder Project." Manuscript on file with Mantiboa Heritage Federation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Olsen, Stanley J.

1960 Post-Cranial Skeletal Characters of *Bos* and *Bison*. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. XXXV, No. 4.

1964 Mammal Remains from Archaeological Sites: Part I - South-eastern and Southwestern United States. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol.56, No. 1.

1968 Fish, Amphibian and Reptile Remains from Archaeological Sites. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 2.

1972 North American Birds: Skulls and Mandibles. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol. 56, No. 4.

1979 North American Birds: Postcranial Skeletons. In Osteology for the Archaeologist. Harvard University, Peabody Museum, *Papers of the Peabody Museum of Archaeology and Ethnology*, Vol.56, No. 5.

Orchard, W.J.

1946 *Kitchen Middens: Prehistoric campsites*. School Aids and Text Book Pub. Co. Ltd., Regina.

Pannella, Giorgio

1971 Fish Otoliths: Daily Growth Layers and Periodical Patterns. *Science* Vol. 173:1124-1127.

Parker, M.L., L.A. Jozsa, S.G. Johnson, and P.A. Bramhall

1984 Tree-ring Dating in Canada and the Western U. S. In *Quaternary Dating Methods*. W.C. Mahaney (Ed.), pp. 211-225. Elsevier, New York.

Pettipas, Leo F. and Anthony P. Buchner

1983 Paleo-Indian Prehistory of the Glacial Lake Agassiz Region Southern Manitoba, 11500 to 6500 B.P. In *Glacial Lake Agassiz*. James Teller & Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Preston, William B.

1982 *The Amphibians and Reptiles of Manitoba*. Manitoba Museum of Man and Nature, Winnipeg.

Priess, Peter J., Sheila Bradford, S. Biron Ebell and P.W. Nieuwhof

1986 Archaeology at The Forks: An Initial Assessment. Environment Canada, Canadian Parks Service, *Microfiche Report Series* No. 375.

Quaternary Consultants Ltd.

1988 *North/South Access Road Archaeological Impact Assessment*. Quaternary Consultants Ltd., Winnipeg. Report on file with Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

1989 *Provencher Bridge Project Archaeological Impact Assessment.* Quaternary Consultants Ltd., Winnipeg. Report on file with Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

1990 *St Mary Archaeological Recovery: Interim Report.* Quaternary Consultants Ltd., Winnipeg. Report on file with City of Winnipeg and Manitoba Culture, Heritage and Citizenship, Historic Resources Branch, Winnipeg.

n.d. Archaeological Mitigation for the Johnston Terminal Refurbishment Project. Report on file with Marwest Management Canada Ltd., The Forks Renewal Corporation, Manitoba Culture, Heritage, and Citizenship, Historic Resources Branch. (In preparation)

Reeves, Brian

1970 Culture Dynamics In The Manitoba Grasslands 1000 B.C.-A.D. 700. In *Ten Thousand Years. Archaeology in Manitoba*, W. Hlady (Ed.), pp. 153 - 174. D.W. Friesen and Sons. Ltd., Altona.

Ritchie, J.C.

1983 The Paleoecology of the Central and Northern Parts of the Glacial Lake Agassiz Basin. In *Glacial Lake Agassiz.* James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Robison, Henry W.

1992 *Canadian Nature Guides Freshwater Fish.* Smithmark Publishers Inc., New York.

Rostlund, Erhard

1952 *Freshwater Fish and Fishing in Native North America.* University of California Publications in Geography. University of California Press, Berkeley.

Saylor, Stanley

1976 The Maskwa River Site. Manitoba Department of Tourism, Recreation and Cultural Affairs, Historic Resources Branch, *Papers in Manitoba Archaeology, Preliminary Report* No. 1.

Schmid, Elisabeth

1972 *Atlas of Animal Bones: For Prehistorians, Archaeologists, and Quaternary Geologists.* Elsevier Publishing Company, Amsterdam.

Scoggan, H.G.

