THE UNIVERSITY OF MANITOBA

PREHISTORIC HUMAN OCCUPATION AND ECOLOGY IN THE SANDILANDS FOREST RESERVE, SOUTHEASTERN MANITOBA

By

Stanley G. Saylor

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Introduction

The survey of the Sandilands Provincial Forest was initiated for a number of reasons: first of all, the area was unknown archaeologically (although a number of other sites elsewhere in southeastern Manitoba have undergone excavation). Secondly, a characteristic of this region is the presence of numerous Lake Agassiz strandlines, which the present author feels are important features in a study of Paleo-Indian settlement patterns. Also, because of previous experience in areas to the south of the Sandilands, the writer wished to continue to study the distribution of prehistoric sites in a systematic manner, and in an area noted for a diverse floral and faunal assemblage.

The aim of the survey was to locate prehistoric sites and to analyze their location with respect to various environments of the region. Special attention was accorded their density and distribution with respect to both physiographic province, and resource distribution and availability. Specific patterns are evident in site location, and trends are noted in the region's geologic history, vegetational development, and resource availability. This thesis will present a hypothesis concerning specific correlations and interrelationships between site distribution and the ecological characteristics of the region.

The archaeological investigations were undertaken in several phases. Prior to field survey operations, a detailed study of published references to the area was done, several initial visits were made to the area, and a research design was formalized. The field research was conducted between June 8 and August 30, 1972. During the following year and into the fall of 1973, laboratory work was conducted. Specific emphasis was placed on the analysis of artifactual, pedological, and osteological data. Also, a study of the literature was undertaken for the purpose of obtaining information on geologic history, vegetative development, resource characteristics (type, extent, distribution), and comparative ethnographic materials. It is this stage of the research that resulted in a formulation of a hypothesis as to a correlation between the site distribution and the ecological characteristics of the area.

The thesis has been divided into four chapters. The first chapter describes the region, and outlines the original research problem. The second discusses the glacial chronology, Lake Agassiz history, vegetative development, and resource availability. The writer believes that since no previous archaeological work has been done in the Sandilands, it was necessary to describe the region's ecological characteristics in some detail. By studying the prehistoric geological and vegetational developments, in addition to the modern vegetational characteristics, soil, and resource distribution, it was possible to discern patterns in prehistoric site distribution and land use that differed markedly throughout the research area. The third chapter is devoted solely to a description of the archaeological sites and their contents. The final chapter correlates the ecological and the archaeological data by formulating a hypothesis, with specific attention being given to ethnographic comparisons and the question of sampling bias and/or adequacy of research design.

All material is in repository at the Anthropology Laboratory, University of Manitoba under the accession number 118; this includes artifacts, soil samples, photographs, and field and laboratory notes.

CHAPTER ONE

The Area and the Research

Location

The Sandilands Provincial Forest is located in extreme southeastern Manitoba east of Winnipeg and west of the Manitoba-Ontario border. A portion lies north of Highway No. 1 and extends southward almost to the International boundary. The area is accessible by Routes 1 and 12 from Winnipeg and Route 89 from Minnesota (Figure 1, page 3).

Bedrock Geology

Johnston (1921: 9) described the bedrock of the region as Precambrian. No outcrops exist in the research area proper, although they can be found near the Manitoba-Ontario border and in certain localities along the Whitemouth River south of its confluence with the Winnipeg River. In the eastern part of the research area, the bedrock is Palaeozoic limestone. All of the bedrock is overlain by unconsolidated deposits of Pleistocene and Recent age. Ehrlich and Smith (1964: 15) have differentiated three principal rock formations. The eastern half of the area is composed of chiefly acidic intrusive rocks, Archaean or Proterozoic in age, separated in the centre of the area by Ordovician sandstone and shale of the Winnipeg Formation. The western quarter consists of Ordovician limestone and dolostone of the Red River Formation.

Vegetation

The Sandilands exhibits a somewhat unique vegetational situation, as it is crosscut or bordered by several distinct vegetational zones. Rowe (1959: 11) described the forest as the "Great Lakes-St. Lawrence, Rainy River section." It is characterized as a northward extension of the Great Lakes-St. Lawrence forest with influence on its western periphery by forest and prairie communities. Red and white pines (Pinus resinosa, P. strobus), of greater extent elsewhere in the Great Lakes-St. Lawrence forest, comprise no more than a scattered representation in the Sandilands, mainly in the eastern part. They have been replaced mainly by jack pine (Pinus banksiana). Extensive swamps exist which are favorable for the growth of black spruce (Picea mariana), tamarack (Larix lariciana), cedar (Thuja occidentalis), willow (Salix sp.), and alder (Alnus sp.). Inland from rivers are found large areas of balsam poplar (Populus balsamifera), white spruce (Picea glauca), balsam fir (Abies balsamea), and scattered tamarack (Larix lariciana). On river banks are found white elm (Ulmus americana), basswood (Tilia americana), Manitoba maple (Acer negundo), bur oak (Quercus macrocarpa), and trembling aspen (Populus tremuloides).

West of the research area is the Aspen Parkland (Bird 1961: 1), situated between the Boreal-Coniferous forest of the Precambrian Shield in Ontario and the prairie of the Red River region.

Settlement History

After 1870, when Manitoba became a province, rapidly increased settlement of the Red River resulted in a heavy demand on timber from this region. The Dawson Road, built in 1868 from the Northwest Angle to the Red River, passes to the northeast of the research area. The Canadian Pacific Railway between Fort William and Winnipeg had little effect on land settlement, although timber for its construction was taken from the Whitemouth River area. The Winnipeg-Rainy River line of the Canadian Northern Railway, completed in 1901, permitted homesteading

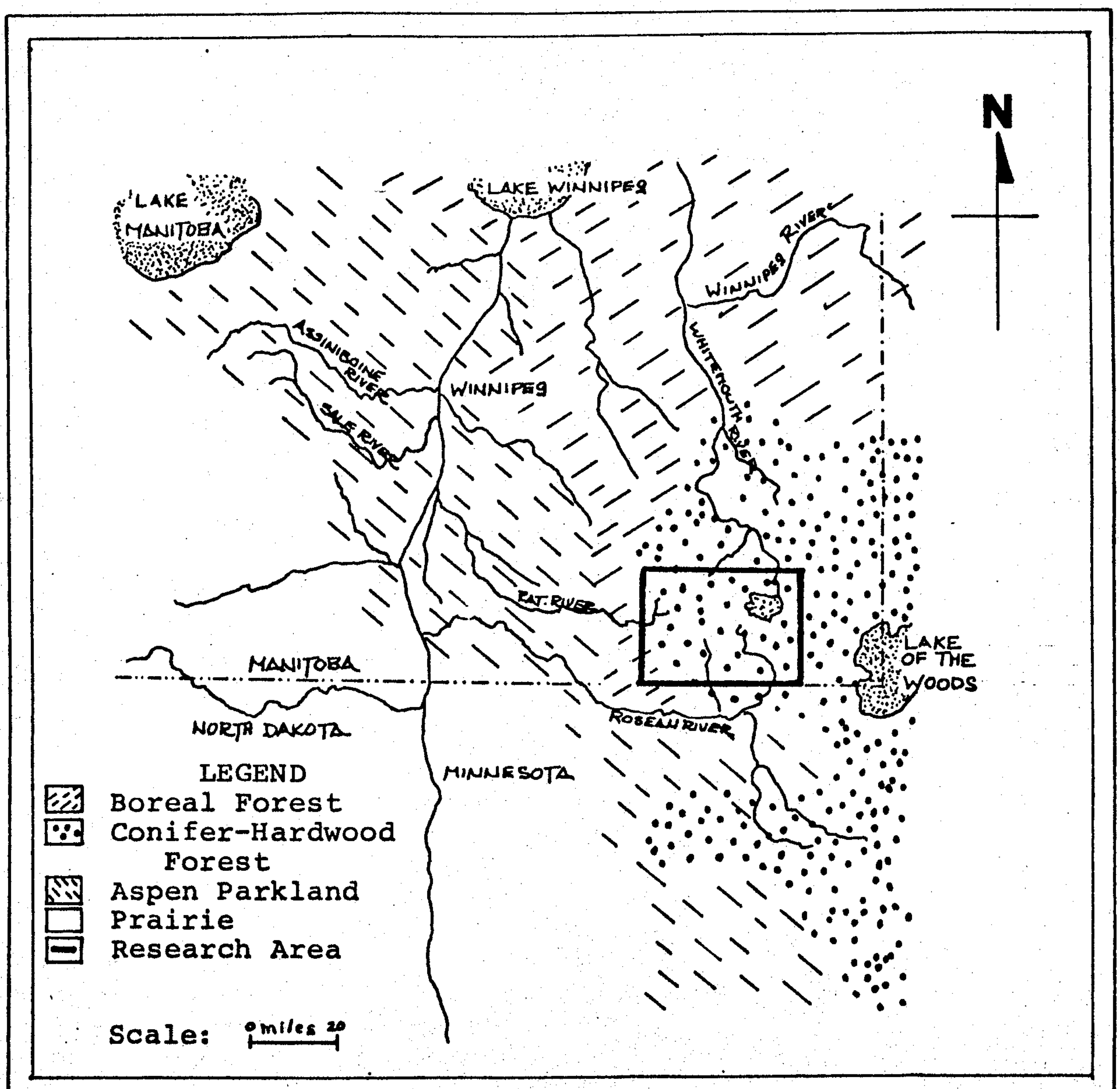

Fig. 1. Research Universe Location

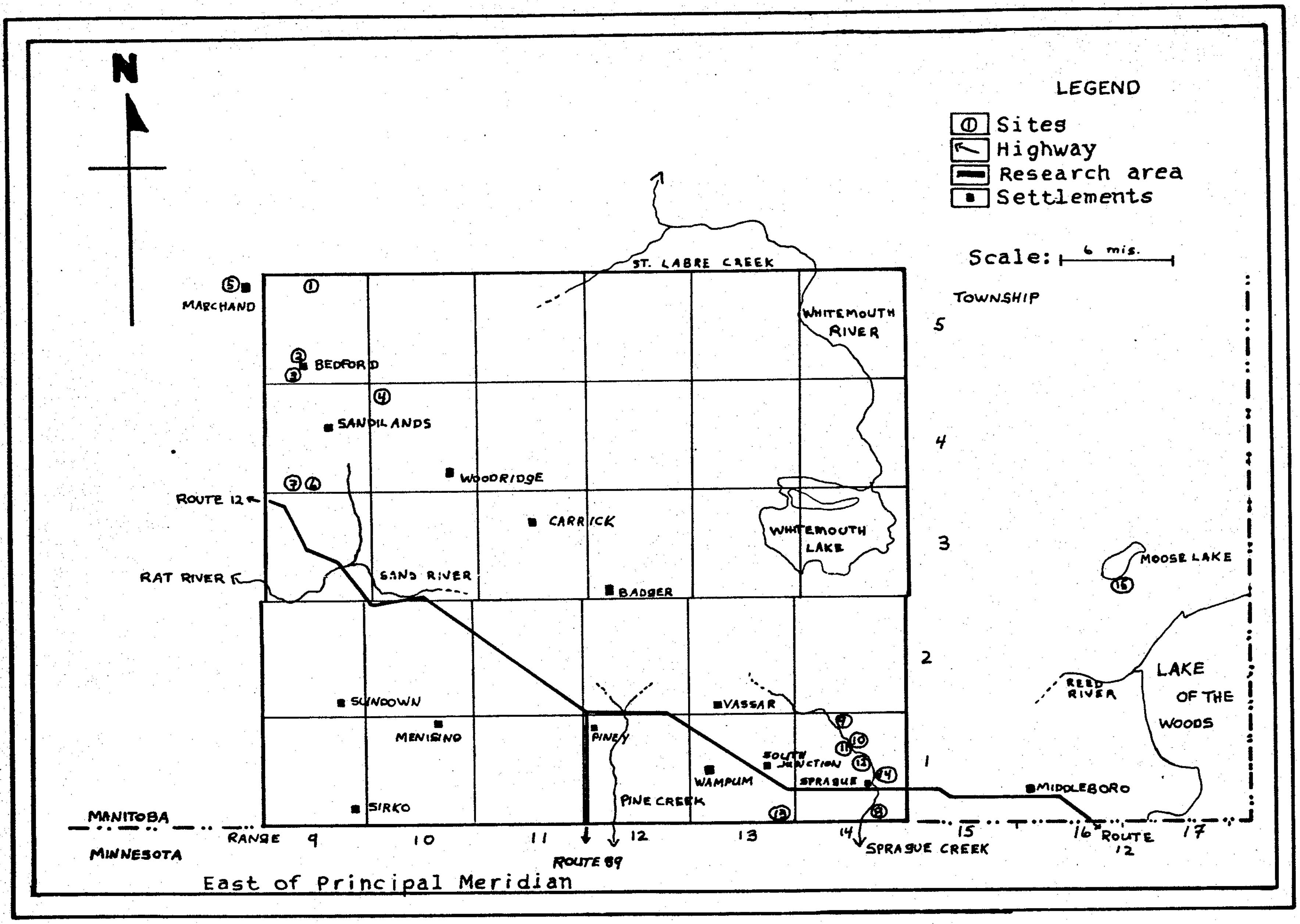

Fig. 2. Research Universe

for the first time. The greatest period of land settlement was between 1900 and 1930. Most of this early settlement was on sand ridges dominated under natural conditions by Pinus banksiana. After the trees were removed by fire or cutting, most settlers were unable to derive additional income from the sandy soil. A pulpwood "boom" of the 1920's provided income for a brief period of time, but the economic depression in the 1930's diminished the population and land use (Ehrlich and Smith 1964: 88-90).

The 1961 Canada census recorded a total population in the Southeastern map area of 4,641 and a density of 1.6 persons per square mile. Approximately forty percent live in unincorporated towns and villages, about twelve percent are located in hamlets or settlements, while the remainder are dispersed throughout the rural area. The average density of the rural population is less than one person per square mile, although this varies substantially throughout the Sandilands. The rural population is concentrated near St. Labre, Sundown, Piney, South Junction, and Sprague. Other small villages are Sandilands, Woodridge, Badger, Vasser, Menisino and Wampum. Near the research area, but outside the area sampled during the survey, are La Broquerie, Marchand, Zhoda, Caliento and Sirko on the western margin, and Middlebro on the eastern margin (Figure 2, page 4).

Physiographic areas

The initial breakdown of the Sandilands into physiographic areas follows that which was established by Ehrlich and Smith (1964) (Figure 3, page 6). The division is based on topography, soil, drainage and vegetation.

The Bedford Hills (hereafter refered to as the Upland), covering

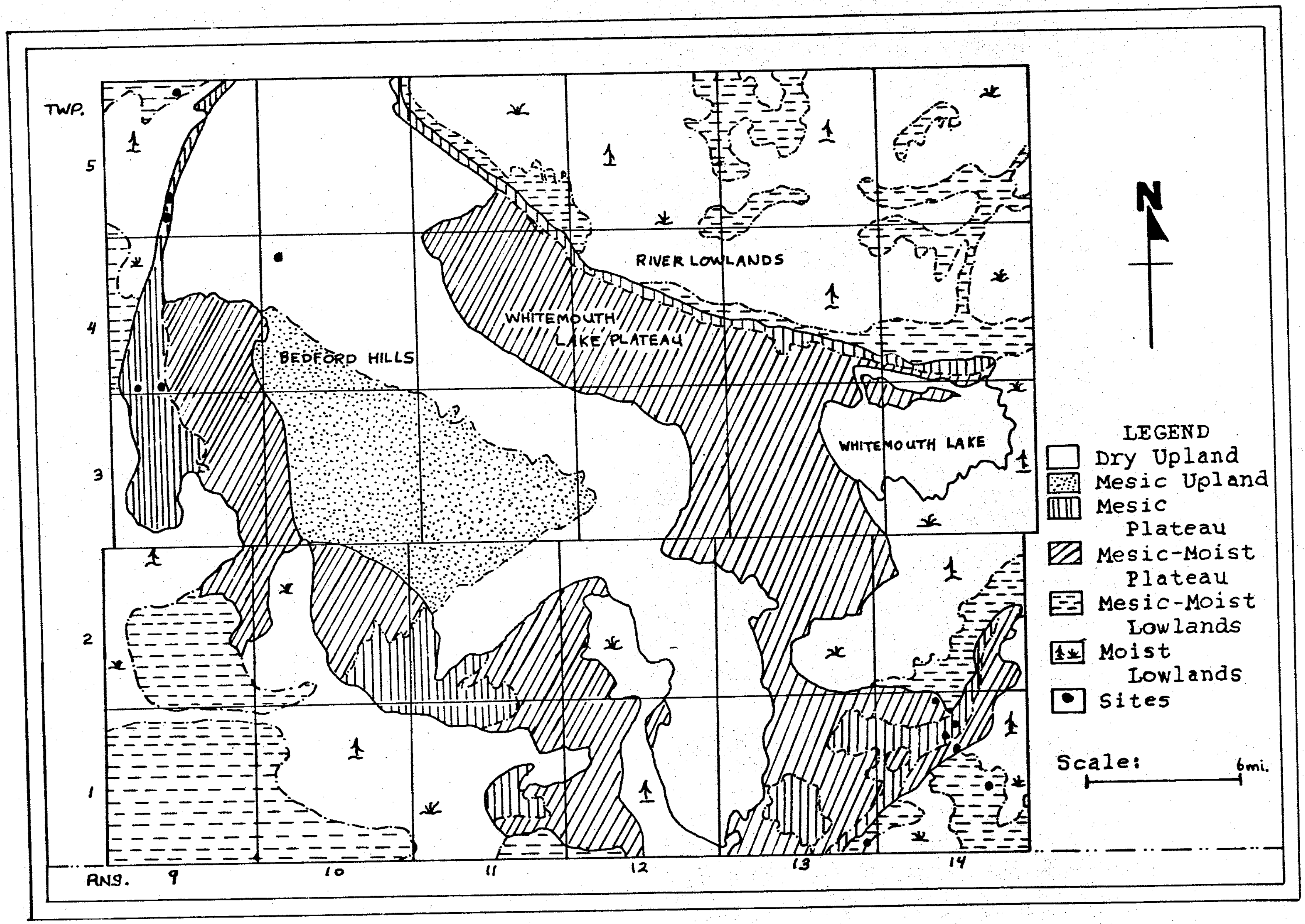

Fig. 3. Sandilands Microenvironments

approximately 265 square miles, constitute the most prominent feature, rising from 1,050 to 1,300 feet in elevation. The Upland stretches from the extreme northern portion of research area, east almost to Whitemouth Lake, and south almost to the International Border. A substantial portion of the Upland comprises numerous, irregularly shaped hills and the prominent UpperCampbell Escarpment (Johnston 1921) in the northwestern and southern section. Undrained basins are common and a few ponds or small lake beds are present. Springs issue from the base of the escarpment or from small peat bogs, although these are impermanent and not well established. A number of artesian wells flow from a stratum of sand and gravel between two layers of glacial till.

The soils of the Upland are predominately podzols and grey wooded soils on dry sand and gravel deposits (Ehrlich and Smith 1946: 29). On the periphery of the Upland are found grey wooded and humic gleysols, as well as low humic gleysols developed on water worked, strongly calcareous till. Podzols, grey wooded, humic gleysols, and low humic gleysols occur on moist, wet sand and gravel.

The vegetation of the Uplands is heavily dominated by <u>Pinus banksiana</u> on the sand and gravel soils. On the periphery of the region are found mixed soft-woods and hardwoods. Near the ponds and undrained depressions, shrub, <u>Salix</u> sp., <u>Alnus</u> sp., and <u>Betula</u> sp. are typical.

The <u>Whitemouth Lake Plateau</u> (hereafter referred to as the Plateau) surrounds the Upland on the western and southern margin, but its greatest area is located in the eastern section. The total area is approximately 335 square miles. The maximum relief is fifty feet, varying between 1150 and 1200 feet above sea level. The only change in relief is that provided by the lower Campbell beach complex in the western area.

Streams are somewhat more frequent than in the Upland, particularly near St. Labre, Sprague, and in the western section at the headwaters of the Sand and Rat Rivers. A notable feature is Whitemouth Lake, situated on the eastern area of the Plateau where the latter merges with the Lowlands. Its maximum depth is reported to be twenty feet, although informants report the majority to be ten feet or less.

Podzol and grey wooded soils cover less area on the Plateau than on the Upland. The most common soils are grey wooded, humic gleysols, and peat. Peat is prominent in areas where the drainage has been blocked by strandlines, notably near Whitemouth Lake and in the extreme western and southern margins. *Pinus banksiana* is quite frequent, mixed with shrub, *Quercus* sp., *Salix* sp., *Alnus* sp., and *Betula* sp. (Ehrlich and Smith 1964 Soils Map).

The *River Lowlands* (hereafter referred to as the Lowlands), occupying some 480 square miles, surround the Upland and Plateau on all sides, but are most extensive in the eastern region of the research area. The maximum relief varies from 1100 to 1150 feet in elevation. Most of the region is an expanse of peat broken only by small "islands" of gravel bars or beaches. A few small ponds or lakes may be found. These beaches and bars may be up to several miles in length, ten feet in height, and between 100 and 500 feet in width. They frequently act as dams which block the surface drainage. The major rivers in this region are the Whitemouth, St. Labre and Pine Creek. This region is most extensive to the east and north of the Upland, stretching to Route 1 and Lake of the Woods.

Organic soils are dominant in the Lowlands, with shallow and deep peat broken by grey wooded soils, humic gleysols, podzols, and low humic gleysol soils. Vegetation that has developed on these soils is characterized by Picea sp., Abies balsamea, Thuja occidentalis, Larix laricina on the flat unbroken expanses. On the gravel bars and beaches Pinus banksiana may occasionally be found, but most characteristic is Populus sp., Salix sp., Alnus sp., and Betula sp. West of the Uplands, however, there is less Picea sp., Abies balsamea, Thuja occidentalis, and Larix laricina; the vegetation is characteristically a mixture of hardwood and softwood species.

It is possible, and indeed desirable, to revise the physiographic devisions of Ehrlich and Smith (1964) into one which is more diagnostic of major soil groups and vegetation.[1] The Upland can be divided into a microenvironment of dry, Pinus banksiana forest developed on aeolian sand soils, covering 191 square miles (Plate 1, page 10) and microenvironment of more mesic soils with mixed vegetation, consisting of 73 square miles. (Plate 2, page 11). The Plateau can be subdivided into two smaller microenvironments. The first consists of soils with a vegetation characterized by Pinus banksiana, Populus sp., Quercus sp., Salix sp., and Alnus sp. that covers 94 square miles (Plate 3, page 12). The second microenvironment, covering 240 square miles, is one of mesic to moist soils with a mixed vegetation of Populus sp., Picea sp., Betula sp., Salix sp., Ulmus sp., Abies Balsamifera and Acer sp. (Plate 4, page 13). The Lowlands can be divided into a microenvironment of 340 square miles consisting of mesic to moist soils with a vegetation largely similar to that of the mesic soils of the Plateau (Plate 5, page 14) and a microenvironment of moist peat soils,

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[1]Unless otherwise stated, the term region will hereafter refer to the Sandilands proper, or to the major physiographic divisions of Ehrlich and Smith; microenvironment (or habitats) will refer to the smaller revised zones (e.g., Mesic-Moist); and area will refer to the vicinity of archaeological sites.

Plate 1. Dry Upland vegetation, showing Pinus bank-
siana trees developed on aeolian sand soils.

Plate 2. Mesic Upland vegetation. Populus sp., Pinus banksiana, Betula sp. and Picea sp. are dominant tree species.

Plate 3. Mesic Plateau vegetation, situated on the lower elevations of the Campbell beach. Quercus sp., Pinus banksiana, and Populus sp. are dominant trees.

Plate 4. Mesic-Moist vegetation of the Plateau, situated west of the lower elevations of the Campbell beach. Dominant trees are Populus sp. and Betula sp.; extensive stands of Picea sp. are out of view to the left of the frame.

Plate 5. Mesic-Moist Lowlands vegetation, situated near the Rat River, west of Route 12. Dominant tree species is Populus sp.; Salix sp. is also notable.

Plate 6: Moist Lowlands vegetation, situated North-East of Sprague, adjacent to route 308. Dominant tree species visible in the background of the frame are Picea sp., Larix laricina, Thuja occidentalis. Extensive area of Salix sp. maybe noted at the right of the frame.

with a vegetation dominated by _Picea_ sp., _Thuja occidentalis_, and _Larix laricina_, covering 339 square miles (Plate 6, page 15).

Research Problem

A hypothesis was formulated after the field research and the subsequent laboratory analysis of the data, namely that site distribution and density in the Sandilands may be a result of certain ecological factors, primarily resource distribution and availability. Because of the diversity of microenvironments, it is hypothesized that one area may have been exploited more fully than another; or alternatively, if no patterns were apparent in site distribution, it was hoped prior to the field research that perhaps the specific resources exploited at each site could be determined. Accordingly, several "variables" were examined: (1) the specific site location with respect to the microenvironments, determined in an unbiased manner; (2) the "visibility" of sites--i.e., the ease or difficulty of finding sites based on the conditions of ground disturbance; (3) the resource characteristics - their type, location and variability. At best, only a hypothesis can be formulated from the initial survey operations. The hypothesis is that the number of sites in a specific microenvironment is a function of the environmental potential of that area, influenced by the visibility factor, the total area involved, and the percentage surveyed. "Environmental potential" as used in this study can be defined as those factors which enable a given population or group to subsist through resource exploitation. The term "resource" may be defined as any substance extracted from the environment for the purpose of physical maintenance of an individual or group.

An alternative method of stating the hypothesis is to present the objective and the variables affecting this objective (adopted from

Harvey 1971: 365). The objective of the Sandilands survey was to identify the site distribution in relation to the environmental characteristics of the region. Variables which can be used to explain site distribution are (1) resource potential of a given area; (2) environmental variability, such as resource availability, both in quality and quantity, and seasonality; (3) cultural preference for certain resources, and scheduling of resource procurement activities. Variables which must be controlled for or analyzed during the survey are (1) the total area of the research universe; (2) the percentage of each subarea or microenvironment; (3) the percentage of each subarea surveyed; (4) surface conditions which determine the visibility of sites, such as dense forests versus cultivated fields.