1957 *Flora of Manitoba.* National Museum of Canada *Bulletin* No. 140. Department of Northern Affairs and National Resources. Canada.

Scott, W.B. and E.J. Crossman

1973 *Freshwater Fishes of Canada.* Environment Canada, Fisheries and Marine Service, Fisheries Research Board of Canada, *Bulletin* 184. Ottawa.

Shay, C.T., S. Coyston, H. Isfeld and M. Waddell

1991 Palaeobotanical Studies at The Forks: Analysis of Seeds, Charcoal and Other Organic Remains. *Manitoba Archaeological Journal*, Vol. 1, No. 1.

Skinner, Alanson

1914 Notes on the Plains Cree. *American Anthropologist.* 16(1):68-87.

Smith, Brian J.

1991 "The Historical and Archaeological Evidence for the use of Fish as an Alternate Subsistence Resource among Northern Plains Bison Hunters" In *Aboriginal Resource Use in Canada: Historical and Legal Aspects.* Kerry Abel and Jean Friesen (Eds.), *Manitoba Studies in Native History* VI:35-49. University of Manitoba Press, Winnipeg.

Smith, G. Hubert

1972 Like-a-Fishhook Village and Fort Berthold, Garrison Reservoir, N.D. U.S. Department of Interior, National Parks Service, *Anthropological Papers* No. 2. Washington.

Smith, Pamela J.

1985 *Faunal Analysis of The Forks (Winnipeg) (21K1 to 21K6).* Environment Canada, Parks Canada, *Microfiche Report Series* 277.

Snortland-Coles, J. Signe

1979 The Duck River or Aschkibokahn Site of West-Central Manitoba: The Role of the Northern Marsh in the Subsistence of the Late Woodland Peoples. Manitoba Department of Tourism and Cultural Affairs, Historic Resources Branch, *Papers in Manitoba Archaeology Final Report* No. 7. Winnipeg.

Speth, John D.

1983 *Bison Kills and Bone Counts: Decision Making by Ancient Hunters*. University of Chicago Press, Chicago.

Spice, Kevin

1991 "An Archaeological Investigation of the Manitoba Glass Works Historic Site, May - September, 1990". Manuscript on file with Manitoba Heritage Federation, Manitoba Culture, Heritage and Recreation, Historic Resources Branch, Winnipeg.

Steinbring, Jack

1965 The Sturgeon Fish Jar. *Manitoba Archaeological Newsletter* 2(3):3-6.

1967 A Copper "Gaff Hook" From Ontario. *Wisconsin Archaeologist* 48(4):345-358.

1971 The Littlefork Burial: New Light on Old Copper. *The Journal of the Minnesota Academy of Science* 37(1):8-15.

Stewart, Catherine

1992 "Fauna From Historic/Prehistoric Site of Forks, Manitoba." Paper presented to the 25th Annual Meeting of the Canadian Archaeological Association, London.

Stoltman, James B., Paul W. Lukens, Jr. and David L. Webster

1973 The Laurel Culture in Minnesota. Minnesota Historical Society. *Minnesota Prehistoric Archaeology Series*, No. 8. St. Paul.

Tamplin, Morgan John

1977 "Prehistoric Occupation and Resource Exploitation on the Saskatchewan River at The Pas, Manitoba." Unpublished Ph.D. Thesis, Department of Anthropology, University of Arizona, Tucson.

Teller, James T. and L. Harry Thorleifson

1983 The Lake Agassiz-Lake Superior Connection. In *Glacial Lake Agassiz*. James T. Teller and Lee Clayton (Eds.). Geological Association of Canada, *Special Paper* 26.

Theler, James L.

1989 The Pammel Creek Site Faunal Remains. *The Wisconsin Archaeologist*, Vol. 70, No. 1-2:157-241.

Thomas, David H.

1971 On Distinguishing Natural from Cultural Bone in Archaeological Sites. *American Antiquity*, Vol. 36, No. 3, 366-371.

Villee, C.A., E.P. Solomon, C.E. Martin, D.W. Martin, L.R. Berg, and P.W. Davis

1989 *Biology*. Saunders College Publishing, Philadelphia. [Second Edition]

Warkentin, John & Richard L. Ruggles

1970 *Historical Atlas of Manitoba 1612 - 1969*. Manitoba Historical Society, Winnipeg.

Webb, T. III, E.J. Cushing and H.E. Wright, Jr.

1983 Holocene Changes in the Vegetation of the Midwest. In *Late-Quaternary Environments of the United States; Volume 2: The Holocene*, H.E. Wright, Jr. (Ed.). University of Minnesota Press, Minneapolis.

Wettlaufer, B., W.J. Mayer-Oakes, B.A. McCorquodale, A. La Rocque, J.S. Clayton and W.K. Janzen

1960 The Long Creek Site. William J. Mayer-Oakes (Ed.). Saskatchewan Museum of Natural History. *Anthropological Series* No. 2. Regina.

Wilson, Gilbert Livingstone

1917 *Agriculture of the Hidatsa Indians, An Indian Interpretation. The University of Minnesota Studies in the Social Sciences. Bulletin of the University of Minnesota* No. 9. Minneapolis.

Wood, W. Raymond

1971 Biesterfeldt: A Post-Contact Coalescent Site on the Northern Plains. *Smithsonian Contributions to Archaeology*, No. 15. Smithsonian Institution Press, City of Washington.

Wright, J.V.

1970 The Shield Archaic In Manitoba - A Preliminary Statement. In *Ten Thousand Years. Archaeology in Manitoba*, W. Hlady (Ed.), pp. 29 - 45. D.W. Friesen and Sons. Ltd., Altona.

Yenne, Bill

1986 *The Encyclopedia of North American Indian Tribes*. Bison Books Limited. London, England. [Reprint - 1992]

Yerkes, Richard

1980 Archaeological Investigations Of Prehistoric Fishing Practices In Illinois. *Wisconsin Archaeologist* 61(2):271-279.

1981 Fish Scale Analysis At the Pipe Site (47Fd10) Fond du Lac County, Wisconsin. *Wisconsin Archaeologist* 62(4):533-557.

Young, David E. and Robson Bonnichsen

1984 *Understanding Stone Tools: A Cognitive Approach*. University of Maine at Orono, Centre for the Study of Early Man. *Peopling of the Americas, Process Series*, Volume 1.

Zalucha, L.A.

1981 Advances in the Identification and Interpretation of Archaeological Charcoal: Implications for Past and Present Studies. In *Current Directions in Midwestern Archaeology* 9, S.C. Anfinson (Ed.). Minnesota Archaeological Society, Occasional Publications in Minnesota Anthropology.

APPENDIX A

RELEVANT PERMITS

Heritage Permit

Rivers and Streams Permit

The Heritage Resources Act (Subsection 14(2) and Sections 52 and 53)

Manitoba
Culture, Heritage
and Citizenship

Heritage Permit No. A36-92

FORM 11

PURSUANT to Section/~~Subsection~~ 53 of *The Heritage Resources Act:*

Name: Quaternary Consultants Ltd.
Address: 130 Fort Street
Winnipeg, Manitoba
R3C 1C7

ATTENTION Mr. Sid Kroker

(hereinafter referred to as "the Permittee"),

is hereby granted permission to:

carry out archaeological excavations as a public archaeology project at the archaic component of DlLg-33 in the archaeological reserve on the north bank of the Assiniboine River at The Forks in Winnipeg, to provide information on the site;

during the period:

July 13 to October 15, 1992

This permit is issued subject to the following conditions:

(1) That the information provided in the application for this permit dated the 25th day of June 19 92, is true in substance and in fact;

(2) That the Permittee shall comply with all the provisions of *The Heritage Resources Act* and any regulations or orders thereunder; PLEASE NOTE ATTACHMENT RE CUSTODY AND OWNERSHIP OF HERITAGE OBJECTS