The survey procedure was designed only to find archaeological sites in an unbiased manner, and to record the sites in relation to the ecological characteristics of the region. The correlation of archaeological and environmental data occurred subsequent to field survey operations. In other words, the hypothesis which resulted from the Sandilands survey was formulated <u>after</u> the data were gathered, and <u>after</u> laboratory analysis was nearly complete. The field survey operations were not influenced by preconceived notions of site distribution.

The laboratory analysis was specifically conducted in order to understand the ecology and resource characteristics of the region. A study of geological history was useful in that it enabled the writer to determine specific factors of topography, drainage, soil conditions, and lithic resource availability. A study of vegetational patterns resulted in discerning the distribution of plant and animal resources, by preferred habitat according to species. By studying the past vegetational developments, it was possible to undetstand the variation in resources at each site in the region, as well as the variation in resource availability throughout the six microenvironments. A review of literature on ethnographic patterns of resource exploitation was also done. The information was correlated with the archaeological and ecological data, and this resulted in the hypothesis that is presented to account for Sandilands site distribution.

However, there are certain difficulties in correlating ethnographic and archaeological data. Specifically, one may wonder precisely how the behavioural patterns of historic populations may be used to explain behaviour of prehistoric populations. The writer believes that, regardless of the age of a cultural group under study (i.e., historic or prehistoric), it is possible to discern certain patterned regularities in the population's lifestyles. The regularities discovered as a result of the Sandilands survey are settlement and resource exploitation occurring largely in two of the six microenvironments. The regularities are hypothesized to be a result of the differential environmental potential of the six Sandilands microenvironments. The survey operations, for the most part, were not sufficiently detailed to allow specific analysis of exploitative patterns at each archaeological site.

CHAPTER TWO

The Environment and its Development

Glacial History

According to Johnston (1921: 27-33), much of the Sandilands Upland was formed during late Wisconsin times by a glacial advance from the northwest, which resulted in the formation of a terminal moraine.[1] This moraine extends northward from the International Border near Vassar and South Junction to east of Marchand. Two distinct layers of calcareous till have been observed. The lower layer contains little or no limestone, whereas the upper layer contains this rock in abundance. In certain locations, these two till sheets are separated by thick deposits of glacial outwash composed of sand and gravel. An absence of lake clays associated with the earlier advance of the ice-sheet is indicative of comparatively free drainage at this time. Therefore, an initial Wisconsin glacial advance from the northeast, followed by a period of ice-recession, and subsequent re-advance from the northwest, are suggested.

Geologic History of the Research Area

Initial studies of Lake Agassiz development were done by Upham (1890, 1895). Specific studies of the research region and the Lake Agassiz Lowlands were carried out by Johnston (1921, 1946) and Elson (1962, 1967, 1971). These publications, in addition to field observations, have been used to reconstruct the following history of recent geologic events in the research area.

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[1] The terminology used in the following description of geological events is after Flint (1971) and the Dictionary Of Geological Terms (1957).

Glaciation initially brought till from the northeast; this was followed by an interglacial period in which the till weathered (the reader is referred to the previous section). A lake then formed which dates in excess of 36,000 years B.P. A subsequent south-eastwardly advancing ice sheet deposited gray till. Deglaciation of the Red River Basin resulted in the formation of Lake Agassiz I, possibly between 11,700 and 13,000 years B.P. (Elson 1967, 1971). The ice subsequently melted northward, with minor fluctuations, and the lake expanded south of it, stretching from Lake Traverse northward to the ice sheet. During the Lake Agassiz I period, the entire research area was submerged. Towards the end of this period, a beach may have been formed during the Tintah or Norcross phases and prior to the establishment of the Campbell Strandline; it is particularly prominent east of Bedford. To date, however, there has been no research that can confirm this hypothesis (Fenton, personal communication).

Approximately 11,000 years to 10,000 years B.P. the lake was drained through an eastern outlet into Lake Superior. This eastern outlet was subsequently blocked by a minor ice readvance initiating the Lake Agassiz II phase, dated at 10,000 to 9,000 years B.P. The first beaches in the research area were established during the Campbell phase, approximately 10,000 years B.P. The Campbell beach (according to Johnston 1946) is that portion of the research area which is highest in elevation and surrounded by a steep embankment. It surrounds roughly the Bedford Hills and the Whitemouth Lake Plateau. The highest elevation of the Sandilands (1300 feet) occurs east of Bedford and also north of Piney and Vassar (1250 feet). If Johnston's (1921) differentiation between Upper and Lower Campbell beaches is to be followed, the escarpment surrounding the

Uplands can be designated the Upper Campbell beach, and the slightly raised beach which surrounds the Plateau is the Lower Campbell beach. During the Campbell period, the research area was essentially an island.

It has been postulated, based on studies of the western and the southern outlet, that during the Lake Agassiz II stage the water level rose until it overflowed the southern outlet. This caused the outlet to erode rapidly to bedrock, whereupon the water subsided to the level of the Campbell strandline where it stabilized for a period of some 200 to 500 years. Elson (1967: 93-94) refers to this period of stabilization as Lake Agassiz III. During this time, there was extensive sand dune formation,[2] deposition of lacustrine clays and silt, and modification of the already existing landforms. Thus, beginning about 9,500 years ago, the Sandilands water had retreated from the area to a degree that would have allowed population migrations from the south.

The Lake Agassiz IV period was characterized by a second discharge into Lake Nipigon through an eastern outlet. Between approximately 8,500 and 7,500 years B.P., additional ice disintegration resulted in a northward drainage into Hudson Bay. From approximately 8,500 years B.P. onward, beaches were being formed in the northeast portion of the Lowlands, and on the periphery of the Plateau. As the raised beaches were formed, they halted drainage, resulting in clay and silt accumulations in some areas and peat formation on a clay base in other areas. Particular features resulting from the geological processes which formed the Plateau are Whitemouth Lake, and a spit on the weatern margin of the Uplands. Downcutting of stream channels and meandering were distinctive processes in the Lowlands after Lake Agassiz retreat. The most active

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[2]The orientation of the dunes suggest prevailing westerly winds during the course of their formation (Johnston 1921: 35).

stream was Sprague Creek which originates in a peat bog south of Whitemouth Lake.

A somewhat earlier date for the termination of Lake Agassiz, 8,530 ± 220 years B.P., has been suggested by Elson (1971). The date was derived from marine shell fragments in northeastern Manitoba. It also suggests a somewhat shorter life-span of the lake.

Recent geologic processes within the research area are few. Minor wind erosion after forest fires has occurred in the Upland, with increased downcutting of stream channels in the Plateau and Lowlands. The only notable alterations of the surface features at the present time are entirely those of man: road construction, railroad construction, gravel pit excavation, forestry plowing, rice field cultivation, agriculture, and building construction.

Vegetative development

A resume of the vegetative development of the Sandilands is difficult to provide because no pollen cores or other sources of paleobotanical data are available from this region. However, data from elsewhere in the Lake Agassiz Basin are from Pickerel Lake, northeastern South Dakota (Watts and Bright 1968: 855-876), Itasca, Minnesota (Shay 1971), and westcentral Manitoba (Ritchie 1964: 181-196). These studies suggest trends in the succession of various plant communities in the research are. Furthermore, several additional papers (Anderson 1960: Heinselman 1963: 327-374, 1970; Curtis and Maycock 1960: 1-35; Janssen 1968; MacAndrews 1966) were consulted for specific trends in soil-vegetation development, although only Anderson's (1960) deals directly with the Sandilands.

MacAndrews' study (1966: 64-66) in northwestern Minnesota was based on a survey of the modern vegetation and sediment cores from ponds in each major vegetative zone. The work was conducted along a transect which stretched from Lake George and Lake Itasca in Hubbard County, west to the lacustrine plain of Lake Agassiz in Norman County. This research indicated that approximately 12,000 years ago the climate was characterized by a lower than present mean temperature, although a rapid warming trend is indicated. A boreal forest, similar to the present southern boreal forest adjacent to the aspen parkland in southern Manitoba and Ontario, grew in the area. A continuation of the warming trend resulted in a shift to prairie and pine forest in the western and eastern portions of the transect, respectively, by around 11,000 B.P. Between 11,000 and 8,500 years B.P., the climate and vegetation may have been similar to those of the present. A continuing trend toward warmer and drier climatic conditions led to the replacement of the pine forest by oak savanna about 8,500 B.P. The period between 8,000 and 7,000 years ago was one of maximum aridity and temperature. The replacement of oak savanna by a mesic deciduous forest approximately 4,000 years B.P. respresents an increase in summer precipitation and possibly decreasing mean annual temperature. The dominance of pine in the pollen assemblages around 2,700 years ago is attributed to decreasing summer temperatures, a shorter growing season, and an increase in winter precipitation. In summary, prairie succeeded boreal forest in the Lake Agassiz lowlands, while oak savanna, mesic deciduous forest and pine-hardwood forest followed the boreal forest on the higher elevations. MacAndrews also notes that additional factors causing fluctuation in the boundaries of these vegetative zones were availability of plant species, fire frequencies, animal populations, and soil conditions.

Janssen's (1968: 1397) study was based on a pollen diagram from a lake in the Agassiz Basin of northern Minnesota. The record demonstrated that a spruce forest was succeeded by an immigration of Pinus banksiana and/or P. resinosa around 10,000 years B.P. This in turn was followed by Abies sp. and Pteridium sp., and later Alnus sp. Between 8,000 and 7,000 years B.P., prairie and/or oak savanna dominated the uplands, followed by deciduous forest of Quercus sp., Ostrya virginiana, Fraxinus sp., and Populus sp. At a still later period, deciduous forest occurred. There is also evidence of a return to prairie conditions prior to 3,000 years B.P.

Heinselman's (1970: 254-255) study was done in the same region as Janssen's — the Lake Agassiz Peatlands Natural Area. A similar development in the early plant communities was noted during this later study. By 8,000 years B.P. peat development was beginning on a considerable scale. By around 7,000 years B.P., which marked the beginning of a drier period, Pinus strobus and many of the modern upland trees had displaced the oak savanna on mineral soils. Heinselman suggests that Picea sp., Larix sp., and Thuja sp. were present in the area about 10,500 years ago, but the development of strong peatland communities probably did not occur until around 5,000 years B.P.

It is difficult to state whether direct parallels can be drawn between the peatlands of northcentral Minnesota and the Sandilands. However, there are sufficient parallels between the two regions, particularly the low peatlands and the dry uplands, to suggest that vegetative development in the two areas was somewhat similar. As Lake Agassiz retreated and various plant communities invaded from the south and east, the Sandilands Upland may have had a vegetative development resulting, around 9,000 to 8,000 years B.P., in a pine forest. During drier periods, prairie may have dominated in the Upland. The Sandilands Plateau has probably undergone a very diverse vegetative development. During moist periods the Plateau may have had a mixed hardwood-softwood forest. However, during drier periods, oak savanna could have been quite extensive. Peat development in the Lowlands, as well as in the depressions of the Upland and Plateau, probably began around 9,000 to 8,000 years B.P.; but peat development presumably did not reach extensive proportions until several thousand years later. Thus, those areas of the Lowlands covered by peat at the present time may have been shallow lakes, surrounded by prairie, pine forest, or mixed hardwood-softwood forest.

Sandilands Resources

The previous section has dealt with geologic history and vegetational development within the research area. This section will describe the resources of the region in terms of availability, seasonality, and distribution throughout the three physiographic provinces according to ten major resource categories: large game, small game, fish, terrestrial birds and migratory waterfowl, trees, shrubs, mosses and herbs, aquatic plants, lithic raw material, and fresh water. Aquatic plants include those producing tubers and bulbs, and wild rice. A list of resources used by prehistoric populations in the Great Lakes-Plains region of North America was compiled from a number of sources: Cleland (1966), Gilmore (1919), Hubbs (1958), Peterson (1966), Rogers (1962), Shay (1971), Soper (1941) and Yarnell (1964). These will be compared with data recorded in the research area, and lists of resources available for exploitation will be given.

Peterson's (1966: 33-334) and Rogers' (1962: A15-16) publications provide the following list of large game mammals available in the Northern Sub-Arctic area of North America:

TABLE 1

LARGE GAME MAMMALS OF THE SANDILANDS

Timber wolf	Canis lupus
Black bear	Ursus americanus
White-tailed deer ..	Odocoileus virginianus
Moose	Alces alces
Woodland caribou ...	Rangifer caribou
Cougar	Felis concolor
Elk	Cervus canadensis

Soper's (1941: 355) study suggests that this portion of North America may have been within the range of both the plains and woodland subspecies of bison, Bison bison bison (Linnaeus) and Bison bison athabascae (Rhoads), respectively. The small game mammals available in the research area are more numerous, as listed in Table 2 page 27.

The list of mammals which were available for exploitation were analyzed according to their habitats, as they were known at the time of European contact. Their habitats were then compared with the present biotic zones of the Sandilands in order to suggest the tendency of a given species to be present or absent, or more abundant, in a particular physiographic region. It is to be considered only an estimation. Other factors which may be considered are biomass and caloric yield of each species (which may be used as possible indicators of cultural preference for certain mammals), the tendency of certain species to range over a substantial amount of terrain, environmental change which in turn would affect the habitat of the mammal species, population number and density, and cyclical fluctuations in population number. The factor of seasonality is of importance for the availability of several large game mammal species; bears hibernate in winter and bison and elk are noted for a wide range of movement (Peterson 1966: 318-322).

TABLE 2

SMALL GAME MAMMALS OF THE SANDILANDS

Varying hare	*Lepus americanus*
White-tailed jack rabbit	*Lepus townsendii*
Woodchuck	*Marmota monax*
Beaver	*Castor canadensis*
Muskrat	*Ondatra zibethicus*
Porcupine	*Erethizon dorsatum*
Brush wolf	*Canis latrans*
Red fox	*Vulpes vulpes*
Grey fox	*Urocyon cinereoargenteus*
Marten	*Martes americana*
Fisher	*Martes pennanti*
Ermine	*Mustela erminea*
Mink	*Mustela vison*
Wolverine	*Gulo luscus*
Striped skunk	*Mephitis mephitis*
Otter	*Lutra canadensis*
Canada lynx	*Lynx canadensis*
Bobcat	*Lynx rufus*
Racoon	*Procyon lotor*

It should be remembered that precise reconstruction of migratory patterns is not possible prehistorically. However, two premises may be used which are relevant to general trends in mammal distribution throughout the Sandilands. They are (1) that animal behavior is similar in the past to that of historic contact, and (2) that there has been no major change in environment of southeastern Manitoba since around 8,000 years B.P.[3]

TABLE 3

MAMMAL DISTRIBUTION ACCORDING TO PHYSIOGRAPHIC AREA

Economic mammal species	Uplands	Plateau	Lowlands
Large game:			
Felis concolor	o	o	+
Cervus canadensis	*	*	+
Odocoileus virginianus ..	+	*	+
Alces alces	o	+	*
Ranger sp.	o	+	+
Canis lupus	*	*	*
Ursus americanus	+	*	+
Bison bison	+	*	+
Small game:			
Lepus americanus	+	*	**
Lepus townsendii	+	o	o
Marmota monax	*	+	o
Castor canadensis	+	**	*
Ondatra zibethicus	+	**	*
Erethizan dorsatum	*	*	*
Canis latrans	*	*	*
Vulpes vulpes	*	*	*
Urocyon cinereoargenteus.	+	*	+
Martes americana	o	*	+
Martes pennanti	o	*	+
Mustela ermina	+	*	o
Mustela vison	o	+	o
Gulo luscus	o	*	o
Mephitis mephitis	+	*	+
Lutra canadensis	o	*	*
Lynx canadensis	+	*	+
Lynx rufus	+	*	+
Procyon lotor	+	*	+

NOTE: o = absent
+ = present, minor degree
* = present, relatively abundant
** = present, substantial degree

[3]Examples of major environmental changes are considered to be shifts from boreal forest to prairie, or from prairie to hardwood forest. The reader should bear in mind that the Sandilands has undergone a number of fluctuations; but those biotic communities in existence in the Sandilands today may have been in existence in southeastern Manitoba since Lake Agassiz retreat.

Hubbs (1958) has noted eleven families of fish in Great Lakes region which have a range that includes the research area. A more specific list of fish species may be presented, based on Hinks (1957) and Rogers (1962: A17). Those listed below are species which are adapted to the aquatic habitats of the Sandilands, based on records at the Freshwater Fisheries Institute, University of Manitoba, and the Department of Mines, Resources and Environmental Management, Province of Manitoba.

TABLE 4

ECONOMIC FISH OF THE SANDILANDS

Common Whitefish ...	Coregonus clupeaformis
Suckers	Catostomus sp.
Common Pike	Esox lucius
Muskellunge	Esox masquinongy
Yellow Pike-perch ..	Stizostedion vitreum
Rock Bass	Ambloglites rupestris
Smallmouth Black Bass	Micropterus dolomieu
Largemouth Black Bass	Huro salmoides

Rogers (1962" A18) noted that the Ojibwa recognized forty-five species of birds, although it was not stated in the publication which were utilized. These can be grouped into three categories: migratory waterfowl, terrestrial birds of possible economic importance, and songbirds or other birds of non-economic importance. Only the economically significant species are listed in Table Five.

TABLE 5

ECONOMIC BIRDS OF THE SANDILANDS

Migratory waterfowl:	
Common Loon	<u>Gavia immer</u>
Red-throated Loon	<u>Gavia stellata</u>
Grebe	<u>Podicepes</u>, sp.
Whistling Swan	<u>Olor columbianus</u>
Canada Goose	<u>Branta canadensis</u>
Brant	<u>Branta bernicla</u>
Snow Goose	<u>Chen hyperborea</u>
Blue Goose	<u>Chen caerulescons</u>
Mallard	<u>Anas P. platyhynchos</u>
Blackduck	<u>Anas rubripes</u>
Pintail	<u>Anas acuta</u>
Green-winged Teal	<u>Anas carolinensis</u>
American Widgeon	<u>Mareca americana</u>
Shoveler	<u>Spatula clypeata</u>
Scaup	<u>Authya</u> sp.
Common Goldeneye	<u>Bucephala clangula</u>
Buffle-head	<u>Bucephala albeola</u>
White-winged scoter	<u>Milanitta deylardi</u>
Common Merganser	<u>Mergus merganser americanus</u>
Terrestrial birds:	
Spruce Grouse	<u>Canachites canadensis</u>
Ruffled Grouse	<u>Bonasa umbellus</u>
Willow Ptarmigan	<u>Pagopus l. albus</u>
Sharp-tailed Grouse	<u>Pedioecetes phasianellus</u>

The principal body of water which will contain migratory waterfowl is Whitemouth Lake. Streams in the Plateau and Lowlands will also support waterfowl. Hence, there is a tendency, particularly during the spring and fall migrations, for this category of birds to be more available in these two regions, as compared with the poorly watered Upland. The two species of grouse are also differentially available. <u>Canachites canadensis</u> tends to be better adapted to the Lowland's spruce forest, and <u>Bonasa umbellus</u> better adapted to higher, drier areas, as in the Upland and Plateau (after Rogers 1962). <u>Pedioecetes phasianellus</u> and <u>Lagapus l. albus</u> may have been rather sparsely represented throughout the region (after Bird 1961: 10).

The field research did not include a botanical inventory of the research area. However, Anderson's (1960) research listed the plant species of 55 select locations in the south-eastern map-sheet area (as per Ehrlich and Smith 1964). Listings of economic plants in the Great Lakes-Plains region have been compiled by Gilmore (1919), Yarnell (1964), Rogers (1962: A11-12) and Shay (1971). These lists were compared with Anderson's and the following table presents a summary of the available plant species (shrubs, herbs, mosses and grasses) in the research area according to dominant tree stand. Most of the study plots are in the Upland and Plateau; only three are in the Lowlands. Hardwood trees, used prehistorically for construction, fuel, or utilitarian purposes (Yarnell 1964), Gilmore 1919), are more extensive in the Plateau and Upland. The Lowlands is largely bog; the tree species are, for the most part, Picea sp., Abies sp., Alnus sp., Thuja sp. and Populus sp. which were not recorded by Rogers or Yarnell as utilitarian items for the Eastern Sub-Arctic and Great Lakes populations.

TABLE 6

SUMMARY OF PLANT RESOURCES IN THE SANDILANDS ACCORDING TO MAJOR TREE STANDS

Species	Upland / Plateau and Lowlands						
Rosa sp.	JP	MJP	MBF	A	ABP	B	
Amelanchier sp.	JP	MJP		A	ABP	B	
Prunus virginiana	JP	MJP		A	ABP	B	
Prunus pensylvanica	JP	MJP		A	ABP	B	
Prunus pumila	JP	MJP					
Corylus cornuta	JP	MJP		A		B	
Vaccinium sp.	JP	MJP		A		B	
Vaccinium myrtilloides	JP			A		B	
Symphoricarpos sp.	JP	MJP		A		B	
Juniperus sp.	JP						
Amorpha canescens	JP						
Lithospermum canescens	JP	MJP					
Galium sp.	JP	MJP	MBF	A	ABP	B	
Aster sp.	JP	MJP	MBF	A	ABP	B	
Pteridium aquilinus	JP	MJP		A	ABP	B	
Lathyrus venosus	JP	MJP		A	ABP	B	
Lathyrus sp.	JP			A	ABP	B	
Anemone sp.	JP	MJP	MBF	A	ABP	B	
Equisetum hyemale	JP			A	ABP		
Smilacina sp.	JP			A	ABP		
Arctostaphylos uva-ursi	JP	MJP					
Gaultheria procumbens	JP	MJP					
Fragaria virginiana	JP	MJP	MBF	A	ABP	B	
Lycopodium obscurum	JP				ABP	B	
Cladonia sp.	JP				ABP	B	
Lilium sp.	JP						
Salix sp.	JP			A	ABP		
Rhus sp.					ABP		
Monarda fistulosa	JP						
Asclepias sp.	JP			A			
Solidago sp.	JP			A			
Aralia sp.	JP			A		B	
Virburnum sp.							
Symphoricarpos alba					ABP		
Achillea millefolium				A			
Thalictrum sp.				A	ABP		
Ribes hirtellum				A	ABP		
Ribes triste				A	ABP		
Anemone canadensis				A	ABP		
Typha latifolia							AQ
Potamogeton Richardsonii							AQ
Phragmites communis							AQ
Nuphar sp.							AQ

NOTE: JP = Jack Pine; MJP = Mixed Jack Pine; MBF = Mixed Balsam Fir; A = Aspen; ABP = Aspen/Balsam Poplar; B = Birch; AQ = Aquatic

TABLE 7

PLANT SPECIES AVAILABLE IN GREATEST ABUNDANCE

Prunus virginiana
Prunus pensylvanica
Prunus pumila
Corylus cornuta
Vaccinium sp.
Vaccinium myrtilloides
Fragaria virginiana
Viburnum sp.
Ribes hirtellum
Ribes triste

Several major native mineral types compose the bulk of the lithics available for stone tool manufacture in the Sandilands: basalt, various cherts and quartzites, quartz (for reference the reader is referred to Barry and Mason 1959), Selkirk Chert, and silicified material (Leonoff 1970: 14, 19, 43-44). One lithic raw material found in the Sandilands, Knife River Flint, has a reliably reported source from the Knife River valley in Dunn and Mercer Counties, North Dakota (Clayton, Brickley and Stone 1970: 282).[4] Leonoff's (1970) study determined that a portion of the research area is adjacent to natural sources of "eastern silicified material" (1970: 19) and a source of "Selkirk Chert" exists northwest of the research area on the Red River. Eastern silicified material

> ... consists of black or dark green ground mass interlaced with thin bands. It is hard, smooth, and fine-grained with conchoidal fracture (1970: 14)

Selkirk Chert, according to Leonoff,

> ... is a limestone chert from the Selkirk member, Ordovician limestone. It is white to cream in colour, with some mottling. Most of the material is hard and dense while some poorer quality has degenerated into what resembles chalk. It is medium to fine grained with a good conchoidal fracture (1970: 14).

[4]Leonoff (1970: 43-44) notes that Knife River Flint seems to be found in sites only as scrapers or projectile points, rarely as detritus, suggesting that it was of high value as a raw material.

Detailed analysis of other mineral types that are found in the Sandilands (i.e., the various cherts, and quartzites) is not available.

Leonoff (1970: 43-44) also noted that the material of most importance in the eastern region of Manitoba was basalt and Selkirk Chert. He postulated that people using basalt and silicified material traveled to the east for them; while the occurrence of Selkirk chert east of its source may be explained by gathering activities and seasonal migration. The present writer views Leonoff's suggestions as hypotheses. No attempt was made to confirm or reject the hypotheses during the Sandilands Survey.

Based on field observations in the Sandilands, several types of stone were found to be available on the surface for tool manufacture. All are glacially derived, since no bedrock outcrops exist within the research area. The materials in question are various cherts, quartz, quartzites, silicified materials, and basalt. Cherts are most common; basalt is rare. The areas where the material is easily available on the surface, but not exposed by recent European activities such as road construction or gravel pit excavation, are beach excarpments and stream channels, particularly on the Plateau. Wind blown sand, which characterizes most of the Upland, overlies gravel deposits that may have contained suitable raw material. Also, since most of the Lowlands is covered by bog or marsh, the only exposure areas for lithic material in this region are the scattered raised beaches. Presumably, lithic raw material is most available from spring to fall when snow does not cover the region.

Fresh water has a marked differential in availability within the research area, and it must have varied considerably over time. Presently, the Upland is extremely dry, although in certain areas, ravines and shallow depressions may have held fresh water for a period of time after the retreat of Lake Agassiz. The plateau is characterized by marshes, small bogs, lakes, streams, and springs which contain a relative abundance of water. The Lowlands is presently dominated by marsh and bog. However, streams which originate on the Plateau continue flowing in the Lowlands.