(3) That the Permittee shall provide to the Minister a written report or reports with respect to the Permittee's activities pursuant to this permit, the form and content of which shall be satisfactory to the Minister and which shall be provided on the following dates:

March 31, 1993

(4) That this permit is not transferable;

(5) This permit may be revoked by the Minister where, in the opinion of the Minister, there has been a breach of any of the terms or conditions herein or of any provision of *The Heritage Resources Act* or any regulations thereunder;

(6) Special Conditions:

a. All surface collections, excavations, etc. are to be carried out using the provenience system estabished for use at The Forks and this project will be designated 92A;
b. All heritage objects (artifacts) recovered from The Forks are to be catalogued according to the CHIN system and the relevant Borden designation will be DlLg-33/92A;
c. All heritage objects from The Forks are to be deposited with the Manitoba Museum of Man and Nature by March 31, 1993, for permanent curation and storage, unless appropriate loan requirements are arranged with the Curator of Archaeology prior to that date;
d. A complete set of archaeological field records, catalogue sheets, laboratory analysis records, photographs, reports, etc. are to be deposited with the Manitoba Museum of Man and Nature upon completion of the archaeological research, or sooner if required; and any subsequent revisions or additions to these records are to be filed as soon as possible thereafter;
e. All computer systems and programs employed in archaeological research should be compatible with the computer system established for The Forks;
f. Appropriate arrangements and funds should be made available for the conservation of perishable heritage objects collected from The Forks;
g. In the event that any human remains are encountered during the excavations, all activity in that particular locus will cease immediately, and the Historic Resurces Branch notified immediately so that appropriate action can be determined and taken;
h. The Permittee will be on-site supervising all aspects of the field work, including the removal of the railroad overburden during site preparation, at least 75% of the time, but when the Permittee must be absent, a qualified designate acceptable to Historic Resources Branch (copy of vita to be filed prior to commencement of field work) shall be present;
i. The Permittee shall be responsible for the conduct of the laboratory analysis of recovered heritage objects and information to be included in the permit report;
j. The report identified in #3 above shall conform at a minimum to the "Guidelines for Archaeological Investigations: II - Excavations" (copy attached)
k. Neither the Government of Manitoba nor the party issuing this permit be liable for any damages resulting from any activities carried out pursuant to this permit, and the Permittee specifically agrees, in consideration for receiving this permit, to indemnify and hold harmless the Minister and the Government of Manitoba, the Minister and any employees and officials of the Government, against any and all action, liens, demands, loss, liability, cost, damage and expense including, without limitation, reasonable legal fees, which the Government, Minister or any employee or official of the Government may suffer or incur by reason of any of the activities pursuant to or related to this permit.

8280h

Dated at the City of Winnipeg, in Manitoba , this 29th day of June 1992.

for Minister of Culture, Heritage and Citizenship

MG-13519 (English)

RIVERS & STREAMS FILE NO. 30/92.

THE WINNIPEG RIVERS AND STREAMS AUTHORITY NO. 1

APPLICATION FOR PERMISSION TO CONSTRUCT A BUILDING OR STRUCTURE OR DEPOSIT MATERIAL WITHIN RIVERS AND STREAMS DESIGNATED AREA NO. 1

(PLEASE PRINT)

TEL: Res. 452-6296 **Bus.** 949-8325

APPLICANT: Quaternary Consultants Ltd
ADDRESS: 130 Fort St., Wpg, R3C 1C7
REGISTERED OWNER: S. J. Kroker
ADDRESS: 773 Jessie Ave, Wpg, R3M 0Z6

LOCATION OF CONSTRUCTION/DEPOSITION:
STREET ADDRESS: #1 Forks Market Rd.
LEGAL DESCRIPTION: ~~LOT~~ PCL E9 BLOCK ______ PLAN 23609
D.G.S. ______