CHAPTER THREE

The Sites

Each site in this section is described with reference to its location, the cultural material, and the ecological characteristics of the immediate vicinity. Whenever possible, a comparison is made with published references for the "cultural" or chronological affiliations of the projectile points. Artifact descriptions have been summarized in Tables. Details of soil analysis have been summarized in the text and presented more specifically in Tables.

Previous archaeological work

No sites were known from the research universe prior to the work described in this thesis. Research efforts in near-by localities are represented by one random find of a native copper point from near Vassar, donated to the Manitoba Museum of Man and Nature. Limited surveys have been done of sections of the Winnipeg River (Penney 1970; Rand *et. al.* 1951-1952; Steinbring 1966 to 1973, and the Manitoba Archaeological Society) and several sites in the southeastern portion of the province were excavated by MacNeish in the early 1950's (1958: 10). An incised antler of moose (*Alces alces*) and several artifacts was recovered from Lake Agassiz II beds near Morson, Rainy River District, Ontario; the antler was C^{14} dated at 5,899 ± 423 B.C. (Churcher and Kenyon 1965: 237). Other sites in the region of the research area are located in Rosseau County, northwestern Minnesota (on file at the Minnesota State Historical Society and office of the state archaeologist, Department of Anthropology, University of Minnesota).

Sampling techniques

The survey method used has several purposes. It was necessary to sample the numerous microenvironments and as much of the total region within the reseach area as possible. A restriction to a particular type of feature such as a beach ridge, lake shore or river, would not have been adequate because these features comprise only a very small percentage of Sandilands' environment. Past surveys of Lake Agassiz beaches (i.e., the Glacial Lake Agassiz Survey, Department of Anthropology, University of Manitoba) have been conducted with preconceived ideas of site location. In the Sandilands, preconceived ideas might suggest the finding of sites near permanent water or on beaches, as opposed to the relatively dry upland or areas covered by dense underbrush. An attempt was made to avoid this kind of bias, although differential accessibility resulted in the survey being restricted somewhat more to the Upland and Plateau rather than the peat-covered Lowlands.

The type of survey conducted follows that defined by Ruppe (1965: 315), that is, a "... limited survey, problem oriented and conducted for a specific ... reason. Surveys of this type seek information about certain attributes of an area or seek to define the areal extent of an archaeological manifestation." The first stage in establishing a research design in the Sandilands was to define the universe of study, following Binford (1964: 427-428) and Rootenberg (1964: 183). The universe was defined as Townships 1 to 5 and Ranges 14 to 9 East of Principal Meridian, inclusive. A division into sampling units followed the already established grid of section/quarter-sections.

After the research area was designated, a number of alternatives was available for detailed sampling. The alternatives considered were those adopted from paleontology (Krumbein 1965: 137-150), Ragir (1967:

184-190), and Cole and King (1968: 115-117). These are simple random sampling, systematic sampling, stratified sampling, and cluster sampling. Cole and King's methods are adopted from geographic studies and include random stream sampling and random line sampling.

It has been stated that the preferred technique during archaeological survey and excavation is the use of a random design in order that "... an equal probability of selection is assigned to each unit of the frame at the time of sample selection" (Binford 1964: 428). It was decided that a simple random design was impracticable, since a placement of sampling units within the research area had to depend in part upon accessibility. Most of the peat-covered lowlands, for example, are inaccessible. Nor was it feasible to adhere to a systematic or stratified design since length of field work, money, differential accessibility, and differential exposure rendered it unlikely that each unit or a select number of units throughout the entire research area could be studied. Similarly, a cluster design might have entailed a concentration of units in particular localities, most logically following streams, lake shores, beach escarpments or one of the six microenvironments. However, finding sites or concentrations of sites in one or several of these situations was considered meaningless for an analysis of the whole region unless all such features or all microenvironments over the entire area were examined. The intention of the design adhered to was to examine the area with as few preconceived notions of site location as possible. Therefore, the plan adopted followed that of a random line technique, sometimes referred to as a "transect" (Cole and King 1968: 116).

On the basis of soil survey and topographic maps, transect lines were randomly established over the research area to crosscut the major physiographic areas in addition to the smaller microenvironments. Each transect crossed at least two of the three physiographic zones and was of varying widths and lengths. The placement of the transects was biased in the sense that it was necessary to adhere to the major road network, although it was found that numerous fire guards and forestry trails made it possible to cover substantial portions of terrain. Also, once detailed reconnaissance in the region began it was decided that a modification was necessary because areas thought accessible to survey in fact were not, such as the large expanses of peat bog. However, once a transect began it was not terminated until at least two physiographic areas had been traversed and all exposed areas examined (the reader is referred to Fig. 30, page 144).

Field procedures

The actual field technique of survey was to surface check all accessible exposures along the transect line. The transect line was divided into one-mile square mile sections. If, as an example, 20 square miles within a given microenvironment were surveyed, this does not imply that twenty square miles of surface exposure was examined. It means only that all exposure areas within the twenty square miles were examined. Because of time limitations and small crew size, it was unfeasible to randomly or systematically remove the sod from areas where sites might possibly be located. In the majority of cases, those sites found were already partially or nearly totally destroyed by modern activity. Once sites were located by survey, a detailed surface reconnaissance was made of the immediate vicinity. The site's legal description was noted (according to section and quarter-section) and in certain situations it was possible to relate the site's datum to a firmly established survey marker or to a building foundation.

The type of exposure varied throughout the research area. Much of the Upland is characterized by tracts of wind-blown sand, exposure features such as road cuts, and areas where forestry cutting, plowing, and reseeding has occurred. On the other hand, the Plateau is noted for few areas of forestry activity (with the exception of pulp cutting), fewer roads, dense underbrush, but more numerous gravel pits. The only existing lake shore within the research area, that of Whitemouth Lake, is noted for extensive peat deposits along the shore and is not conducive to surface reconnaissance. Near Sprague, agricultural clearing and plowing has resulted in exposure of extensive surface areas. The Lowlands are noted for little exposure; the roads and an occasional gravel pit account for the majority of exposed features. In the southern portion of the research area agricultural areas are also included in the Lowlands. Fields and meadows near Marchand, west of the research region, and Moose Lake, east of the research area, contain additional exposure localities in the Lowlands, but were not within the sphere of research. It was determined that exposure area, in terms of total square miles, is greatest in the Bedford Hills, followed by the Whitemouth Lake Plateau in a slightly reduced proportion, and least in the River Lowlands.

After sites were found, they were recorded with respect to location, the physical characteristics of the site location, and the flora in the site's vicinity. Photographs were taken of the site and vicinity. A soil sample was also taken from each soil horizon at each excavated site. Test pits were excavated at each site unless the surface conditions indicated that the site was too badly disturbed to render excavation productive. All possible effort was made to place the excavation units within the site in such a manner that both the surface and subsurface artifact distribution could be determined. A 1 x 1 metre area was used as the basic unit. The usual technique was to excavate by shovel in five or ten centimetre intervals until artifacts, bone or other cultural items were found. Trowels, brushes, and other small tools were employed as soon as any items were noted. All back-dirt was passed through a quarter-inch screen. Excavation in the test pits continued until a sterile level was reached; in some cases this was glacially-derived gravel or a dense clay that had formed during the withdrawal of Lake Agassiz.

Data were recorded on standardized forms. A survey sheet recorded location, site ownership, the site's ecological characteristics, excavation, artifact and photograph numbers. A soil sheet also recorded site location and ecological data, plus relevent soil data which could be collected in the field. Universal data forms contained excavation unit location by relationship with the datum and in numerical order of excavation, and additionally served as level sheets to record features and artifact distributions. Continuation forms, large gridded sheets, were used for site mapping, elaboration of features, soil profiles, or any additional data as was viewed relevant. Photographic data sheets were kept according to roll and frame number, subject, location, f-stop, and shutter speed. Separate series were kept for colour and black-and-white. Field specimen numbers were recorded on the same form as the photo-data sheets. Numbers were assigned to artifacts found in excavations, surface artifacts, bags of material from a specific excavation unit or level, and bags of soil. A number referred to a specific item, or a select group of items, its description (e.g., scraper), and provenience according to site, date, excavation unit, or level. A daily journal recorded each day's activities with respect to distance covered and type of terrain covered, results (for example, sites found, excavation units opened), whether photographs or particular samples were taken, the day's noteworthy events, and the expenses incurred.

Lithic analysis

Following recovery from the sites, the artifacts were separated into categories according to use, e.g., projectile point, scraper, or biface knife. Each artifact was analyzed according to a predetermined attribute list. These attributes are further subdivided into two categories, metric and non-metric. Metric measurements were adopted from Binford (1963). Nonmetric observations include categories defined by Rouse (1971), Berry and Mason (1959), the Munsell Soil Chart (1971) and those conceived by the writer.

All metric measurements were made with a metal sliding caliper. Several measurements were taken for each attribute on a specific artifact until a consistent reading was obtained. All measurements were recorded in centimetres and rounded-off to the nearest millimetre. Weight measurements were taken by electric weight balance and recorded in grams. Measurements were conducted over a number of sessions in order to avoid fatigue. The nonmetric attributes of longitudinal and transverse section were recorded in accordance with Binford (1964: 200-202). If it was not possible to make a specific measurement or observation on an artifact—because the artifact was broken—it was recorded as four broken lines. If an artifact was not broken and it was therefore possible to make a particular observation, but the attribute did not exist on the artifact (such as wear), it has been recorded an "none." Table 8 provides a summary of the attributes used; the letters correspond to those in the accompanying diagrams:

TABLE 8

LITHIC ATTRIBUTE DESCRIPTION

Metric (projectile points):	
(a) Overall length	(d) width inside notches
(b) Blade length	(e) max. tang width
(c) Max. blade width	(f) max. thickness
	(g) weight
(h) Angle "a" —angle of edges near tip of notches in relation to longitudinal axis.	
(i) Angle "b" —angle of outside tip of notches in relation to notch base.	

Nonmetric (projectile points):	
Condition	Grinding/polishing
Blade shape	Primary flaking
Base shape	Secondary flaking
Colour	Transverse section
Wear	Longitudinal section
	Lithic type

Metric (scrapers):	
(a) Overall length	(d) Width—mid-section
(b) Width—worked end	(e) Max. thickness
(c) Width—unworked end	(f) Weight
(g) Angle of worked edge in relation to ventral surface	

Nonmetric (scrapers):		
Outline	Secondary flaking	Longitudinal section
Material	Wear	
Colour	Weathering	
Primary flaking	Transverse section	

The recording of attributes for all other artifacts—utilized flakes, utilized cores, choppers, gravers, spoke-shaves, and an "effigy" —followed the criteria established for the other artifacts, but with fewer measurements being taken.

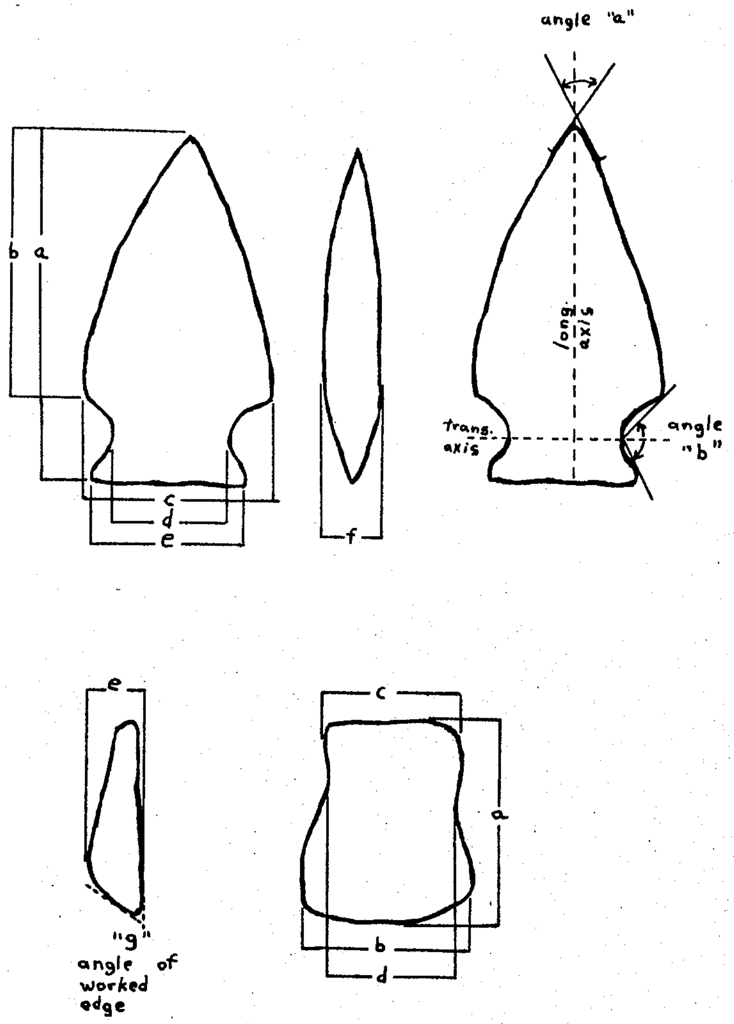

Fig. 4. Lithic Attribute Illustrations

Osteological Remains

Bones which were recovered during survey operations at archaeological sites, or other areas, were identified with the aid of the comparative collections at the Manitoba Museum. In certain circumstances, use was made of publications by Gilbert (1973), Olson (1964) and Schmidt (1972) in order to identify a particular bone as to anatomical position. All species identification was done with the aid of the comparative collection, however.

Soil Analysis

No chemical analysis of soil was conducted. Several sites were chosen for detailed analysis of seeds, molluscs, and sand particle grain size. The results have been summarized in Tables which accompany the site descriptions. Unless otherwise stated, the standard laboratory sample volume was 250 ml. All samples of the above were sorted through 2.0, 1.0, 0.50, and 0.25 mm. mesh screens. Identification was conducted under a low-power microscope with the aid of the following publications: Eddy and Hodson (1961), molluscs; Martin and Barkley (1961), Deloit (1970), and the Woody-Plant Seed Manual (1948), seeds. Lithologic analysis was conducted following the Soil Survey Laboratory Methods And Procedures For Collecting Soil Samples (1972).

Site One (DcLb-1)

The first site is located in the NE¼ of the SW¼, section 33, Twp. 5, Rng. 9E., 96° 19' 30" W. and 49° 26' N. It was found while conducting a transect from the Marchand Forestry Office west to the vicinity of Marchand village. It is situated in a gravel pit on the south side of the gravel road (a new paved road has been built to the north since the 1972 survey) 2.1 miles west of the Marchand Forestry Office. Bone material was found eroding out of the east cut-bank in one of two depressions south of the road (Fig. 5, page 46).

The site is on level terrain west of (and below) the Campbell escarpment, in a slightly raised area which is surrounded by a spruce and tamarack swamp. The soil is "Woodridge", surrounded by "Wampum" on the site periphery (Ehrlich and Smith soils map 1964) gleyed grey wooded soil over a base of sand and gravel. These soils develop under a vegetation of *Pinus banksiana*, and *Populus* sp. Present vegetation is

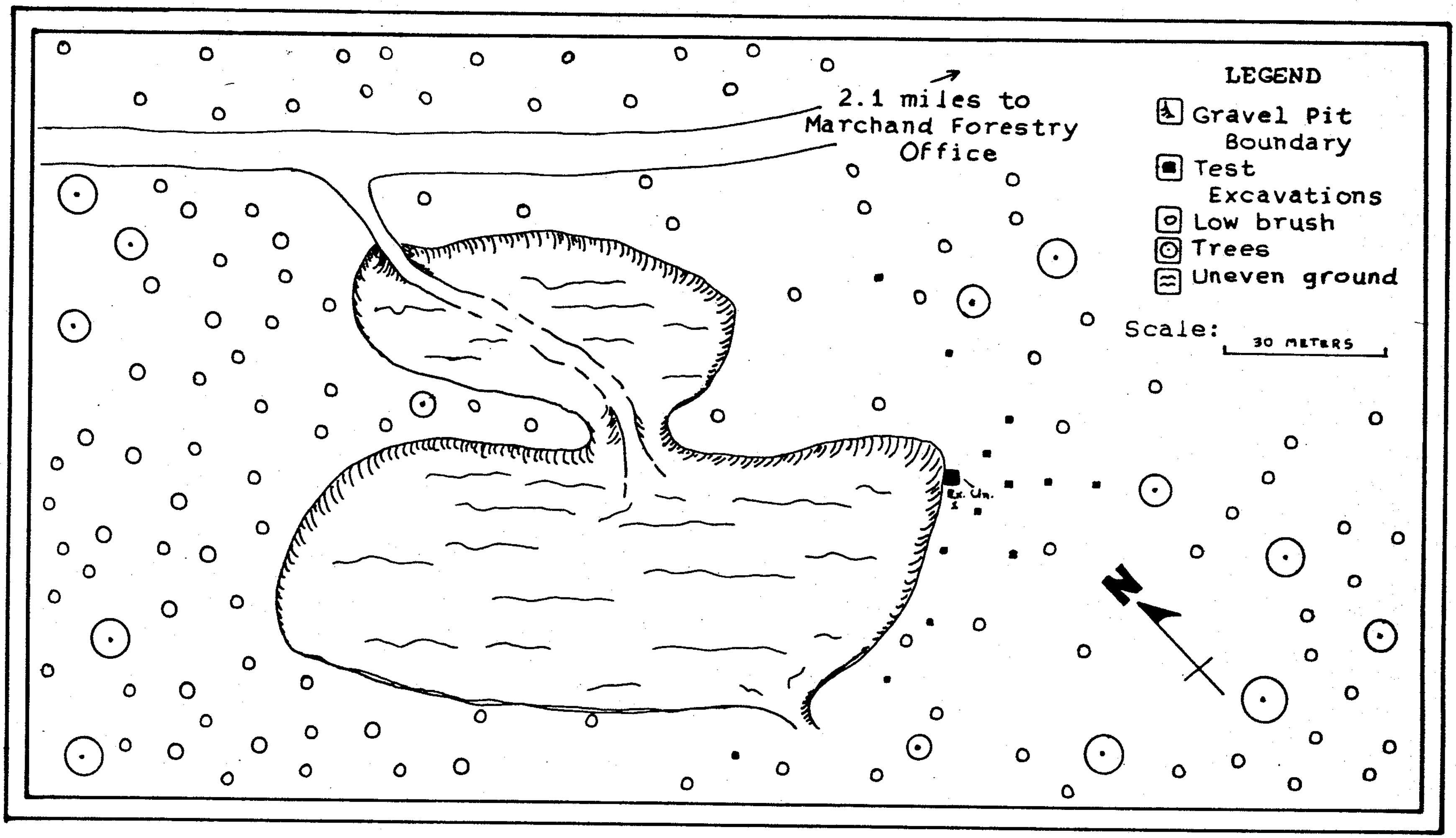

Fig. 5. Site One

Salix sp., Quercus sp., Rosa sp., and various species of Graminae.

A 1 x 1 metre unit was excavated adjacent to the eastern edge of the cut-bank, since this was the only portion of the pit where surface material was found. A number of split bone fragments was found on the surface (Alces alces or Cervus canadensis). The excavation yielded several additional fragments in association with a brown chalcedony end-scraper (Table 9, page 48) all lying five cms. below the surface. Immediately above the bone and scraper were several acorns. The lithic material is not of local origin and had to have been brought into the region from North Dakota (Clayton, et. al. 1970).

An attempt was made to sample additional areas of the site by excavating ten to twelve small (less than one-half metre-square) test units in the vicinity of the first unit. A survey was made of the general locality, where road construction was exposing substantial amounts of area, but no other sites were found. Future work at this site is not recommended.

Site Two (DcLb-2)

This site is located in the SE¼ of the NW¼ of section 4, Twp. 5, Rng. 9E., 96° 19' W. and 49° 21' 50" N. It was discovered while conducting a transect on, and parallel to, the Campbell beach south of the Marchand Forestry Office. The beach strandline is several hundred metres to the west. This site was also found in a gravel pit, and hence was badly disturbed by bulldozer activity. It is south of the former townsite of Bedford (the town no longer exists) and west of the railroad (Fig. 6, page 50).

The site is situated in an area where the terrain slopes gently from east to west. The soil belongs to the "Sandilands catena" which in-

TABLE 9

SITE ONE SCRAPER

Attribute	Description
Spec. no.	(118) 1
Outline	square
Material	chalcedony
Colour	brown
Primary flaking	detached from core
Secondary flaking	heavy on the end, light on the edges
Wear	on worked edge
Weathering	all surfaces
Transverse section	prismatic
Longitudinal section	---
Length	2.6
Width, worked end	2.3
Width, unworked end	1.8
Width, mid-section	1.9
Maximum thickness	0.8
Weight	5
Angle	37°

cludes thin organic podzols developed on wind-deposited sand beneath a vegetation of Pinus banksiana and Salix sp. (Ehrlich and Smith soils map 1964). All trees were bulldozed off the site when the land was cleared for gravel extraction. Pinus banksiana and Salix sp. grow in the site vicinity at the present time.

Several bone fragments and sections of mammal longbones (Table 12, page 53) were found randomly scattered over the surface. A projectile point tip (Fig. 10, page 67) and a scraper (Tables 10 & 11, pages 51 and 52) were found in close proximity to one another, and test excavations were concentrated in this area in order to determine if there was a subsurface cultural deposit. Two base lines, at right angles to one another, were established. Six 1 x 1 metre excavation units were dug ten metres apart along both base lines to a depth of 70 cms. No cultural items or features were encountered. The Ae horizon was very fine-grained light grey sand followed by yellow sand in the B horizon, and a parent material of dark grey clay and gravel in the C horizon. By means of a transit, the base line was surveyed with respect to a railroad spur, which in turn was tied into the junction of the spur and main tracks.

This site was been badly disturbed by bulldozing and future work is not recommended. It is not possible to make a statement concerning either the site activity or the date of occupation. It is notable that the lithic material is of local origin and can be found in beach gravels anywhere in the immediate vicinity where an exposure exists.

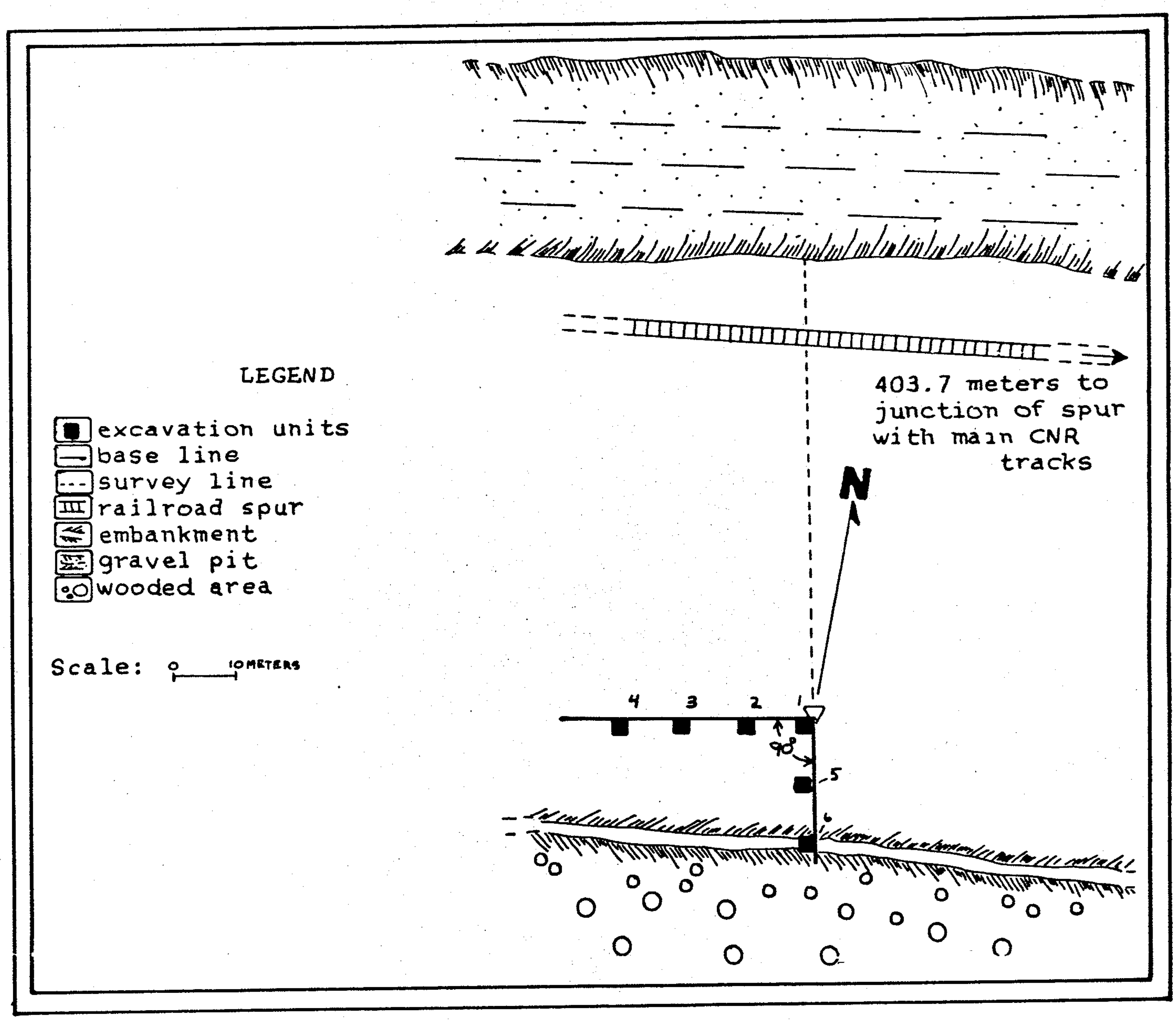

Fig. 6. Site Two

TABLE 10

SITE TWO, PROJECTILE POINT

Attribute	Description
Specimen number	(118)2
Blade shape	triangular
Condition	broken
Base shape	---
Colour	2.5Y 8/2
Wear	on broken base
Polishing/grinding	on tip
Primary flaking	entire surface of artifact
Secondary flaking	along the edges
Transverse section	biconvex
Longitudinal section	biconvex
Lithic type	chert
Total length	2.5
Blade length	----
Blade width	2.2
Width inside notches	----
Tang width	----
Maximum thickness	0.6
Weight	3
Angle "a"	22/23°
Angle "b"	----

TABLE 11

SITE TWO, SCRAPER

Attribute	Description
Specimen number	(118)3
Outline	square
Material	chert
Colour	2.5Y 8/8
Primary flaking	on one edge only
Secondary flaking	on one edge only
Wear	none
Weathering	all surfaces have been weathered
Transverse section	irregular
Longitudinal section	irregular
Length	2.4
Width, worked end	1.9
Width, unworked end	2.0
Width, mid-section	1.8
Maximum thickness	1.4
Weight	7
Angle	63^{o}

TABLE 12

SITE TWO, OSTEOLOGICAL DATA

Spec. no.	Species	Description
(118) 12	<u>Odocoileus</u> sp.	L. radius, distal end
12	<u>Cervus</u> <u>canadensis</u>	Humerus, distal end
12	<u>Alces</u> or <u>Cervus</u>	Scapula segment, midsect.
12	<u>Alces</u> <u>alces</u>	Calcaneous
12	----	Cut calcaneus midsect.
	East Of Site Two, Osteological Data	
17	<u>Odocoileus</u> sp.	Humerus segment, distal end
		Vertebrae segments (4)
		Maxillary segments (2)
		Premolar (1)
		3rd. Molar (1)
		Mandible segment
18	<u>Odocoileus</u> sp.	R. mandible segment
21	<u>Equus</u> sp.	Scapula, proximal end
		Pelvis, section

Site Three (DcLb-3)

This site was found approximately half a mile north of Site Two, on the west side of the same railroad tracks. It is accessible by forestry trails west from Provincial Road 404. It is located in the SW¼ of the NE¼ of the NW¼ of section 9, Twp. 5, Rng. 9E., 96° 19' 25" W. and 49° 22' 45" N.

The site is situated in an ecological setting similar to that of Site Two. The terrain declines gently from west to east. A minor beach escarpment is situated immediately to the west. The soil belongs to the "Sandilands" series; i.e., minimal podzol developed on siliceous sandy outwash, beach, or aeolian deposits. Vegetation in undisturbed situations is Pinus banksiana (Ehrlich and Smith soils map 1964). Present vegetation at the site is predominately P. banksiana, mixed with Graminae. The vegetation fifteen to twenty metres to the west changes rapidly to predominantly Populus sp., Betula sp. and dense Salix sp. Beyond this (100 metres) is a deep peat, spruce-tamarack swamp (Fig. 7, page 56).

While our transect parallel to the lower elevations of the Campbell beach was being conducted, a side-notched projectile point (Fig. 10, page 67; Table 13, page 57) was found on the surface ten metres west of the tracks. The site is an area bulldozed for railroad construction, with sand from the road bed deposited on top of the original soil. Bone fragments (Table 14, page 57) were also found eroding out of the cutbank near the surface.

Two 1 x 1 metre excavation units were dug in the vicinity of the surface material through the original soil profile to a depth of 35 cms. in order to search for subsurface cultural material. The soil showed evidence of considerable disturbance. Roots, decayed organic matter, coal, and charcoal fragments were found intermixed above the undisturbed soil. No subsurface artifacts or features were found. Detailed surface collecting was carried out for a distance of one mile north of the site along the exposed banks of the tracks, but nothing was recovered. The site was mapped in relation to the railroad because no other permanent landmarks exist.

It is not possible to make a statement concerning site form and function because of insufficient data. The lithic material is of local origin and can be found in any exposed beach area in the vicinity.

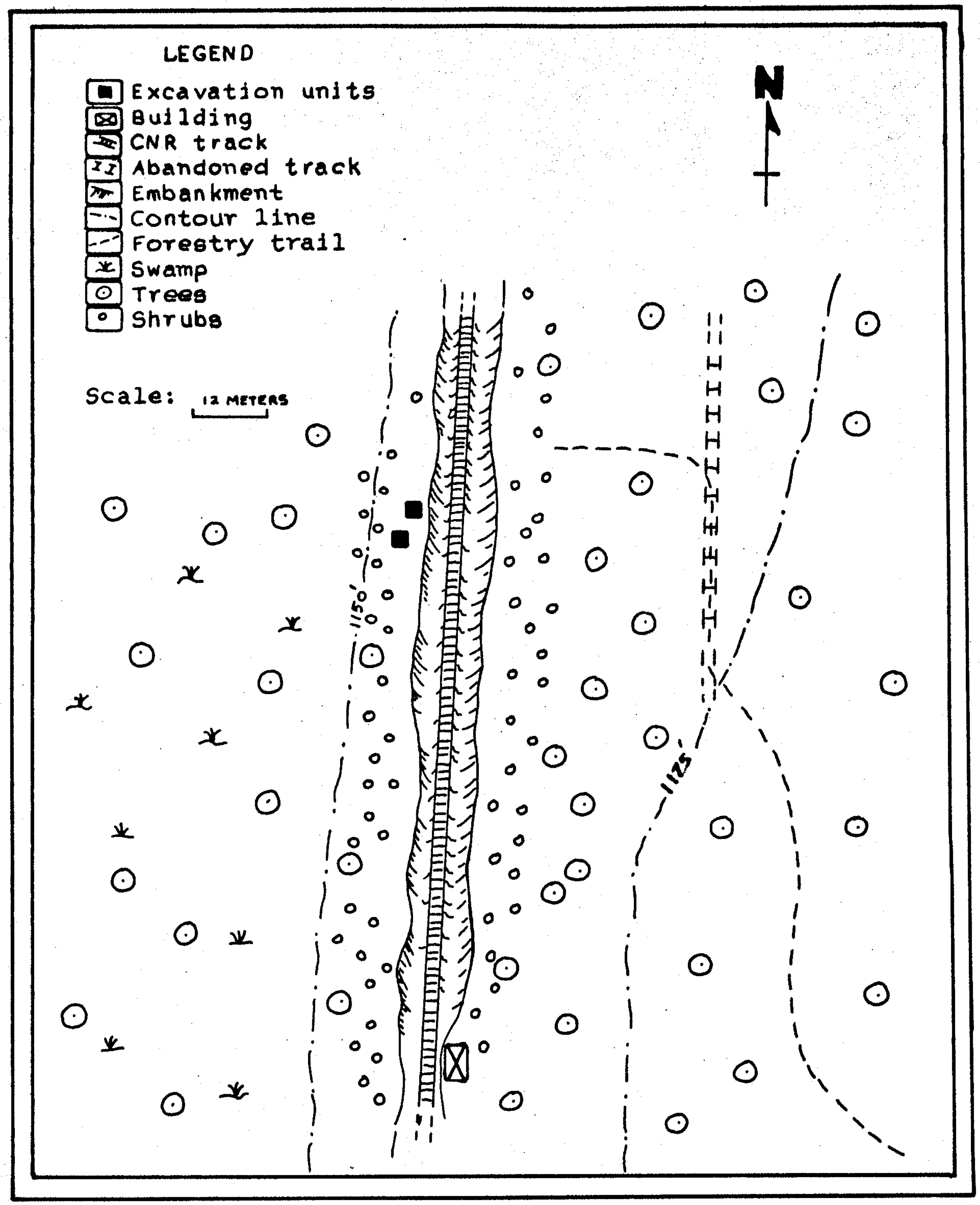

Fig. 7. Site Three

TABLE 13

SITE THREE, PROJECTILE POINT

Attribute	Description
Specimen number	(118)4
Blade Shape	triangular
Condition	complete
Base shape	straight
Colour	2.5Y 8/2
Wear	none
Polishing/grinding	on the notches
Primary flaking	irregular
Secondary flaking	light on edges, base and notches
Transverse section	biconvex
Longitudinal section	asymmetrically biconvex
Lithic type	chert
Total length	4.5
Blade length	3.4
Blade width	2.5
Width inside notches	1.5
Tang width	1.8
Maximum thickness	0.9
Weight	8
Angle "a"	$22/18^{o}$
Angle "b"	$50/82^{o}$, $70/54^{o}$

TABLE 14

SITE THREE, OSTEOLOGICAL DATA

Spec. no.	Species	Description
(118)13	Odocoileus sp.	Longbone, 2 fragments

Site Four (DcLb-4)

This site is located in the Bedford Hills in the SW¼ of the NW¼ of section 30, Twp. 4, Rng. 10E., 96° 14' 20" W. and 49° 20' 05" N. It was found while conducting a transect line east of, and perpendicular to, the Campbell beach. It is located on the edge of an intermittent stream that drains south into the Rat River through a spruce-tamarack swamp, adjacent to a forestry trail which runs north of Route 404. From a physiographic standpoint it is situated on top of a rounded sand dune that is bordered on the south and southwest by a ravine (Fig. 8, page 61). The soil is very fine-grained, of the "Sandilands" series (Ehrlich and Smith soils map 1964). Present vegetation on the immediate area is *Pinus banksiana*, Graminae, and several herb species. Only a few *P. banksiana* grow on the site, and all are less than fifteen feet in height; the remainder have been cut. Large mature *P. banksiana* grow near the ravine edge. *Salix* sp. and *Populus* sp. are found on the slopes of the ravine edge bottom.

Initial surface-collecting recovered very small brown chalcedony flakes, chert flakes, and small unidentifiable burned bone fragments which were eroding out of the cut-bank of the road. An initial test pit (Unit 1, Fig. 8, page 61) placed near the cut-bank determined that the cultural layer was between ten and fifteen cms. in depth. Excavation continued in this unit below this depth, but no further occupational layers were noted. This unit was expanded into a 2 x 2 metre area, which yielded more brown chalcedony flakes, small bone fragments, charcoal flakes, small granite rocks, pine seeds, and acorns.

After excavation of the first two units, two base lines, oriented at right angles to one another, were established, and the site datum was tied into a government survey marker approximately one-quarter mile to the south. Eight excavation units were dug on the east side of the road in addition to one unit on the west side and a stratigraphic unit southwest of the site at the bottom of the ravine. A light scattering of brown chalcedony flakes (chipping detritus) and one utilized chalcedony flake (Table 15, page 62) were found in the units east of the cut-bank. Fewer artifacts were recovered than from those units nearest the cut-bank. One unit contained a concentration of granite stones, but no cultural items were associated.

The topsoil consisted of decayed moss and needles, roots, small branches and numerous Pinus banksiana seeds. At five to eight cms. below the surface this soil changed to very fine-grained, pale yellow, aeolian sand. Examination of the road-cut and the stratigraphic pit from the ravine bottom revealed that the aeolian sand continued to a depth of more than twenty-five feet. However, because there are no buried soil horizons it is impossible to determine the extent to which sand was deposited over the cultural material.

Neither identifiable artifacts nor features were found. The presence of acorns is notable, since no Quercus sp. trees grow in the area. The length of occupation and activity cannot be determined. Because the site has been badly disturbed by road construction, and since it is therefore possible that a great deal of the cultural material has been dispersed, no future work is recommended.

The stratigraphic pit located in the ravine bottom was excavated in order to recover macro-fossil evidence of the vegetative development in the site vicinity. It was determined that the area has been repeatedly burned since Lake Agassiz retreat because all seeds, pine needles, roots and plant fibers throughout the stratigraphy were burned. The accompanying Table (Table 17, page 63) summarizes the variety of plant species present at the site in the past. It is notable that nearly all are dry-land or prairie species, therefore suggesting that the site vicinity was prairie or open jack pine forest for a (substantial) period of time in the past.[1]

An intensive surface reconnaissance was conducted in the site vicinity and two chert flakes were found south of the site near Route 404. Several additional chalcedony flakes and a large chopper (Table 16, page 62) were found along the road-cut immediately north of the site. No other occupation areas were found in this vicinity.

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[1]MacAndrews (1966: 31-33) observed that an open jack pine forest, when burned, is succeeded by prairie until reforestation occurs. Although his research was done in northwestern Minnesota, it can be hypothesized that a similar pattern may have existed in much of the Sandland's Upland , or at least in those areas covered by extensive <u>Pinus banksiana</u> forest. If this hypothesis can be verified by future work in the Sandlands, then it is likely that the Upland was covered alternately by prairie, open jack pine forest, or parkland at various times since Lake Agassiz retreat.

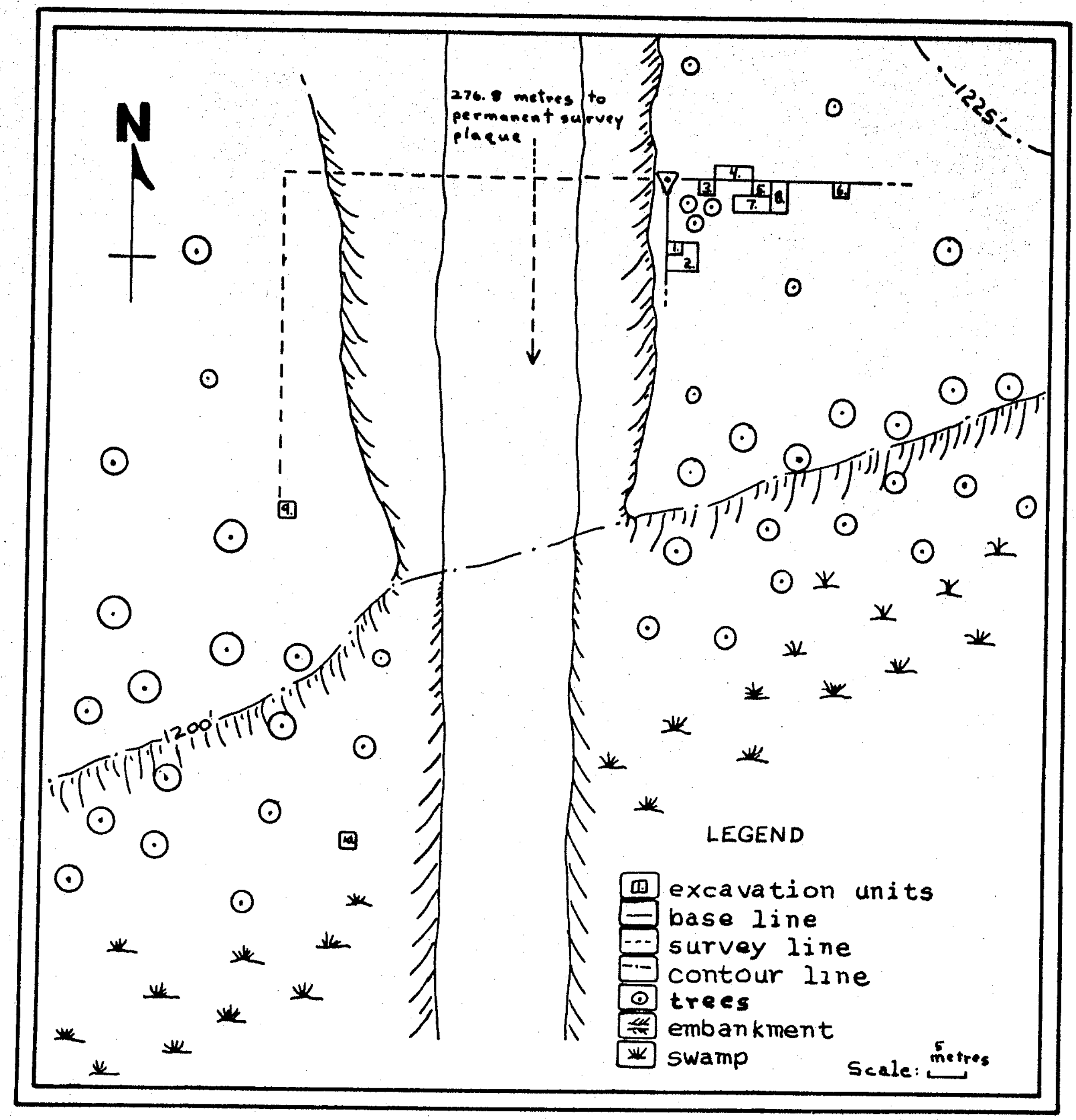


Fig. 8. Site Four

TABLE 15

SITE FOUR, UTILIZED FLAKES

Attribute	Spec. no. Description (118)37	(118)40
Outline	oblong	round
Material	chalcedony	chalcedony
Colour	brown	brown
Trans. section	biconvex	biplano
Long. section	asymmetrically ovate	asymmetrically concavo-convex
Prim. flaking	on both surfaces	item is a prim. flake
Sec. flaking	on 2 opposite edges	on 1 edge
Max. thickness	0.9	0.3
Width	1.8	1.4
Length	2.9	1.9
Weight	4	1

TABLE 16

SITE FOUR, CHOPPER

Attribute	Description
Spec. no.	(118)40
Outline	irregularly circular
Colour	7.5Y N6/
Primary flaking	----
Secondary flaking	along the curved edge
Maximum thickness	2.3
Width	10.4 x 8.1
Length	----
Weight	279

TABLE 17

SEED ANALYSIS* SITE FOUR - EXCAVATION UNIT TEN

Description	Species	No.	Habitat
Level "A" 0-17 cms., moss, roots, decayed leaves and grass rediah brown	Chenopodium album	3	fields, disturbed areas (introduced)
	Amaranthus sp.	3	sandy prairie, disturbed areas
	Vicia angustifolia	2	moist prairie
	Panicum sp.	2	dry, prairie or woods
	Chenopodium hyperbridium var. gigantospermum	1	thickets, shores, clearings
	Kochia scoparia	1	alkaline flats, disturbed areas (introduced)
	Cyperus sp.	1	sandy prairie
	Vaccinium angustifolium	1	dry woods, rock outcrops
	(needles)		
	Picea sp.	1	dry or moist soil, depending on species
	Pinus banksiana	16	dry, sandy
Level "B" 17-27 cms., black humus, with decayed roots, leaves, moss and needles	Amaranthus sp.	689	sandy prairie, disturbed areas
	Chenopodium album	208	fields, disturbed areas
	Polygonum sp.	10	moist ground, forest, shallow water areas
	Rubus sp.	4	thickets,rock outcrops, clearings
	Mentha sp.	3	swampy grounds, shores, rock outcrops
	Prunus sp.	3	dry prairie, sandy ground, rock outcrops
	Chenopodium hyperbridium var. gigantospermum	1	thickets, shores, clearings
	(needles)		
	Picea sp.	80	dry or moist, depending on species
	Pinus banksiana	4	dry, sandy
Level "C" 27-65 cms., grey sandy-silt, with thin lenses of humus	Amaranthus sp.	19	sandy prairie, disturbed areas
	Chenopodium sp.	17	fields, disturbed areas, thickets, shores, clearings
	(needles)		
	Pinus banksiana	4	dry, sandy
Level "D" 65 cms. and below, grey sandy-silt with no humus lenses, water present	Amaranthus sp.	9	same as above
	Chenopodium sp.	2	

*A sample was extracted from each soil zone in the stratigraphic pit, southwest of the main excavations, in the spruce-tamarack swamp. Four samples of 250 mls. each of soil was processed through 4 screen mesh sizes, isolated and dryed, and then identified by species.

The habitats of the species are listed according to Scoggan (1957).

The seed examination was done only by major soil zone in order to determine the variety of plant species present at the site vicinity in the past. The sample was not extracted by arbitrary levels within the excavation unit.

Sample Summary

Level "A"	14	seeds
	17	needles
"B"	921	seeds
	84	needles and fragments
"C"	36	seeds
	4	needles and fragments
"D"	11	seeds

Site Five (DcLc-1)

This site is located in the NE¼ of the NW¼ of section 35, Twp. 5, Rng. 8E., 96° 24' 45" W. and 49° 26' 30" N. It was discovered outside the research area while extending the transect line west of the Marchand Forestry Office. Situated immediately south of Provincial Highway 210 in a dry, lowland area, it is on the east side of a shallow ravine that forms a tributary of the Seine River. The terrain is level to slightly rolling and low embankments characterize the stream edge. The soil, which belongs to the "Menisino" series (Ehrlich et. al. soils map 1953), is an acid podzol developed on loamy sand and aeolian sand deposits. Predominant vegetation is *Pinus banksiana* and Graminae in undisturbed soil conditions. *Salix* sp. and *Populus* sp. grow on the edge of the ravine (Fig. 9, page 65).

Because of the occurrence of numerous blow-outs and cultivation (the land was broken for the first time in 1972), an entire section lent itself to surface collecting. Two brown chalcedony flakes, several chert flakes, a chert graver (Fig. 10, page 67 , Table 18, page 66) and several bone fragments (*Canis* sp., left half of the mandible) were recovered. Neither artifact concentrations nor spatial relationships between the artifacts and the bones were found. The lithic material is of both local and non-local origin. Test excavations were not carried out, and no future investigation is recommended.

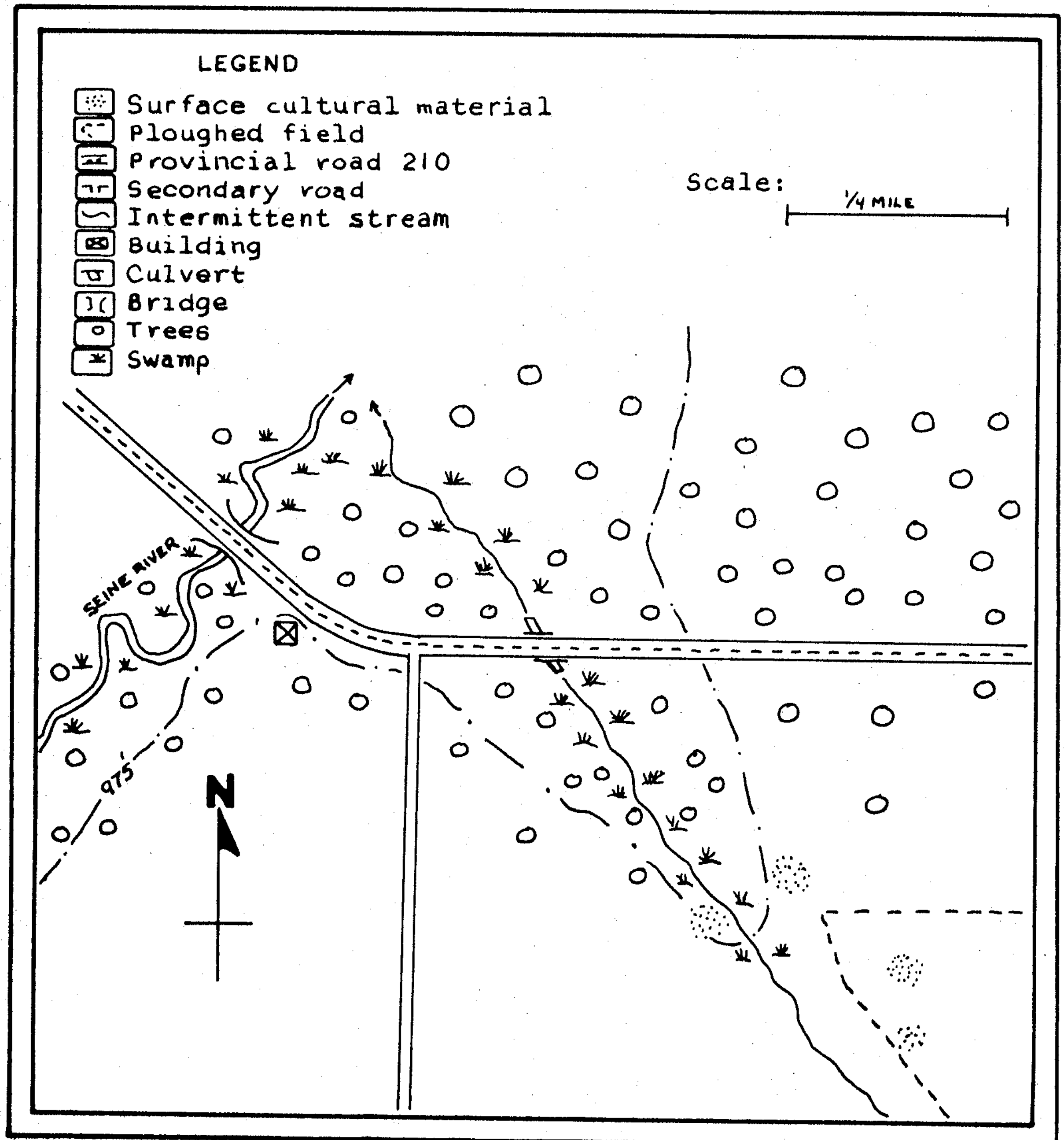


Fig. 9. Site Five

TABLE 18

SITE FIVE, GRAVER

Attribute	Description
Specimen number	(118)41
Outline	triangular
Lithic type	chert
Colour	2.5Y 8/2
Primary flaking	on 1 surface near the edge
Secondary flaking	on the edge and near the tip
Width	1.5
Length	3.0
Weight	3

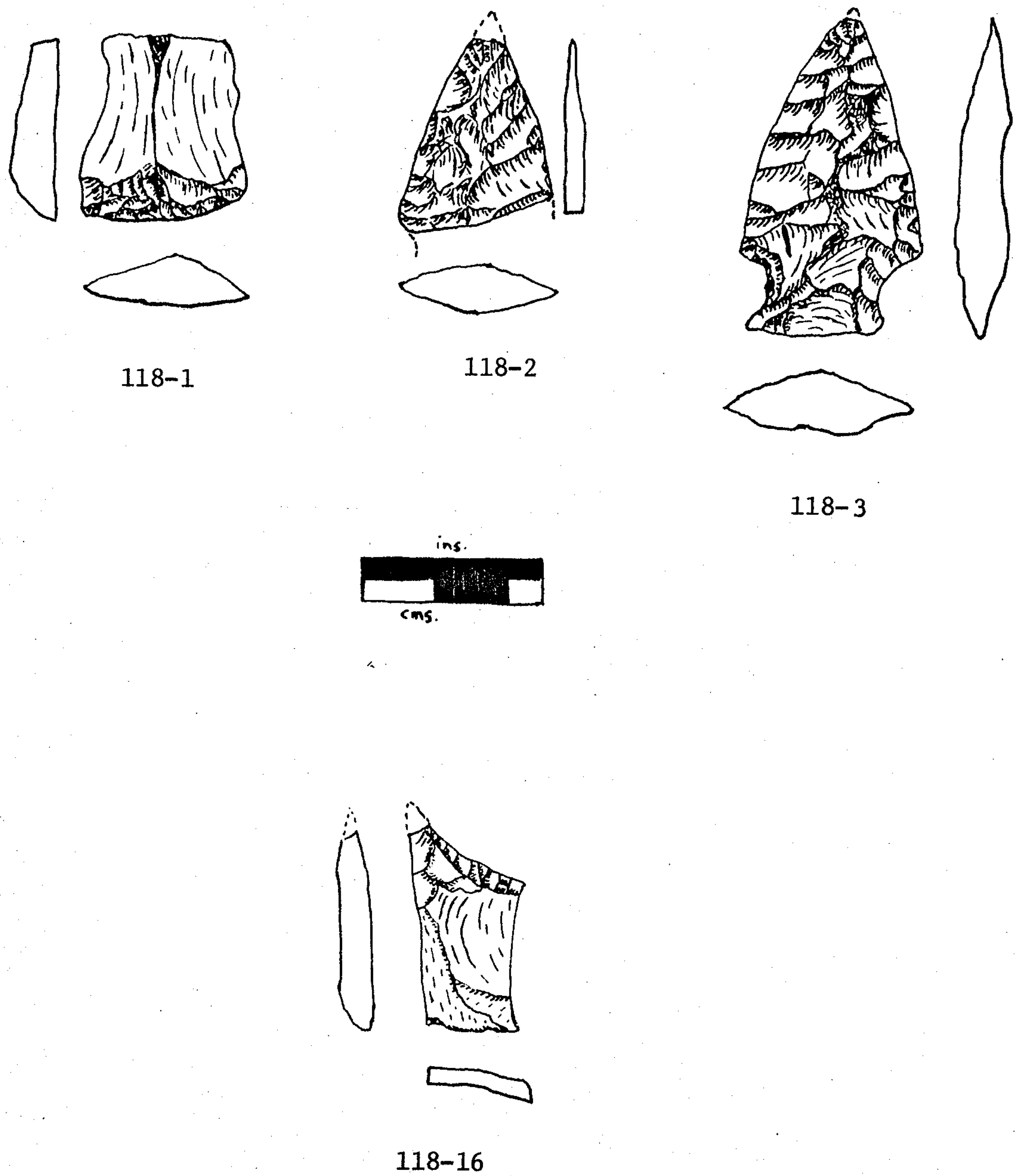


Fig. 10. Artifacts recovered from the surface; 118-1, end-scraper from Site One; 118-2, projectile point tip from Site Two; 118-3, projectile point from Site Three; 118-16, graver from Site Five.