DESCRIPTION OF PROPOSED CONSTRUCTION:
Site two temporary trailers (12'x60' and 10'x20') at Forks Public Archaeology Project in Forks Archaeological Preserve (July to Sept)

MINIMUM HORIZONTAL DISTANCE BETWEEN PROPOSED CONSTRUCTION AND WATER'S EDGE AT SUMMER LEVEL ≈ 60 m.
GROUND ELEVATION (Geodetic)
EXISTING AT REAR OF BUILDING 231.2
PROPOSED AT REAR OF BUILDING 231.2 AT NORMAL SUMMER RIVER LEVEL 223.4

4729 0001-001 A CSR RIVESTRS 8/4/92 70.00

DEPOSITION OF MATERIAL:
MINIMUM HORIZONTAL DISTANCE BETWEEN MATERIAL AND WATER'S EDGE AT SUMMER LEVEL ______
MATERIAL TO BE DEPOSITED Nil.
APPROX. QUANTITY (Cu Metres) ______ MAXIMUM DEPTH OF MATERIAL ______
METHOD OF WASTE DISPOSAL: SEPTIC FIELD ______ MUNICIPAL SEWER ✓ PUMP OUT TANK ______
VALUE OF BUILDING AND/OR CONSTRUCTION: 15,000.00 **FEE $:** 70. pd #4729.
Cheque or Money Order, Payable to the City of Winnipeg

NOTE: See attached sheets for supporting material required, schedule of fees, and other information.

DATE: Aug 4/92 **SIGNATURE OF APPLICANT:** S. J. Kroker

A. ZONING INFORMATION (Departmental Use Only)

Documents Submitted: ☐ Plans of Development ☐ Surveyor's Certificate ☐ Certificate of Title ☐ Owner's Authorization

Property Zoned: ______ Size of Site ______ Site Area ______
By-law/T.P.S. ______ Community ______ Atlas Sheet# C.C./FCR AH25
Minimum Yards Required to Comply with Zoning Regulations:
Front Yard: ______ Side N.E. Yard S.W. ______ Side N.E. Yard S.W. ______ Rear Yard ______
THIS APPLICATION: ☐ COMPLIES ☐ DOES NOT COMPLY
ZONING/PLANNING COMMENTS: ______

THE CITY OF WINNIPEG
WINNIPEG RIVERS & STREAMS
AUTHORITY
AUG 4 1992
RECEIVED

APPENDIX B

1992 PARTICIPANTS

Caroline Ackerman
Star Ackerman
Susan Algie
David Allen
Peter Allen
Steven Allen
Jessica Antonio
Tannis Bazilewich
Lyle Beattie
Mathew Beaty
Andrew Bell
Bernie Bock
Philip Bock
Laura Borrett
Debbie Boutin
Christine Braun
Dorothy Braun
Todd Braun
D. Britton
Moira Brown
Doug Browning
Laurel Buckels
Sharlene Burleigh
Shelley Buskell
Sean Chubbuck
Amanda Clairmont
Rebecca Coish
Barbara Collerman
Renee Conrad
Avril Coutou
Gilles Crevier
Jeff Crozier
Judy Crozier
Andreas Dajic
Mirko Dajic
Steven Dajic
Drew Daniels
Ada Dengate
Leslie Dengate
Lynn Desilets
C. Desjardins
Taryn Dufault
Vera Dufault
Lorna Mae Feilberg
David Flood
Jason Flood
Lacie Frost
Max Frost
Teresa Gagne
Gideon Garland
Marshall Garland
Matthew Garland
Tom Garrett
Lianne George
Randy Gerylo
Marie Giasson
Sylvain Giasson
Michelle Gilbert
Ezra Glinter
Ruth Glinter
Jason Gren
Ryan Gren
Stephen Hayter
Ramzi Helewa
Lorraine Hercus
David Herfst
Leanne Hildebrand
Ingrid Hillman
Livia Hillman
Robert Hitchen
Dylan Hoemsen
Travis Hoemsen
Alex Hupka
Elizabeth Ingram
Robert Ingram
Lorraine Iverach
Christopher Iverach-Brereton
Jennifer Iverach-Brereton
Kevin Jaworski
Trevor Jones
Daniel Jordan
Thomas Jordan
Jim Kacki
Sarah Kalcsics
Shannon Kotelo
Julia Kwiecinski
Marjorie Lauder
Andre Leger