Site Six (DbLb-1)

The sixth site is located in the NW¼ of the SE¼ of section 4, Twp. 4, Rng. 9E., 96° 18' 45" W. and 49° 16' 15" N. It was found within a large gravel pit system while surveying along a transect from Route 12 and the Campbell strandline, east to Woodridge. The site is located directly west of the 1100-foot contour elevation at a height of eight to ten feet above the edge of a deep peat, spruce-tamarack swamp situated immediately to the east. The site is on very gently sloping terrain which declines eastward towards the edge of the swamp, where a slight embankment existed prior to gravel extraction. The terrain rises slightly to the south of the site, but remains level to very gently sloping to the north and west. Half a mile to the west, slightly rounded, raised areas of "Woodridge" (gravel) soil are found. These are bars formed by brief stabilizations of water retreat during the Campbell phase of Lake Agassiz (Fenton, personal communication).

The soil of the site is of the "Sandilands-woodridge" series, i.e., excessively well-drained minimal podzol and orthic grey wooded soil over stratifed deposits of sand and gravel (Ehrlich and Smith soils map 1964). Present vegetation is _Pinus banksiana_, _Populus_ sp., with a ground cover of grasses (Graminae). Immediately to the east, where the terrain slopes down to the edge of the swamp, the soil is characterized by minimal podzol and peaty gleysol over deposits of aeolian sand. Vegetation on this soil is _Pinus banksiana_, _Alnus_ sp., _Salix_ sp., _Betula_ sp., and Cyperaceae in undisturbed situations. The water in this area in normal years is generally less than two feet beneath the surface.

While surface collecting along the edges of the gravel pit, three chert scrapers (Fig. 13, page 74) and several small waste flakes were found on the exposed gravel surface. On the edges of the next cut bank to the east of the initial surface find, a green quartz flake was found. This flake was the only one found at any distance from the site. Because material seemed to be eroding out of a gravel layer, a base-line was established (by transit) which ran twenty-five degrees west of magnetic north and parallel to the edge of the gravel pit. This base line was later tied into a permanent survey marker located to the southeast at the swamp's edge. Three 1 x 2 metre excavation units and a 2 x 2 metre unit were excavated south and west of datum (Fig. 11, page 72).

An area of cultural activity was found concentrated at the edge of the cut-bank. It yielded three white chert scrapers (Table 21, page 77), a white quartz utilized flake (Table 20, page 76), and two sections of a green quartz biface (Figs. 13, 14, pages 74, 75; Table 19, page 76). Excavation Unit 2 (see soil profile, Fig. 12, page 73) yielded the greatest concentration of chipping detritus. A total of 310 small secondary waste flakes were recovered; 212 were derived from the manufacture of the biface, while eighty-nine were of other material such as quartz, white chert, and grey chert. Several of the grey chert flakes could not be matched with any of the artifacts recovered. Since gravel excavation has been extensive, a number of artifacts was presumably lost prior to site discovery. The concentration of artifacts and associated chipping detritus was found parallel to, but not extending any distance away from, the cut bank. Neither bone nor features were found. The primary site activity is postulated to have been one of tool manufacturing. The lithic material is of local origin and could have been derived from the exposed beach gravels.

The cultural layer was located at a depth of forty-two to fifty cms. A few flakes had undergone a small amount of vertical displacement, but the vertical distribution of the cultural layer as a whole remained very consistent. The cultural layer lay immediately above a gravel layer; only a few flakes were incorporated into the gravel. Immediately above the cultural layer was water-deposited, dull-white sand, superimposed in turn by aeolian sand mixed with humus. This layer also contained streaks of charcoal, indicating that burning has occurred at the site, perhaps from recent forest fires. It was in turn succeeded by another deposit of aeolian white sand. The modern topsoil was only several cms. thick and consisted of decayed leaves, grass, and pine needles.

The site is located on one of the Campbell beaches. The area of the site was formed as a spit when the waters of Lake Agassiz retreated westward. Material was deposited as wave action moved sand southward from the Campbell shoreline and redeposited it first near the site and subsequently in successive stages to the westward. This spit, which begins near the site and extends west to Provincial Highway 12, was formed entirely during the Campbell II phase.

The gravel layer immediately underlying the cultural deposit was formed during the early stages of the spit formation. Coring in the site determined the following sequence of events from the earliest to the most recent: (1) deposition of sand in a lake less than forty feet in depth; (2) deposition of the gravel layer; (3) deposition of the cultural material during a dry period; (4) deposition of water-borne sand which sealed the cultural material; (5) stabilization of the deposit and modern soil development. Several factors may account for the water-laid sand: (1) a storm could have deposited the sand from the east, where an inland lake existed; (2) or wave action could have deposited the sand from the west, before Lake Agassiz had retreated any substantial distance; or (3) sand was washed downslope from either the east or south when the inland lake still existed; or (4) the gravel layer was dry for a period and a subsequent readvance of Lake Agassiz deposited the sand.

The determination of the sand and gravel deposition phases, and the corresponding wet and dry site conditions, was based on the grain size of sand particles in the various deposits. The water deposited sand had a mixture of large and very small grain size, while the wind-deposited sand tended to have evenly sorted grains and very high percentages of small grains (the accompanying Table 22, page 78 summarizes the site's stratigraphy by grain size analysis).

On the basis of these data and other research conducted in the Sandilands (a forthcoming PhD dissertation), M. Fenton suggested maximum and minimum dates of 10,000 to 7,000 years B.P. for the site. A narrowing of this date is possible. Elson (1971: 288-289) has revised his earlier estimates for termination of Lake Agassiz to a date of 8,530 ± 220 years B.P. He also suggested a date of 10,000 years B.P. for the re-establishment of the Campbell water plane. This date is also postulated by Moran et. al. (1971: 61-73) and Ashworth (1972: 187). Ashworth suggested that the water level was stable from 9,400 to 10,000 years B.P. during the Campbell stage. Fenton determined that the sands which sealed the cultural layer were deposited shortly after the Campbell beach was first formed. Therefore, a more appropriate date for the cultural deposit is between 10,000 and 9,000 years ago.

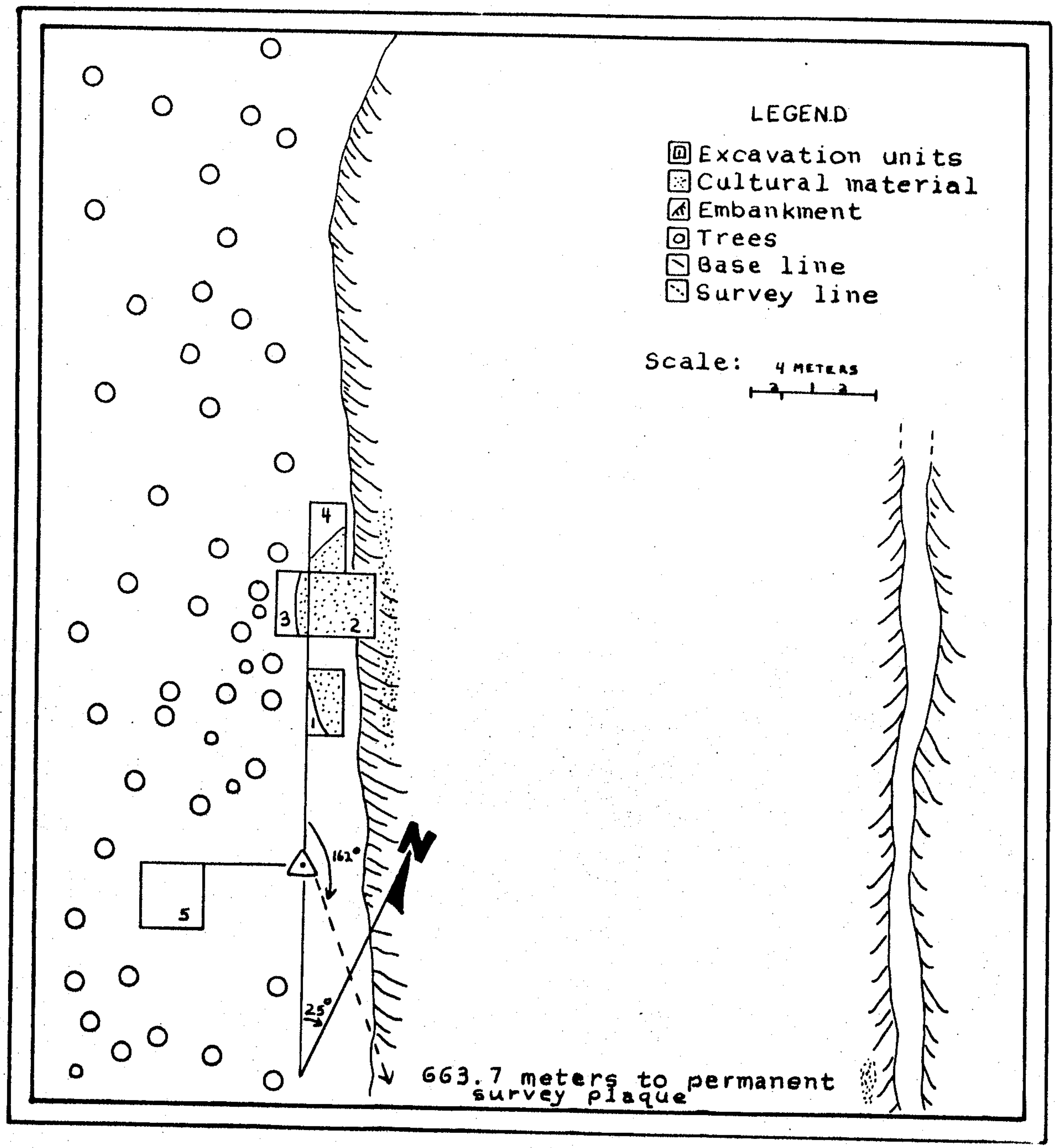


Fig. 11. Site Six

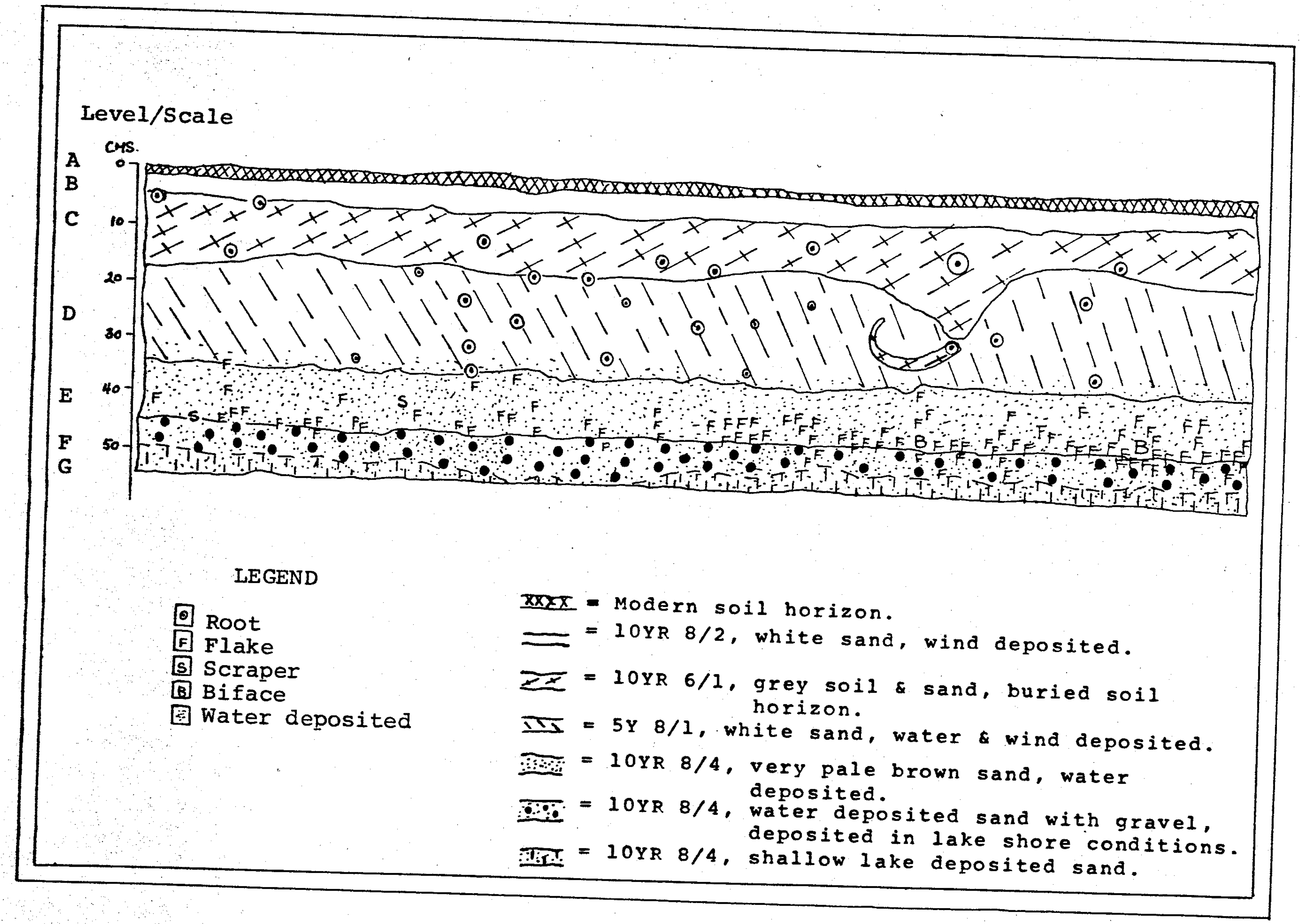


Fig. 12. Site Six Stratigraphy

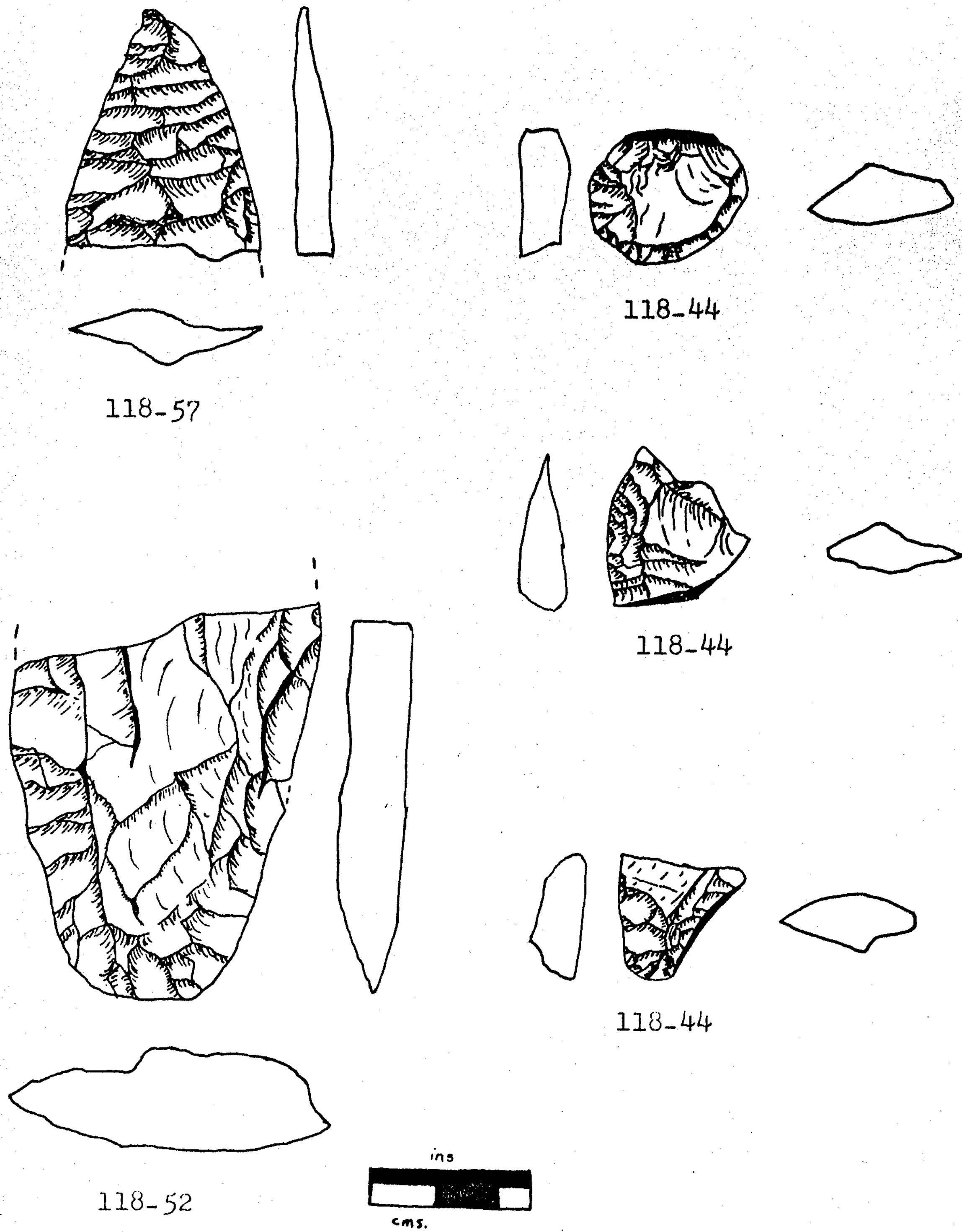


Fig. 13. Two fragments of a quartz/quartzite biface (118-52,57) are pictured at the left; scrapers which were found on the surface prior to excavation (118-44) are pictured at the right.

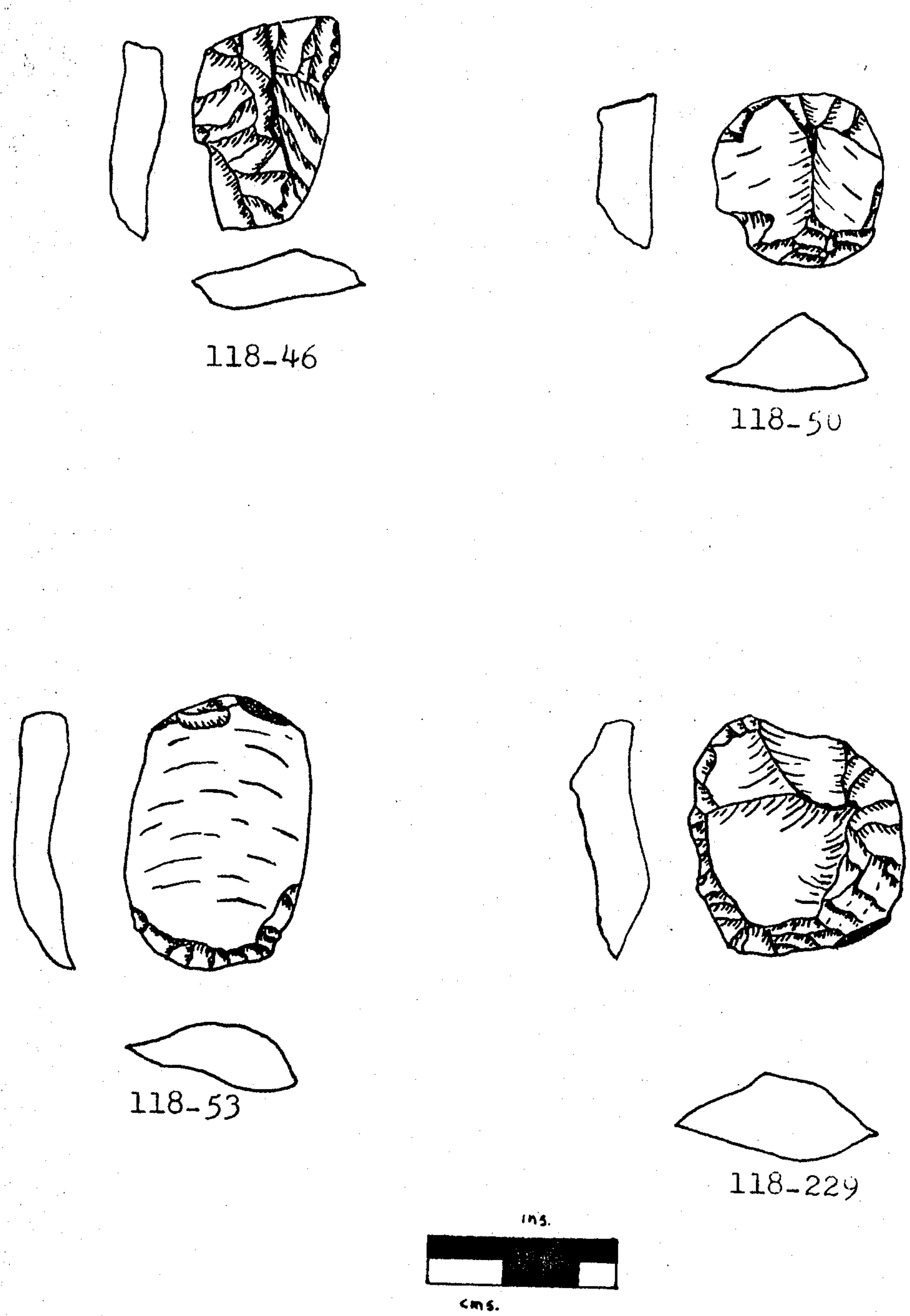


Fig. 14. A quartz utilized flake (118-46) and chert scrapers (118-50,53, 229) found during excavations at Site Six.

TABLE 19

SITE SIX, BIFACE

Attribute	Spec. no. Description (118)52	(118)57
Condition	broken	broken
Blade shape	expanding ovate	expanding ovate
Base shape	convex	----
Colour	"green"	"green"
Wear	none	none
Polishing/grinding	none	none
Primary flaking	entire base	entire surface
Secondary flaking	edges	edges
Transverse section	asymmetrically biconvex	asymm. biconvex
Lithic type	quartz/quartzite	quartz/quartzite
Total length	5.9	3.7
Blade width	5.0	2.9
Max thickness	1.5	1.8
Weight	50	9
Angle	----	18/24^{o}

TABLE 20

SITE SIX, UTILIZED FLAKE

Attribute	Description
Spec. no.	(118)46
Outline	oblong
Material	quartz
Colour	translucent
Transverse section	asymmetrically ovate
Longitudinal section	ovate
Primary flaking	detached from a core
Secondary flaking	on two edges
Maximum thickness	0.8
Width	1.1 x 2.1
Length	2.6
Weight	5

TABLE 21

SITE SIX SCRAPERS

Attribute	Description, Spec. no. (118)44	(118)44	(188)44	(118)50	(118)53	(118)229
Description	end scraper	end scraper	sidescraper	end scraper	end scraper	side/end scraper
Outline	semi-triangular	triangular	triangular	semi-triangular	oblong	circular
Material	chert	chert	chert	chert	chert	chert
Colour	5Y 8/	10YR 7/1	10YR 8/1	5Y 8/2	5Y 8/3	10YR 8/1
Primary flaking	detached from core	detached from core	detached from core	on opposite ends	detached from core	detached from core
Secondary flaking	entire edge	on edge	on one edge	on opposite edges	distal end	on two edges
Wear	none	none	none	none	none	none
Weathering	all surfaces	all surfaces	all surfaces	none	none	all surfaces
Transverse section	asymm. biconvex	irreg. biconvex	plano-convex	plano-triangular	asymmetrically biconvex	concavo-triangular
Longitudinal section	irregular	biconvex	irregular	irregular	asym. con.-convex.	asym. con.-convex
Length	----	----	1.9	----	3.7	3.4
Width, worked end	----	2.4	2.4	----	2.0	3.2
Width, unworked end	----	1.2	0.6	----	2.1	2.3
Width, midsection	2.9 x 2.4	1.9	2.0	2.4 x 2.2	2.3	3.0
Maximum thickness	0.9	1.9	0.9	1.0	0.9	1.1
Weight	6	5	3	5	8	10
Angle	53°	37°	40°	70 & 42°	54°	73°

TABLE 22

SAND GRAIN ANALYSIS,* SITE SIX

Grain size:	Grain size in percentage of total volume				
	2.0	1.0	.50	.25	<.25
Level "B"	0	0	1	36	62
"C"	0	2	14	49	35
"D"	1	4	5	64	25
"E"	1	6	22	39	32
"F"	13	4	17	42	24
"G"	2	1	7	62	28

*Analysis was conducted according to the following procedure:

(1) A specified amount in mls. was measured in grams.
(2) The sample was processed through 4 screen-mesh sizes by water.
(3) The amount remaining in each screen was measured by volume.
(4) This was subtracted from the original sample volume, and divided by the total volume, for percentage.
(5) The process was repeated through the remaining aperature sizes, including the residue which passed through the smallest mesh size.

NOTE: Sand deposited in levels "E" and "F" show a greater percentage of large grains, indicating that the sand was deposited by means other than wind--i.e. water-action.

SOIL LEVEL DESCRIPTION
Site Six

Level "A": Topsoil, grass, needles--modern soil horizon

"B": 10 YR, 8/2 (white) sand--wind deposited

"C": 10 YR, 6/1 (gray) soil and sand, with streaks of charcoal--buried soil horizon

"D": 5 Y 8/1 (white) sand, water and wind deposited

"E": 10 YR, 8/4 (very pale brown) sand, water deposited

"F": 10 YR, 8/4 (very pale brown) sand with gravel, water deposited in lake shore conditions

"G": 10 YR, 8/4 (very pale brown) sand, no gravel, water-deposited in shallow lake less than 40 feet in depth

Site Seven (DbLb-2)

This site is located in the SE¼ of the SW¼ in section 5, Twp. 4, Rng. 9E., 96° 20' 45" W. and 49° 16' 01" N. It was found in a gravel pit adjacent to Provincial Road 203, approximately one and three quarters miles from the junction of this road with Route 12. Material was recovered from the east edge of the gravel pit cut-bank.

The site is situated immediately east of a depression which is now a spruce-tamarack swamp. The local terrain is gently sloping and a small embankment is located at the edge of the depression. Soil on the site is of the "Woodridge" series - orthic grey wooded over calcareous stratified sand and gravel deposits (Ehrlich and Smith soils map 1964). Present vegetation is Pinus banksiana, Populus sp., Salix sp., Picea glauca and Graminae. Larix sp., Picea mariana, Polypodiaceae, Cyperaceae and mosses grow in the depression.

Several chert and chalcedony waste flakes, a utilized chert flake (Fig. 16, page 82; Table 24, page 84), and small burned bone fragments were found at the edge of the cut-bank. A 1 x 3 metre unit was excavated thirty-eight to forty metres north of the road and thirty-nine to forty metres west of the junction of the road with a forestry trail (Fig. 15, page 81). The soil was badly mixed because of bulldozer activity. Two projectile points (Table 23, page 83), and several additional waste flakes were found. The lithic material is derived from Souris River gravels of southwestern Manitoba (Fenton, personal communication). Another unit, which proved to be sterile, was excavated five metres east of datum. Bulldozer activity had stripped the sod over the entire site. A detailed surface inspection recovered no additional material, and no future investigation is recommended.

This site can also be dated within a broad margin. The cultural material was contained within a deposit of aeolian sand and medium textured gravel lying thirteen cms. above water deposited gravels of Lake Agassiz. It postdates by a substantial margin the period when water covered the site. The projectile points very closely resemble "Prairie side-notched" (Kehoe 1966: 833, Mayer-Oakes 1976: 346), and "Selkirk side-notched" (MacNeish 1958: 105) types. An estimate, based solely on artifact morphology, places the period of occupation between A.D. 1000 and 1700.

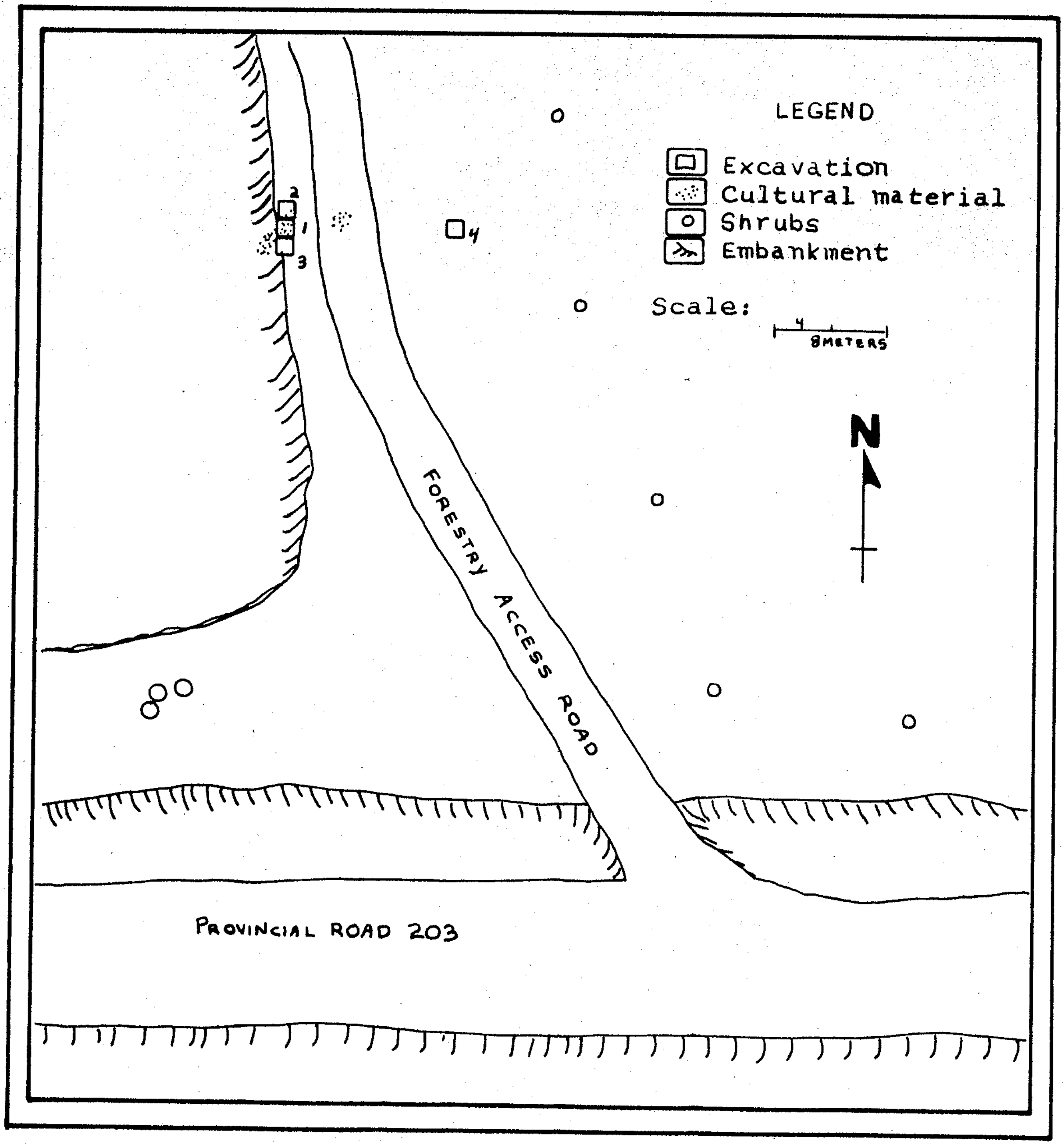


Fig. 15. Site Seven

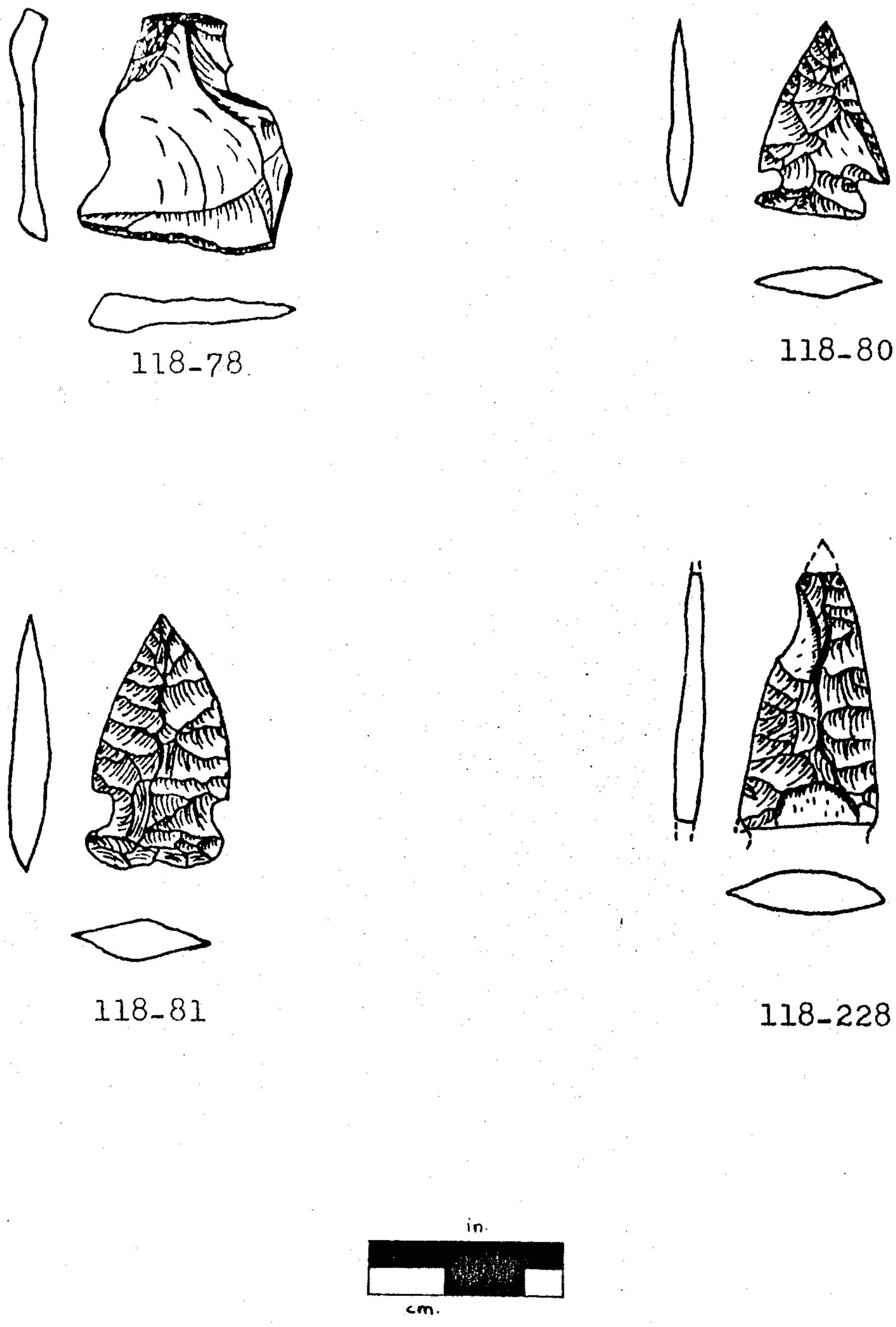


Fig. 16. Artifacts found on the surface at Site Seven: Utilized flake, 118-78 and a broken projectile point, 118-228. Found during excavation at Site Seven: two projectile points, 118-20 and 81.

TABLE 23

SITE SEVEN, PROJECTILE POINTS

Attribute	Description Spec. no. (118)80	81	228
Blade shape	triang.	triang.	long triang.
Condition	compl.	compl.	broken
Colour	2.5Y N/7	10YR 5/1	10YR 6/1
Wear	none	none	none
Polishing/grinding	none	on notch	none
Primary flaking	all surfaces	all surf.	dorsal surf.
Secondary flaking	all surfaces	all surf.	all surf.
Transverse section	asymm. biconvex	biconvex	biconvex
Longitudinal sect.	asymm. biconvex	biconvex	biconvex
Lithic type	chalcedony	chert	chert
Total length	2.6	3.2	3.4
Blade length	2.2	2.5	-----
Blade width	1.8	1.9	1.9
Width inside notches	1.0	1.4	-----
Tang width	1.4	1.7	-----
Weight	1	4	3
Angle "a"	$28/28^{\circ}$	$31/31^{\circ}$	$20/20^{\circ}$
Angle "b"	$23/30^{\circ}$ $20/30^{\circ}$	$52/40^{\circ}$ $43/40^{\circ}$	-----

TABLE 24

SITE SEVEN, UTILIZED FLAKE

Attribute	Description
Outline	irregularly square
Material	chert
Colour	2.5Y 6/2
Transverse section	irregular
Longitudinal section	asymmetrically concavo-convex
Primary flaking	detached from core
Secondary flaking	on base and 3 edges
Maximum thickness	0.6
Width	3.0 x 2.6
Length	-----
Weight	4

Site Eight (DaKv-1)

This site is located in the SW¼ of the SW¼ of the SW¼ of section 3, Twp. 1, Rng. 14E., 96° 39' 00" W. and 49° 10' 00" N., half a mile south of Provincial Highway 12, adjacent to the Sprague River. The only non-archaeological site recorded during the survey, it was brought to our attention by informants. It is on the property of Mr. Clarence Alton. The terrain is level but sharply sloping near the river. However, since the site is located approximately 30 metres north of a house, recent landscaping may have altered the surface relief. Elsewhere in the vicinity a slightly rolling relief can be seen - the result of changes in the river's course. The soil is of the "Frammes" series - gleyed dark grey over a parent material consisting of six to thirteen inches of clay and strongly calcareous silty sediment (Ehrlich and Smith 1964: 81). Present vegetation at the site is Ulmus sp., Salix sp., and a variety of intrusive grasses. This is largely a result of modern building and landscaping. Vegetation in undisturbed soil areas is *Populus tremuloides*, *Populus balsamifera*, *Fraxinus* sp., *Ulmus* sp., *Quercus* sp., and *Acer* sp. (Fig. 17, page 87).

The site was originally discovered in 1971 by the landowner while bulldozing an area to build a house foundation. At that time a *Bison bison* skull was discovered. It was taken by another local resident, who subsequently made the find known to a number of local persons. However, in 1972 the owner of the skull could not be determined and for all intents and purposes it is lost.

George Lammers of the Manitoba Museum was informed of the site. With several students, he conducted a one-day salvage operation and recovered several longbones, vertebrae, and rib fragments, all of *Bison bison*. When visited during the 1972 archaeological survey, the site yielded a *Cervus canadensis* pelvis (os coxae, acetabular area) at a depth of 1.40 metres. It was identified at a later date by Lammers.

A soil sample extracted from undisturbed alluvial sand immediately north of the pelvis showed that the material was deposited in an aquatic environment (the accompanying Table 25, page 88 lists the associated mollusc species). The stratigraphic sequence observed at this site is gleyed dark grey soil developed on a grey clay deposit, followed by the alluvial sand in which the bones were contained. An identical stratigraphy, in addition to a number of small bone fragments, was observed immediately to the west in a road-cut. The stratigraphy was also seen in a house excavation in the same soil zone half a mile north of the site. Because of the badly disturbed condition of the bone deposit, it was impossible to determine the mode of deposition. This particular soil may be a result of frequent shifts in the course of the Sprague

River. Therefore, the bones could have been deposited in a sand bar when the river flowed thirty to forty metres west of its present location. The substantial depth of the deposit is not necessarily an indication of great antiquity.

There were no cultural items associated with the bones. Informants reported that several projectile points were found in fields surrounding the site, but surface collecting in 1972 was unproductive.

This site may be useful to future researchers for paleontological and environmental data. It also demonstrates the prehistoric presence of *Bison bison* and *Cervus canadensis* in the research area.

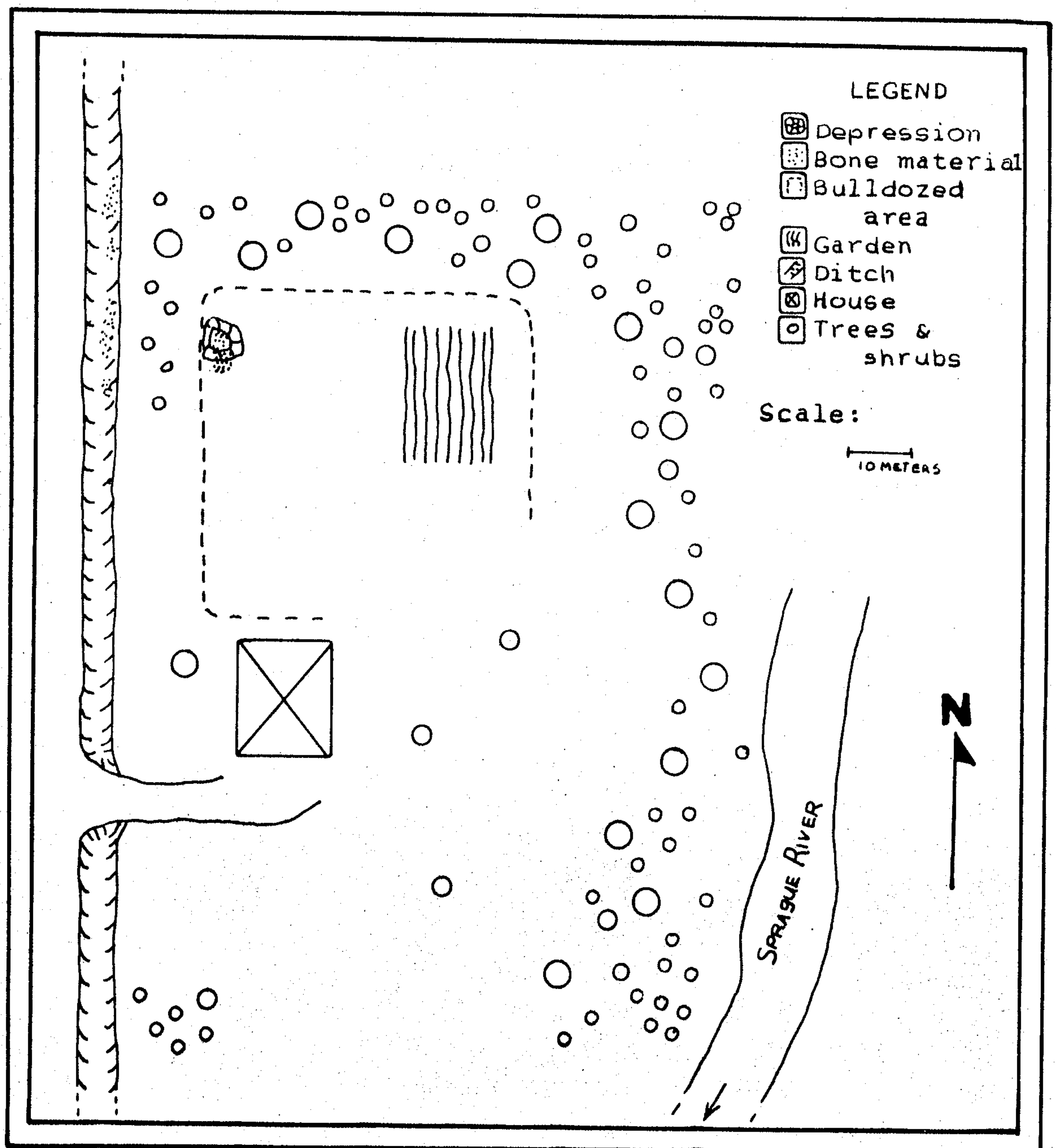


Fig. 17. Site Eight

TABLE 25

MOLLUSC ANALYSIS* SITE EIGHT

Species (Pelecypoda)		Number
	Anodonta grandis	3
	Pisidium sp.	4
	Eliptio dilatatus	58
	Plethobasis cyphus	1
	Actinonais carinata	1
	Lampsilis ventricosa	28
	Total	82
(Gastropoda)	Helisoma corpulenta	28
	Amnicola lustrica	7
	Lioplax subcarinata	14
	Planorbula armigera	10
	Gyraulus sp.	47
	Valvata sincera	16
	Stagnicola caperata	1
	Promenetus exacuatus	2
	Helisoma antrosa	6
	unidentified	1
	Total	132
	Sample total	214

*The above listed molluscs were recovered from undisturbed sediments in direct association with Bison bison and Cervus canadensis.

Approximately 750 mls. of sediment were processed through 4 aperture screen sizes. The material remaining in the .25 mm. screen was too fragmentary for identification, and was discarded.

All of the above listed species are aquatic. They were identified according to Eddy and Hodson (1961).

Site Nine (DaKw-1)

This site is located in the SE¼ of the NW¼ of the NE¼ of section 32, Twp. 1, Rng. 14E., 96° 40' 25" W. and 49° 05' 10" N. It is the only archaeological site specifically located by informants and not discovered during transect surveying. It is on the property of Erwin Coston, and is accessible by proceeding 3.3 miles north of Sprague on Provincial Road 308, turning left(west) and proceeding one mile, and travelling south on a private road at a point prior to crossing a bridge.

The site is situated in a cultivated field. The general terrain is level except where it slopes steeply to the Sprague River. A number of small ravines cut downslope to the river at several places at the edge of the field. The soil on the field is the "Arnes" series - dark grey wooded over a parent material of weakly to moderately calcareous till. This soil normally supports a vegetation of *Populus tremuloides*, *Populus balsamifera*, *Picea glauca*, and *Abies balsamea*. In the uncultivated river bottom the soil is the "Hadashville" series (very fine grained sandy loam), a gleyed dark grey wooded soil over a parent material of moderately calcareous, medium to moderately coarse textured sediments. This soil supported vegetation of *Populus tremuloides*, *Populus balsamifera*, *Ulmus* sp., *Betula* sp., *Salix* sp., and *Corylus* sp. (Ehrlich and Smith soils map 1964). These trees grow solely on the river edge, and have regrown since the original land clearing in 1910.

The land owner informed us of several places in the field where he had collected material. The greatest concentration was at the extreme western edge where it slopes sharply to the river. Cultural material was distributed on the surface, on both sides of a small ravine, and approximately fifty metres to the east of the river's edge. Two base lines which intersected at right angles were established by the use of a transit. One 2 x 2 metre unit was excavated on the northern edge of the ravine, a second was sunk at the base of the ravine, and a third was put down in uncultivated soil at the river's edge (Fig. 18, page 92). Detailed surface reconnaissance was also carried out over the entire field. A trip was made to the Rosseau County Museum (Rosseau, Minnesota) to view artifacts which the land owner had donated.

The excavation units were dug to a depth below the plow zone, and work continued until the dense clay soil became too difficult to remove. Unit One yielded small flakes and small burned bone fragments. The second unit was taken down to a depth of thirty cms. A quartz scraper (not illustrated) was found at a depth of fifteen cms.; it was the only cultural item recovered from this unit. Unit Three was undisturbed. Five flakes were recovered at a depth of eight cms., but no other material was encountered. On the basis of what was found in Unit Three, it was concluded that very little soil had accumulated over the cultural material after deposition. The land owner stated that he normally ploughed to a depth of four inches; but when soil conditions permitted, the soil had to be ploughed much deeper one year out of five. Ploughing had obliterated all features of the site and badly mixed the subsurface deposits.

Surface collecting recovered a number of artifacts, the majority of which were utilized flakes and scrapers (Fig. 19, page 93; Tables 26, 27 and 28 pages 94,95,96). The land owner donated two grooved mauls, a blade, a biface fragment, and a scraper to the University of Manitoba. Drawings were also made of the projectile points in possession of the landowner, as well as those at the Rosseau Museum. These points, six complete and six fragmentary, were compared with MacNeish's (1958) typology and found to correspond quite closely to the "Whiteshell side-notched", "Eastern triangular", and "Prairie side-notched" types. Only one point closely resembled "Whiteshell side-notched"; all others are of the aforementioned types.

On the basis of the data, and with the suggested dates of both Mayer-Oakes (1967: 339-337) and MacNeish (1958), it can be postulated that the site was occupied several times, from approximately 1000 B.C. to the late prehistoric period. These dates are tentative, since there were no direct means of dating the site. Cultivation had destroyed any signs of multicomponent occupation, spatial distribution of activity areas, and possible features.