Brian Lennox
Peter Lennox
Eva Linklater
Janice Liwang
Nicholas Lysecki
Drew MacKenzie
Graeme MacLean
Yvonne Maes
Craig Marshall
Joan Marshall
Dawna Marynuk
Amy McGowan
Shannon McGregor
Nathaniel McVicar
Noreen Mian
Susan Murray
Aaron Nelson
Rebecca Nelson
Shari Nelson
Becky Nemetchek
Carla Nemetchek
Kristin Nemetchek
Daniel Oakes
Rose Oakes
Darren Officer
Laura Onukywycz
Mae Painchaud
Don Palmer
Linda Paul
Steven Paulus
Karen Pedersen
James Prentice
Curtis Prystupa
Max Reed
Darryl Reilly
Andrew Reimer
Carlton Reimer
Joshua Ritterman
Dean Robinson
Debra Rodd
Richard Rodd
Carl Schmid
Angelika Selleck
Betty Shale
Michael Shale
Dianne Simister
Heather Simister
Ian Simister
Andrea Smith
Suzanne Smith
Micaela Steingarten
Heather Suderman
Kelly Suderman
Jennifer Sykes
Andrew Synyshyn
Elaine Szymanski
Steven Terrick
Keely Timko
Krysti-Anna Timko
Sherry Turman
Sheridan Vinci
Brandice Vivier
Cameron Wagner
Jennifer Watkins
Melanie Watkins
Sonia Watkins
Daniel Weber
Michael Weber
Ian Whetter
John Young
Katy Younger
Karen Zaplachinksi

SCHOOLS PARTICIPATING IN THE HANDS-ON PROGRAM

SCHOOL	GRADE	STUDENTS	TEACHER
Sansome School	8	15	Anne Williams
James K. McIsaac School	6	11	Chris Baetsen
H.S. Paul School	6	44	Bill Zuk
Royal School	6	31	Phil Saurette
St. Johns High School	8	26	Murray Scott
Glen Elm School	6	17	Kim Gowaryluk
Centennial School (Selkirk)	5/6	18	Bruce MacLaren
Ramah Hebrew School	5	32	Pat Leclair

IN-DEPTH LECTURE PARTICIPANTS

SCHOOL	STUDENTS
St. Johns Collegiate	57
Whitemouth School	32
Joseph Wolinsky	30
Charleswood School	180
St. Johns High School	64
La Broquerie	46
Crocus Plains (Brandon)	8
Roses Family Daycare	6

APPENDIX C

RURAL MANITOBA VISITORS

Alexander 1 Individual
Altona 7 Individual
Amaranth 1 Individual
Anola 8 Individuals, 1 Family
Arborg 7 Individuals, 1 Family
Argyle 1 Individual
Ashern 2 Individuals
Basswood 2 Individuals
Beausejour 9 Individuals
Belair 2 Individuals
Binscarth 1 Family
Birds Hill 1 Individual
Birtle 2 Individuals
Bissett 2 Individuals
Boggy Creek 1 Individual
Boissevain 3 Individuals
Brandon 91 Individuals, 6 Families
Carberry 3 Individuals, 1 Family
Carman 2 Individuals
Cartwright 1 Individual
Churchill 2 Individuals
Clandeboye 1 Individual
Cooks Creek 1 Individual
Cypress River 4 Individuals
Dauphin 16 Individuals
Deloraine 1 Individual
Domain 1 Family
Dominion City 1 Individual
Duck River 1 Individual
Dufresne 1 Individual
Dufrost 1 Individual
Dugald 1 Individual
Dunrea 1 Individual
East Selkirk 4 Individuals
Ebb & Flow 1 Individual
Elie 1 Individual
Emerson 1 Individual
Eriksdale 4 Individuals
Fisher Branch 2 Individuals
Flin Flon 5 Individuals
Fort Alexander 1 Individual
Foxwarren 1 Individual
Gilbert Plains 1 Individual
Gillam 2 Individuals
Gimli 1 Individual
Glass 1 Individual
Glenboro 1 Individual, 1 Family
Glenora 1 Individual
Grahamdale 1 Family
Grand Beach 1 Individual
Great Falls 1 Individual
Gretna 1 Family
Hamiota 5 Individuals
Hartney 1 Individual
Haywood 1 Individual
Headingley 3 Individuals
Ile Des Chenes 3 Individuals, 1 Family
Inwood 2 Individuals
Kelwood 2 Individuals
Killarney 6 Individuals, 2 Families
Kirkness 1 Individual
Lac Du Bonnet 7 Individuals
Landmark 2 Individuals
La Salle 2 Individuals
Leaf Rapids 2 Individuals
Lockport 2 Individuals
Lorette 1 Individual
Lowe Farm 1 Family
Lyleton 2 Individuals
Lynn Lake 1 Individual
MacGregor 2 Individuals
Marquette 2 Individuals
Matlock 1 Family
Melita 1 Individual
Miami 1 Individual, 1 Family
Miniota 2 Individuals
Minitonas 1 Individual
Minnedosa 3 Individuals
Moosehorn 2 Individuals
Morden 11 Individuals, 1 Family
Morris 8 Individuals
Mulvihill 1 Individual
Neepawa 7 Individuals, 1 Family
Nelson House 7 Individuals
Newdale 2 Individuals
Niverville 2 Individuals, 2 Families
Norway House 2 Individuals
Notre Dame de Lourdes 1 Individual

Oakbank 6 Individuals, 1 Family
Oak Lake 2 Individuals
Onanole 2 Individuals
Petersfield 2 Individuals
Pinawa 11 Individuals, 1 Family
Pine Falls 1 Individual
Plum Coulee 3 Individuals
Poplar Point 2 Individuals
Portage la Prairie 19 Individuals
Rennie 1 Individual
Reston 1 Individual
Richer 3 Individuals
Rivers 2 Individuals, 1 Family
Riverton 1 Individual
Roblin 3 Individuals
Rock Lake 1 Individual
Roseisle 1 Individual
Rossendale 2 Individuals
Rosser 1 Individual
Russell 1 Individual, 1 Family
St. Adolphe 2 Individuals, 1 Family
St. Andrews 3 Individuals
St. Claude 1 Individual
St. Francis Xavier 2 Individuals, 2 Families
St. Lazare 2 Individuals
St. Leon 1 Individual
St. Malo 1 Individual
St. Pierre-Jolys 2 Individuals
Ste. Agathe 1 Individual
Ste. Anne 4 Individual
Sandy Lake 1 Family
Sanford 2 Individuals
Selkirk 13 Individuals
Shilo 2 Individuals
Sidney 1 Individual
Silver Falls 1 Individual
Snow Lake 7 Individuals, 1 Family
Souris 1 Individual
Split Lake 1 Individual
Springfield Municipality 2 Individuals
Starbuck 3 Individuals
Steinbach 2 Individuals, 2 Families
Stonewall 8 Individuals, 1 Family
Stony Mountain 1 Individual
Swan River 4 Individuals
Teulon 3 Individuals
The Pas 7 Individuals
Thompson 13 Individuals
Thornhill 2 Individuals, 1 Family
Virden 4 Individuals, 2 Families
Waldersee 1 Individual
Warren 4 Individuals
Wellwood 1 Individual
West St. Paul 1 Individual
Whitemouth 1 Individual
Windygates 2 Individuals
Winkler 3 Individuals
Woodlands 2 Individuals