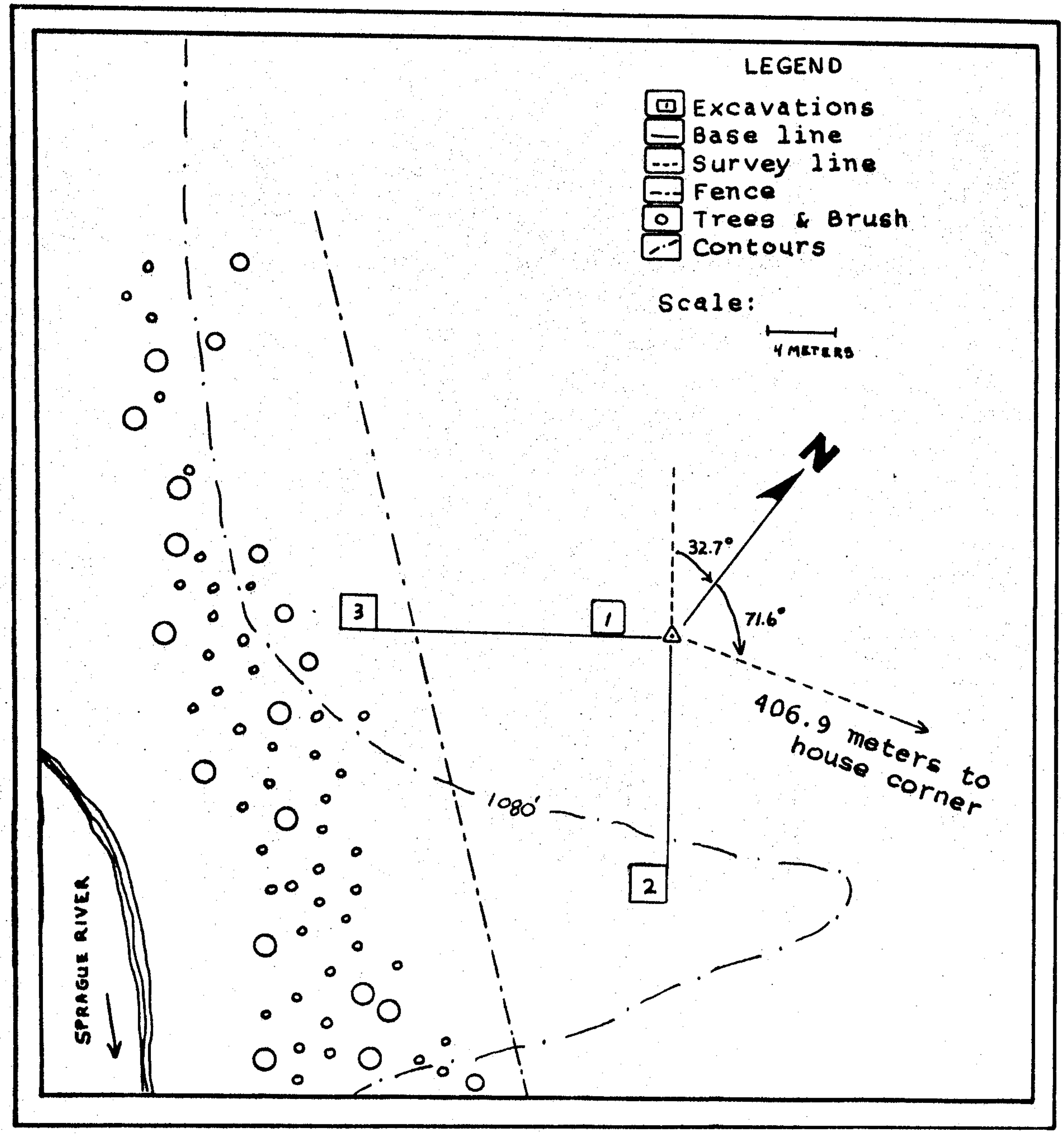


Fig. 18. Site Nine

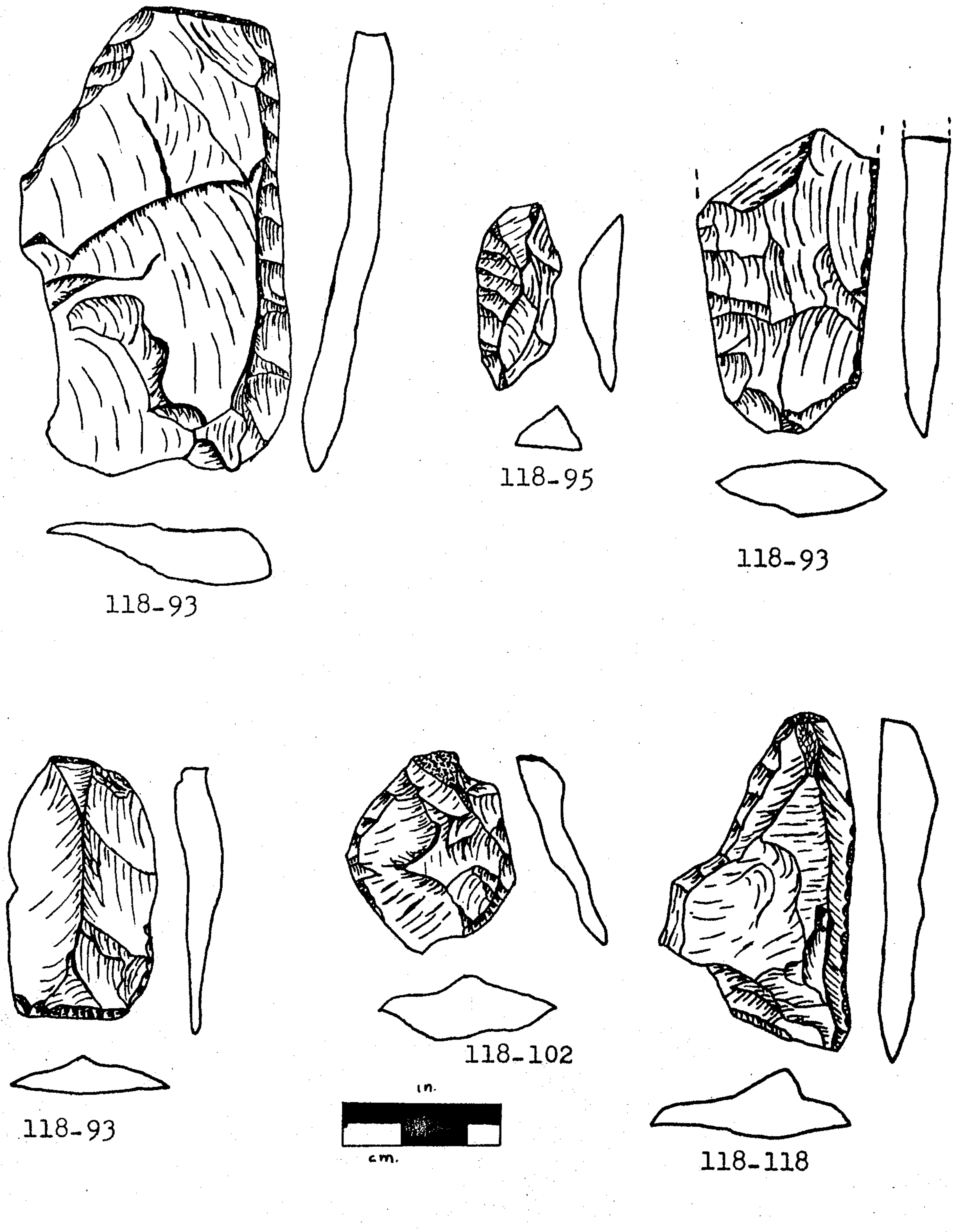


Fig. 19. Artifacts recovered from the surface of the site: top (left to right), a side-scraper on a blade, a side-scraper, and a broken biface; bottom (left to right) an end-scraper, an end-scraper, and a side-scraper.

TABLE 26

SITE NINE, BIFACE

Attribute	Description
Specimen number	(118)93
Blade shape	parallel ovate
Condition	broken
Colour	2.5Y N/3
Wear	none
Polishing/grinding	none
Primary flaking	all surfaces
Secondary flaking	all edges
Transverse section	biconvex
Longitudinal section	biconvex
Lithic type	chert
Total length	4.9
Blade length	----
Blade width	2.8
Width inside notches	----
Tang width	----
Maximum thickness	0.8
Weight	14
Angle "a"	----
Angle "b"	----

TABLE 27

SITE NINE SCRAPERS

Attribute	Description, Spec. no. 93	93	95	95	95	95	102	105		118
Type	blade/end	side	side	side	side	side	end	end	core/s	side
Outline	oblong	irregular	irreg., circ.	oblong	square	irreg. circ.	circular	irreg. triang.	circu	irregular
Material	quartzite	chert	chert	chert	chert	chert	chert	quartz	fossi chert	chert
Colour	2.5Y N6/	5Y 3/1, 3/2	5Y 8/1	5Y 8/1	5Y 8/1	10YR 8/2	10YR 8/1	translucent	2.5Y 8	2.5Y 7/4
Primary flaking	detached from core	detached from core	detached from core	on 1 edge	on 2 oppos. edges	detached from core	all surfaces	on one edge	on 1 e	detached from core
Secondary flaking	on end	edges & bulb	on 1 edge	on 1 edge	on 2 edges	on 1 edge	on 3 edges	on 1 edge	on 1 e	on 2 sides, end
Wear	on end oppos. bulb	on edge	----	----	----	----	on edges	----	on edg	----
Transverse sect.	convexo-triangular	irreg. biplano	irreg. convexo-triang	plano-triang.	plano-triang.	irreg. plano-triang.	asymm. biconvex	plano-convex	irreg.-triangular	plano-triang.
Longitudinal sect.	asymm. ovate	asymm. concavo-convex	plano-convex	plano-convex	----	excurvate	asymm. ovate	plano-convex	----	asymm. concavo-convex
Length	4.1	7.4	----	3.1	----	2.1	----	----	----	5.4
Width, worked end	1.7	----	----	----	----	----	----	----	----	----
Width, unwork. end	1.4	----	----	----	----	----	----	----	----	----
Width, mid-sect.	2.3	4.2	2.8 x 2.2	1.3	2.8 x 2.9	1.4	3.3 x 2.7	1.3 x 1.3	3.8 x 2	3.0
Max. thickness	1.8	0.9	1.2	0.8	1.4	0.9	0.9	0.6	1.6	1.0
Weight	7	31	8	3	15	3	7	1	21	11
Angle	----	55°	67°	83°	90°	48°	60°	58°	48°	62°

TABLE 28

SITE NINE FLAKES

Attribute	Description Spec. no. (118)104	105
Type	utilized flake	spokeshave
Outline	square	crescent
Material	chert	chert
Colour	2.5Y N3/	7.5YR N7/
Transverse sect.	biplano	-----
Longit. sect.	ovate	-----
Primary flaking	detached from core	detached from core
Secondary flaking	on 1 edge segment	lt., on 1 end
Maximum thickness	0.3	1.3
Width	1.7 x 1.8	1.5
Length	-----	3.1
Weight	1	5

TABLE 29

SITE NINE OSTEOLOGICAL DATA

Specimen no.	Species	Description
(118) 95	_Alces alces_	metatarsal
110	_Alces alces_	incisor
118	_Alces_ or _Cervus_	portion, distal end of humerus

TABLE 30

SEED ANALYSIS* SITE NINE - EXCAVATION UNIT TWO

Description	Species	No.	Habitat
Level "B", Ex. Un. 2, 14-15 cms. very dark grey silt with organic matter (500 mls.)	Thlaspi arvense	75	gardens, fields, disturbed areas (introduced)
	Dracocephalum parviflium	16	wet ground, damp thickets, shores
	Rumex crispus	8	
		8	sandy, disturbed areas
	Solanum sp.	1	sandy prairie, disturbed areas
	Medicago lupilina	7	fields, clearings (introduced)
	Helianthus annus	1	prairie, thickets, disturbed areas
	Chenopodium sp.	38	fields, disturbed areas, shores, thickets, clearings
	Amaranthus sp.	132	sandy prairie, disturbed areas
	Silene noctiflora	6	roadsides, clearings
	unidentified	50	
Level "C", 15-22 cms., lt. brownish grey, lt. textured silt with stones intermixed (500 mls.)	Amaranthus sp.	106	sandy prairie, disturbed areas
	Chenopodium album	16	fields, disturbed areas (introduced)
	Chenopodium sp.	8	fields, disturbed areas, shores, thickets, clearings
	Dracocephalum parviflorum	12	wet ground, dampt thickets, shores
	Thlaspi arvense	7	gardens, fields, disturbed areas
	Rumex crispus	1	moist ground, disturbed areas
	unidentified	85	
Level "D", 22-30 cms., lt. grey silt with stones, charcoal, plant fibers, and traces of yellow clay (500 mls.)	Dracocephalum parviflorum	13	wet ground, damp thickets, shores
	Amaranthus sp.	11	sandy prairie, disturbed areas
	Saponaria vaccaria	6	grain fields, disturbed areas
	Solanum dulcamara	1	sandy prairie, disturbed areas, thickets, gardens
	unidentified	8	
Level "D", 28-30 cms., NE corner— floor (250 mls.)	Amaranthus sp.	397	sandy prairie, disturbed areas
	Cycloloma artiplicifolium	75	sandy prairie
	Saponaria vaccaria	65	grain fields, disturbed areas
	Trifolium hybridum	13	fields, clearings
	Dracocephalum parviflorum	12	wet ground, damp thickets shores
	Chenopodium sp.	3	disturbed areas, thickets, clearings, fields shores
	Convolvulus sp.	1	prairie, thickets, clearings
	Prunus virginiana	2	dry prairie, sandhills, rock outcrops, shores
	Cirsium altissimum	1	sandy, open, low woods, thickets, swampy ground
	Glycyrrhiza lepidota	1	prairie, thickets, clearings
	(needles)		
	Larix sp.	1	moist, swampy
	Picea sp.	4	dry or moist, depending on species

Sample summary: Level "B": 282 seeds
"C": 243 seeds
"D": 39 seeds
floor: 575 seeds
5 needles

Sample total: 1144 items

*All seed habitats were identified according to Scoggan (1957)

It is apparent from the sample that a great deal of mixture has occurred in the site stratigraphy (even though the top 13 cms. were excluded from analysis). Several notable factors were concluded from the seed analysis, however. It is apparent that at least three vegetative complexes have existed at the site: agricultural, prairie, and moist wooded. Although a substantial percentage of the seeds analyzed from the lowest level of the site are from plants which can grow on disturbed ground, it cannot be stated if this a factor of recent agriculture disturbance or prehistoric human activity. This site is too disturbed for accurate environmental reconstruction.

Site Ten (DaKv-2)

This site is located in the SW¼ of the SW¼ of the SW¼ of section 28, Twp. 1, Rng. 14E., 96° 39' 55" W. and 49° 03' 40" N. It is situated one and one-half miles northwest of Sprague and is accessible by vehicle. It was found while conducting a north-south transect survey in the vicinity of the Sprague River. The site is adjacent to the latter, situated on terrain which gently slopes to the river.

The site is located at the junction of four soil zones: "Woodridge", orthic grey wooded; "Seven Sisters", dark grey wooded over a parent material of weakly to moderately calcareous lacustrine clay; "Hadashville", gleyed dark grey wooded; and "Carrick", orthic grey wooded over strongly calcareous till. The "Hadashville" and "Seven Sisters" soil series are confined to the river bottom and edges. The "Woodridge" and "Carrick" are on the higher areas. Vegetation is quite diverse. Growing on undisturbed portions of these soil series is *Populus balsamifera*, *Betula* sp., *Populus tremuloides*, *Ulmus* sp., *Fraxinus* sp., *Acer* sp., *Picea glauca*, *Abies balsamifera*, and *Pinus banksiana*. Present vegetation, which has regrown after land clearing, is *Populus* sp., *Betula* sp., *Picea glauca*, *Ulmus* sp., *Salix* sp., and *Alnus* sp. (Ehrlich and Smith soils map 1964).

A detailed surface collecting was conducted from the field in the southern half of the section. Cultural material was found concentrated in the field closest to the river. No diagnostic artifacts were found, although a number of flakes, a biface (Table 31, page 102 ; Fig. 21, page 101), scrapers (Table 32, page 103) and utilized flakes (Table 33, page 104) were recovered. A dense surface concentration of artifacts, burned bone fragments, and chipping detritus was located and three contiguous 1 x 2 metre units were excavated (Fig. 20, page 100).

Each excavation unit was dug to a depth of 20 cms. and each yielded quantities of burned and cracked large mammal bone fragments. Several flakes and one artifact, a chopper, were found. The cultural material was confined to the upper fifteen cms., which were totally distorted by ploughing. One feature, a hearth with larger fragments of bone, was situated in the extreme southwest corner of Unit Three. A soil sample was extracted which yielded more bone fragments. Material for Carbon-14 dating was not collected because no apparent relationships existed between the subsurface hearth and the surface artifacts, and because ploughing had badly distorted the entire deposit. Because of this extensive disturbance, it is not possible to make suggestions concerning the site activity, form, structure, antiquity, or length of occupation.

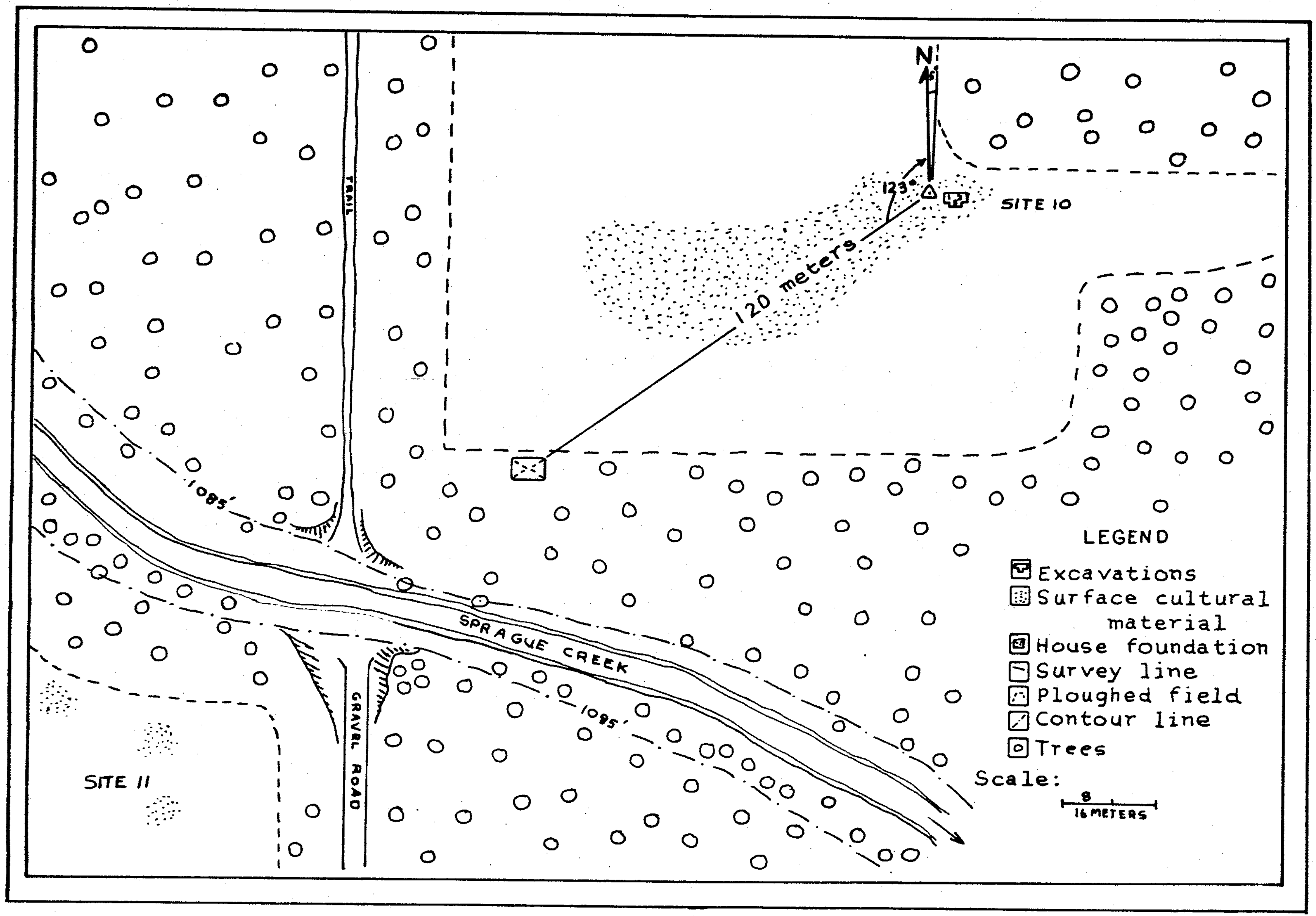


Fig. 20. Site Ten and Eleven

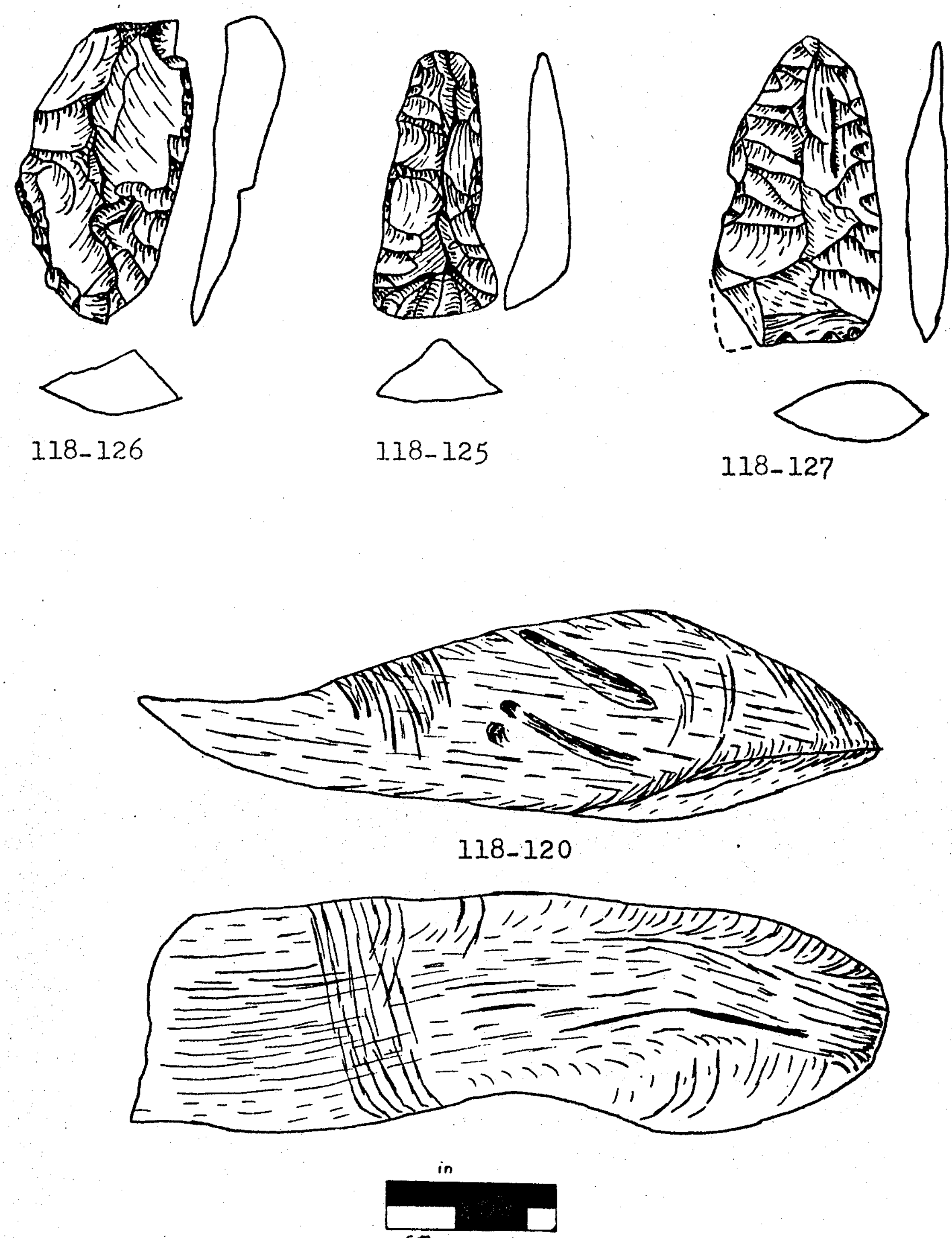


Fig. 21. Artifacts recovered from the surface of the site: top row left to right, preform, convex end-scraper, and a bifacial knife; bottom, fish or beaver effigy object.

TABLE 31

SITE TEN BIFACIAL ARTIFACTS

Attribute	Description Spec. no. (118)126	127
Type	preform	knife
Blade shape	triangular	ovoid
Condition	complete	complete
Colour	5Y 8/2	"pinkish"
Wear	on worked edge	on one edge
Polishing/grind.	none	none
Base shape	----	convex
Primary flaking	irregular	irregular
Secondary flaking	on 1 edge	all edges
Transverse sect.	convexo-triangular	irregular biconvex
Longitudinal sect.	asymm. concavo-convex	biconvex
Lithic type	chert	quartzite
Total length	4.6	4.8
Blade length	4.6	4.8
Blade width	2.4	2.4
Width inside notches	----	----
Tang width	----	----
Maximum thickness	1.0	1.0
Weight	11	12
Angle "a"	----	----
Angle "b"	----	----

TABLE 32

SITE TEN SCRAPERS

Attribute	Description, Spec. no (118) 123	123	123	123	123	123	123	125
Type	side	end	side	side/end	end	end	side	convex end
Outline	triangular	oblong	crescent	pentagonal	triang.	triang.	circular	trapezoidal
Material	chert	schist	chert	quartz	chalcedony	chert	limest.-chert	chert
Colour	7.5Y N8/0	----	7.5Y 8/2	white	white	glossy pink	10YR 8/1	2.5Y 6/2
Prim. flaking	on 1 edge	det. from core	on 2 surfaces	det. from core	on 1 surface	det. from core	det. from core	on dorsal surf.
Sec. flaking	on 1 edge	on 1 end	on 1 edge	on 2 edges	on 1 end	on 1 edge	on 1 edge	on edges
Wear	----	lt. on 1 end	----	on 2 edges	on edges	----	----	on end
Weathering	lt. all surf.	all surfaces	all surfaces	all surfaces	all surf.	all surf.	all surf.	all surfaces
Transverse sect.	plano-triang.	asym. biconvex	----	irreg. plano- convex	plano-convex	asym. biconvex.	plano-triang.	plano-triang.
Longitudinal sect.	----	asym. excur.	----	asym. concavo-convex	asym. ovate	asym. con.-conv.	asym. con.-conv.	asym. con.-conv.
Length	1.9	2.3	3.9	----	2.6	2.5	4.9	4.1
Width, worked end	----	1.5	----	----	1.9	----	----	1.8
Width, unwork. end	----	0.9	----	----	0.4	----	----	0.9
Width, mid-sect.	1.8	1.8	1.7	1.8 x 2.0	1.4	2.4	3.7	1.4
Max. thickness	0.8	0.8	1.2	0.5	1.6	0.8	1.3	0.9
Weight	3	3	9	3	2	4	29	5
Angle	48°	58°	45°	45°	70°	67°	58°	58°

TABLE 33

SITE TEN FLAKES

Attribute	Description, Spec. no (118) 122	123	140	141
Type	retouched core	retouched core	utilized prim.	utilized
Outline	irreg. oval	pentagonal	square	irreg. triang.
Material	quartzite	chert	chert	chert
Colour	lt. grey	2.5Y N6/	7.5Y N6/	----
Trans. sect.	asym. excurvate	plano-triang.	irregular	----
Long. sect.	asym. excurvate	asym. excur.	asym. concavo-convex	----
Prim. flak.	detached from core	detached from core	detached from core	----
Secondary flak.	one location	on 2 edges	on 2 edges	on 1 edge
Max. thickness	2.4	1.0	1.0	0.3
Width	4.6	2.7	2.7	1.6 x 1.4
Length	7.0	3.3	3.3	----
Weight	67	6	22	3

TABLE 34

SITE TEN EFFIGY OBJECT

Attribute	Description
Form	beaver or fish
Outline	oblong
Lithic type	sandstone
Colour	5Y 8/1
Primary flaking	----
Secondary flaking	----
Max. thickness	3.2 x 2.8 x 1.2
Width	3.5 x 3.3 x 3.3
Length	11.5
Weight	176

Site Eleven (DaKw-2)

The eleventh site is located across the Sprague River in a field directly to the southwest of Site Ten. It is in the NE¼ of the NE¼ of the NE¼ of section 20, Twp. 1, Rng. 14E., 96° 40' 05" W. and 49° 03' 35" N. Ecological conditions were identical to Site Ten. A detailed reconnaissance was made of the field, but no surface concentrations or culturally diagnostic artifacts were found. Three scrapers (Table 35, page 106), a core, several flakes, and several bone fragments (Table 36, page 106), were the only items recovered. This material tended to cluster along the river. Again, the sample is too small to permit a statement of occupational period, site form, or structure.

TABLE 35

SITE ELEVEN SCRAPERS

Attribute	Description, 129	Spec. no. (118) 129	129
Type	side	side	end
Outline	oblong-pointed	crescent	triang.
Material	chert	quartz	chert
Colour	10YR 8/1	"grey"	5Y 8/1
Primary flaking	----	det. from core	----
Secondary flaking	on 1 side	on 1 side	on 1 edge
Wear	----	none	----
Weathering	all surfaces	all surfaces	----
Transverse sect.	irregular	convexo-triang.	all surfaces
Longitudinal sect.	irregular	asym. con.-conv.	irregular
Length	4.3	3.5	2.0
Width, worked end	----	----	1.6
Width, unworked end	----	----	0.7
Width, mid-sect.	2.4	2.3	1.2
Max. thickness	1.2	0.9	1.2
Weight	12	10	3
Angle	37^{o}	38^{o}	67^{o}

TABLE 36

SITE ELEVEN OSTEOLOGICAL DATA

Spec. no.	Species	Description
(118) 227	Alces or Cervus	third molar
227	Odocoileus sp.	humerus, distal end and longbone, fragment
227	Alces or Cervus	tarsal
227	Odocoileus sp.	second phalanx

Site Twelve (DaKv-3)

This site is located in the NW¼ of the NE¼ of the NW of section 21, Twp. 1, Rng. 14E., 96° 39' 30" W. and 49° 03' 15" N. It is approximately half a section to the southeast of Sites Ten and Eleven in a field that has a small area of unbroken soil extending from the edge of the field to the bank of the Sprague River (Fig. 22, page 110). The terrain is level over most of the field and steeply sloping at the river's edge. The site is situated at the junction of three soil series: "Hadashville", "Sandilands", and "Seven Sisters" (Ehrlich and Smith soils map 1964). Present vegetation at the site is *Populus* sp., *Betula* sp., *Picea glauca*, *Salix* sp., and *Alnus* sp.

The cultural material was found in a recently ploughed field owned by a Mr. Bartinski. Extensive surface collecting suggested that the cultural material was distributed along the creek's edge. A broken projectile point base, four scrapers, a biface base, and chipping detritus were found (Fig. 23, page 111 ; Tables 37 and 38, pages 108 and 109). The previous land owner informed us he had found a large "spear point" (pink and grey banded-chert, 15 cms. in length, 5.5 cms. maximum width) which we later photographed in the Rosseau County Museum.

Two excavation units were dug in the undisturbed soil between the field and the river. A 1 x 5 metre and a 1 x 4 metre trench, the ends of which met at a 90° angle, were excavated to a depth of 50 to 55 cms. A number of waste flakes and small burned bone fragments was found scattered between 5 and 40 cms., but neither artifacts nor features were exposed.

On the basis of the surface collection and the excavation, one may speculate that Site Twelve is a habitation area. It is not possible to date this site from the work conducted thus far. The majority of the flakes and burned bone fragments were found below a depth which would be disturbed by agricultural activity. Accordingly, it should be possible to conduct extensive excavations in the future.

TABLE 37

SITE TWELVE BIFACIAL TOOLS

Attribute	Description, Spec. no. (118) 130	132
Type	projectile point base	knife
Blade shape	----	parallel ovate
Base shape	straight	straight
Condition	broken	broken
Wear	----	none
Polishing/grinding	on notches	none
Primary flaking	all surfaces	all surfaces
Secondary flaking	all edges	all edges
Transverse sect.	biconvex	plano-convex
Longitudinal sect.	asym. excurvate	asym. excurvate
Lithic type	chert	chert
Total length	1.4	4.0
Blade length	----	----
Blade width	2.1	3.2
Width inside notch	1.4	----
Tang width	1.9	----
Maximum thickness	0.5	0.9
Weight	2	13
Angle "a"	----	----
Angle "b"	$40/50^{\circ}$ $47/48^{\circ}$	----

TABLE 38

SITE TWELVE SCRAPERS

Attribute	Description, Spec. no. (118) 131	133	134	135
Type	core/side	end	end	core/side
Outline	curved	curved	square	square
Material	chert	chert	chert	chert(quartzite?)
Colour	2.5Y N5/	2.5Y N5/	7.5Y N3/	"white"
Primary flaking	det. from core	det. from core	det. from core	detached from core
Secondary flaking	on end & 1 side	on end	on 1 end	on 2 sides
Wear	----	on end	on end	on worked end
Weathering	all surfaces	all surfaces	all surfaces	all surfaces
Transverse sect.	convexo-triang.	plano-triang.	excurvate	irregular
Long. sect.	asym. biconvex	ovate	asym. con.-conv.	asym. ovate
Length	6.2	6.6	3.4	----
Width worked end	2.2	3.8	2.1	----
Width unworked end	4.1	1.7	1.8	----
Width midsect.	4.3	3.1	2.3	----
Max. thickness	1.7	1.1	0.9	4.3 x 2.4
Weight	43	29	8	21
Angle	50°	30°	70°	52°

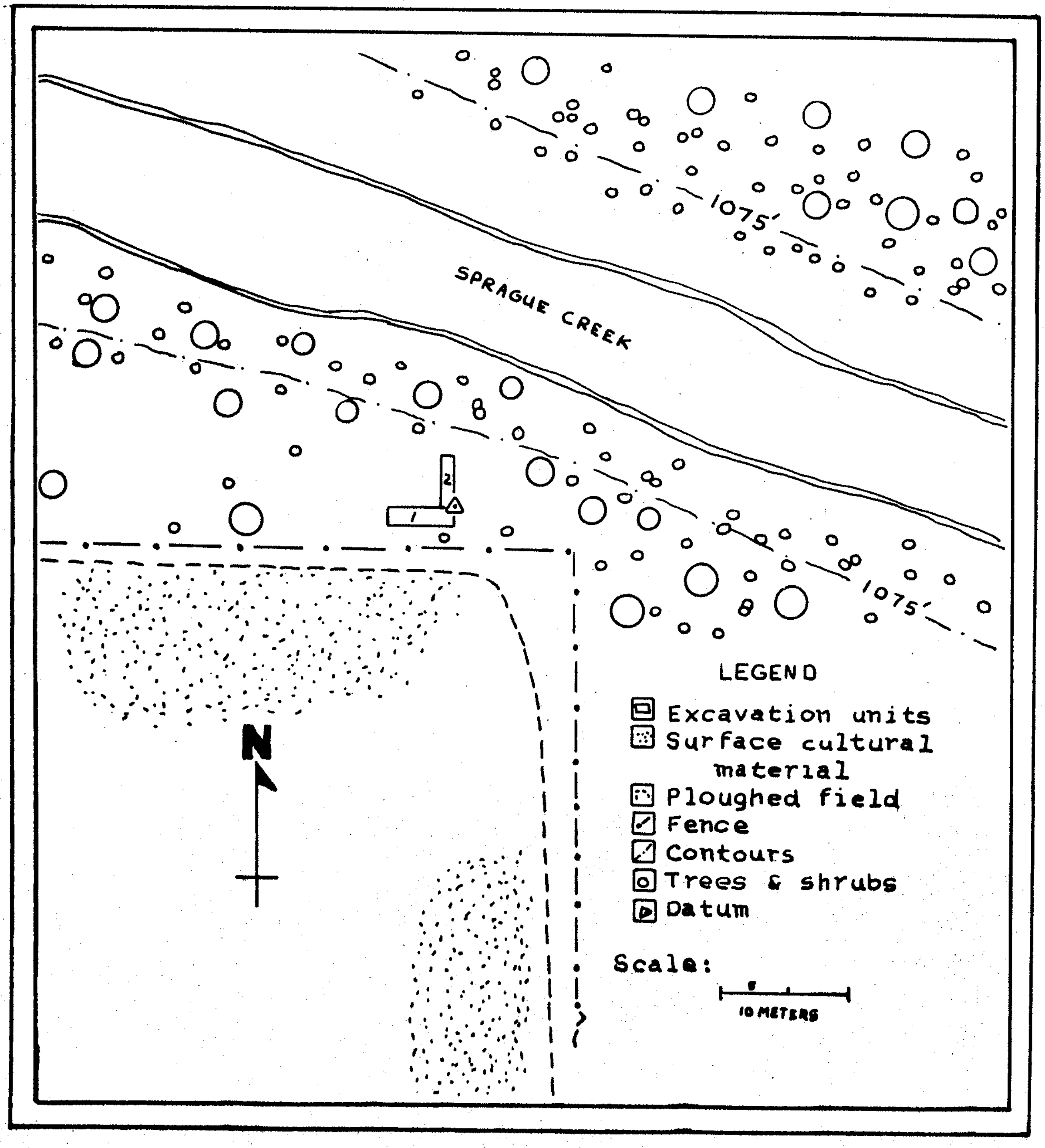


Fig. 22. Site Twelve

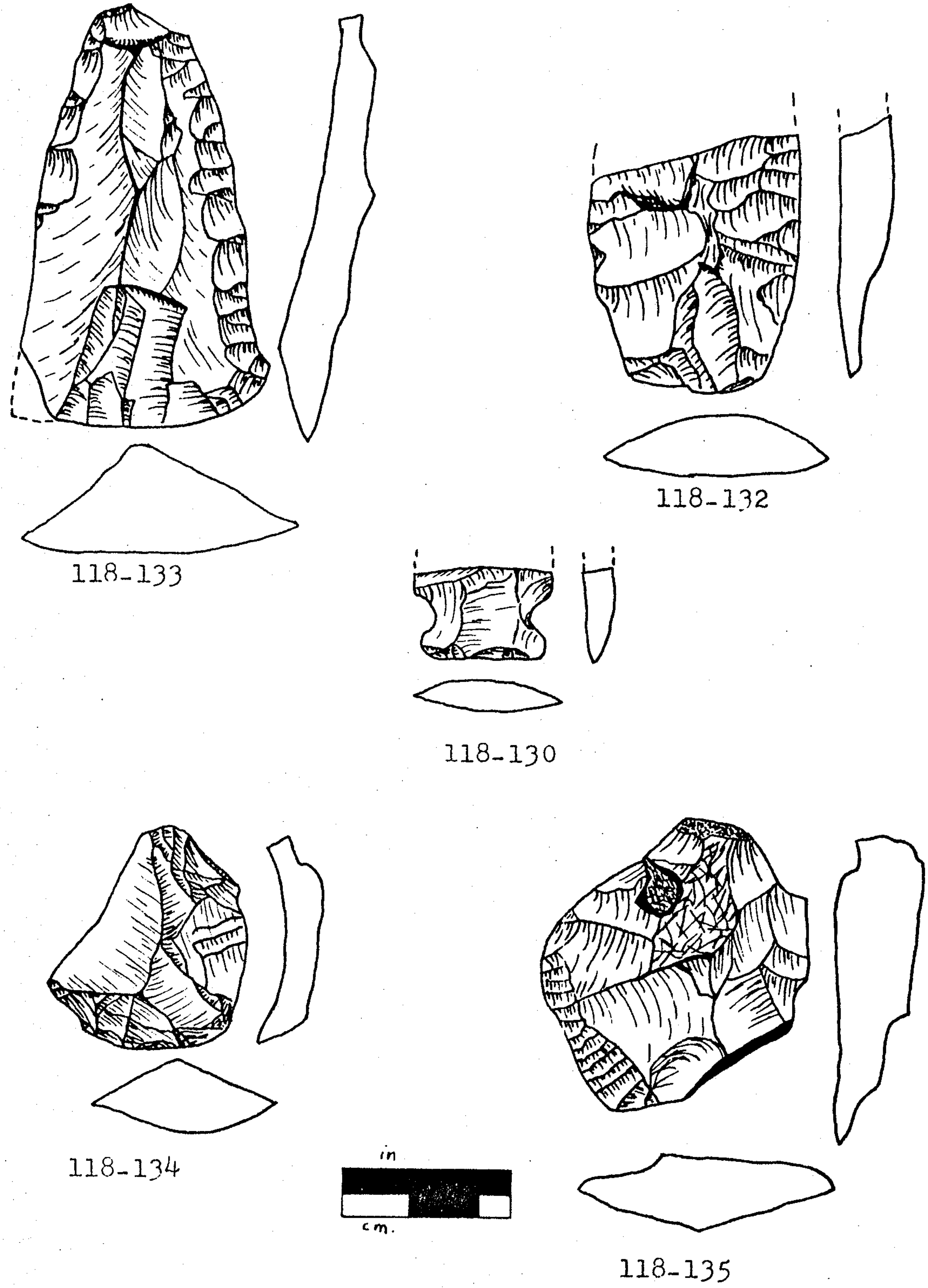


Fig. 23. Artifacts recovered from the surface of Site Twelve: end scraper (top, left), broken biface (top, right), projectile point base (centre), end-scraper (bottom, left), core/end scraper (bottom, right).

Site Thirteen (DaKw-3)

This site located in the NE¼ of the SW¼ of section 2, Twp. 1, Rng. 13 E., 96° 44' W. and 49° 00' 15" N. was found during transect surveying west from Sprague. It is near the Minnesota border, one mile east and two miles south of South Junction, and is accessible by gravel road south from Provincial Highway 12.

The site is located on a low rounded ridge which runs northeast-southwest; the area to the north, east, and west is spruce-tamarack swamp. It occurs on high ground at the junction of "Woodridge" and "Wintergreen" soil. The latter is a gleyed drey wooded soil over a base of weakly calcareous, fine to medium grained sand deposits. Natural vegetation comprises *Pinus banksiana*, *Populus balsamifera*, and *Populus tremuloides* (Ehrlich and Smith soils map 1964). The present vegetation is the result of land clearing, cultivation, and replanting, and is composed of *Picea glauca*, *Pinus resinosa*, *Pinus sylvestris*, *Populus* sp., and *Salix* sp. (Fig. 24, page 114).

The land owner stated that projectile points had been found when the land was originally broken. However, a detailed surface reconnaissance of all the fields and a newly excavated drainage ditch was unsuccessful. Several bones were recovered (Table 38, page 109), as were four unworked flakes. No culturally diagnostic artifacts were found.

Because of the extensive agricultural activity and the extremely scattered surface distribution of the cultural material, no excavation was undertaken. Surfaces of several other fields in the vicinity were also inspected, but no additional sites were found. No suggestion as to site form or structire, length or period of occupation can be made.

TABLE 39

SITE THIRTEEN OSTEOLOGICAL DATA

Spec. no.	Species	Description
(118) 138	*Ursus americanus*	molars and premolars
138	*Odocoileus* sp.	distal portion of humerus unidentified fragment
138	*Aves* (species?)	femur, from very large species
144	----	phalanx
144	----	tibia
144	*Cervus canadensis*	pelvis, segment
144	*Bos* or *Bison*	mandible, segment
144	*Lepus americanus*	vertebrae, one broken segment
144	*Bison bison*	head proximal end of humerus
144	*Canis* sp.	premolar
144	*Odocoileus* sp.	humerus, mid-section

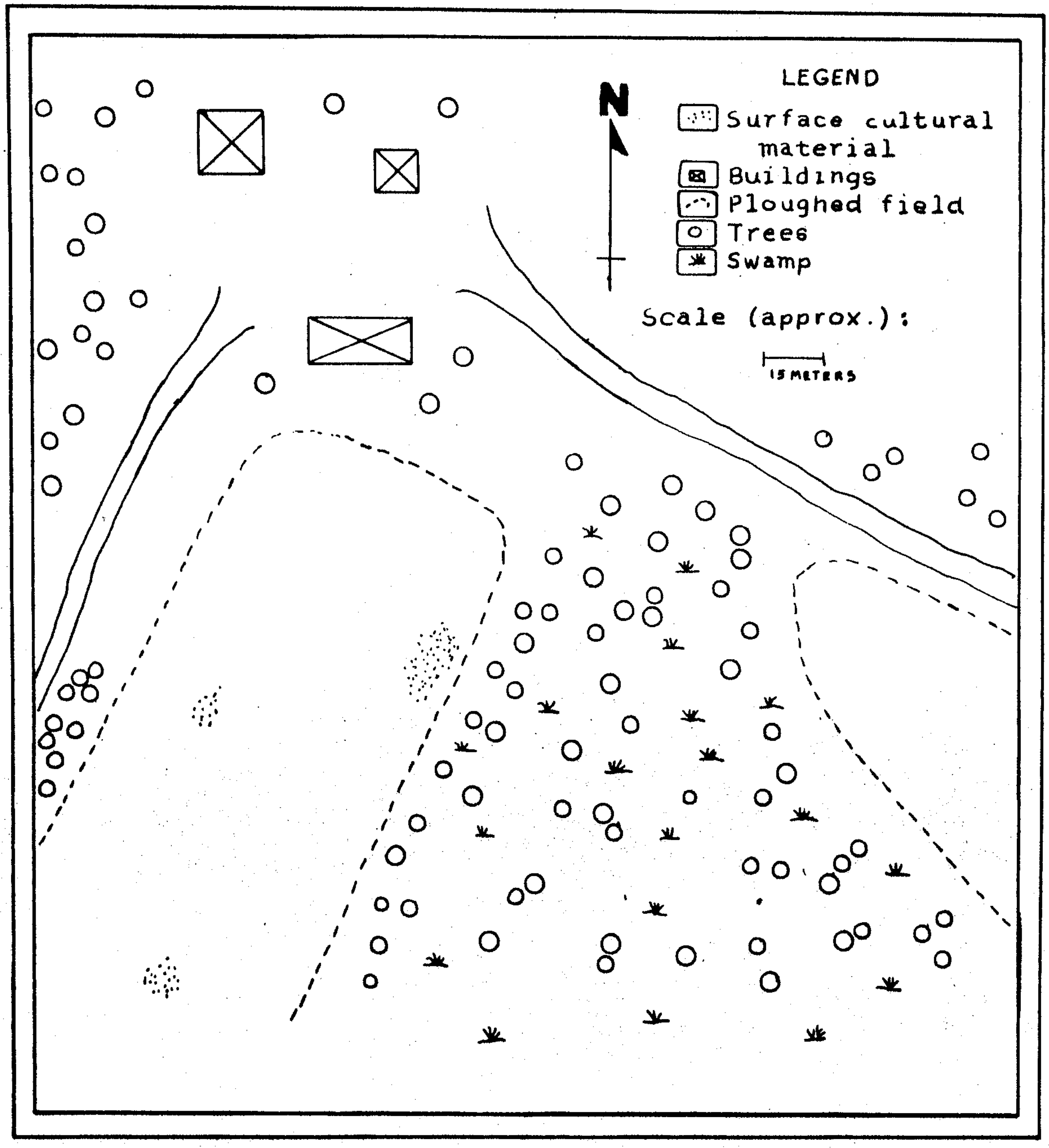


Fig. 24. Site Thirteen

Site Fourteen (DaKv-4)

This site, located in the NW¼ of the NW¼ of section 15, Twp. 1, Rng. 14E., 96° 38' 30" W. and 49° 02' 40" N. was also found during the Sprague River transect. It is situated on the east bank of the Sprague River not far from the R.C.M.P. detachment office and Route 308 on property owned by a Mr. Holgram. The terrain slopes gently downward from east to west towards the river. The soil belongs to the clay substrate phase of the "Elma" series, a gleyed dark grey wooded soil over a parent material of six to thirty inches of moderately calcareous, moderately fine textured clay. Vegetation growing in undisturbed conditions is *Populus balsamifera*, *Populus tremuloides*, *Ulmus* sp., *Fraxinus* sp., and *Acer* sp. (Ehrlich and Smith soils map 1964). At the present time, the entire site is under heavy cultivation.

Cultural material was found distributed over the field, concentrated directly north of the R.C.M.P. office and east of Holgram's house (Fig. 25, page 116). A high proportion of scrapers (Table 41, page 119; Fig. 26, page 117), in comparison with other artifacts, (Tables 42, 43 page 120) was recovered. One of the scrapers was made from brown chalcedony; all other lithic material was of local origin. Two partial projectile points (Table 40, page 118; Fig. 26,117) were found, neither of which could be matched with material described in the literature. Bone material was not well represented at this site. Several small unidentified fragments and one segment of a butchered *Bison bison* long-bone (metacarpal, distal end) were found.

Because of the disturbed nature of the site, no test excavation was done and none is recommended. It is suggested that future surface collecting be done to gather a larger artifact sample size. Site activity and date of occupation cannot be suggested at this time.

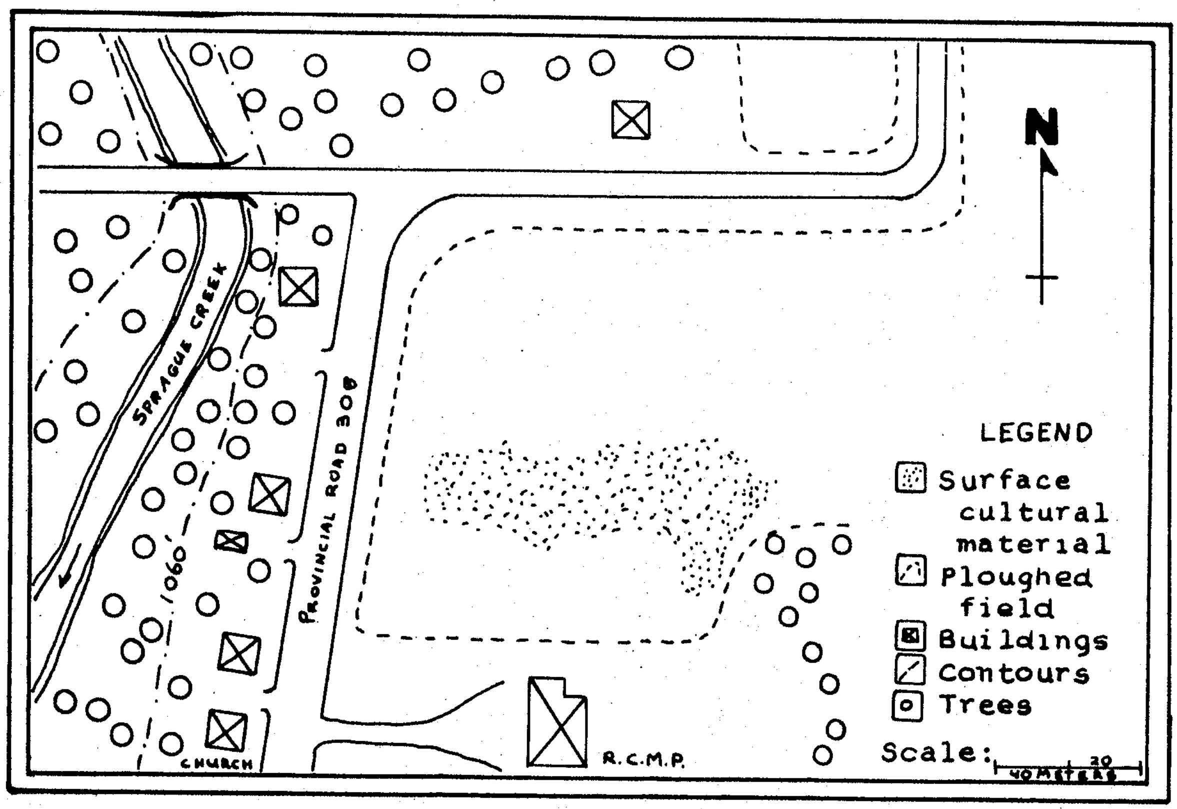


Fig. 25. Site Twelve

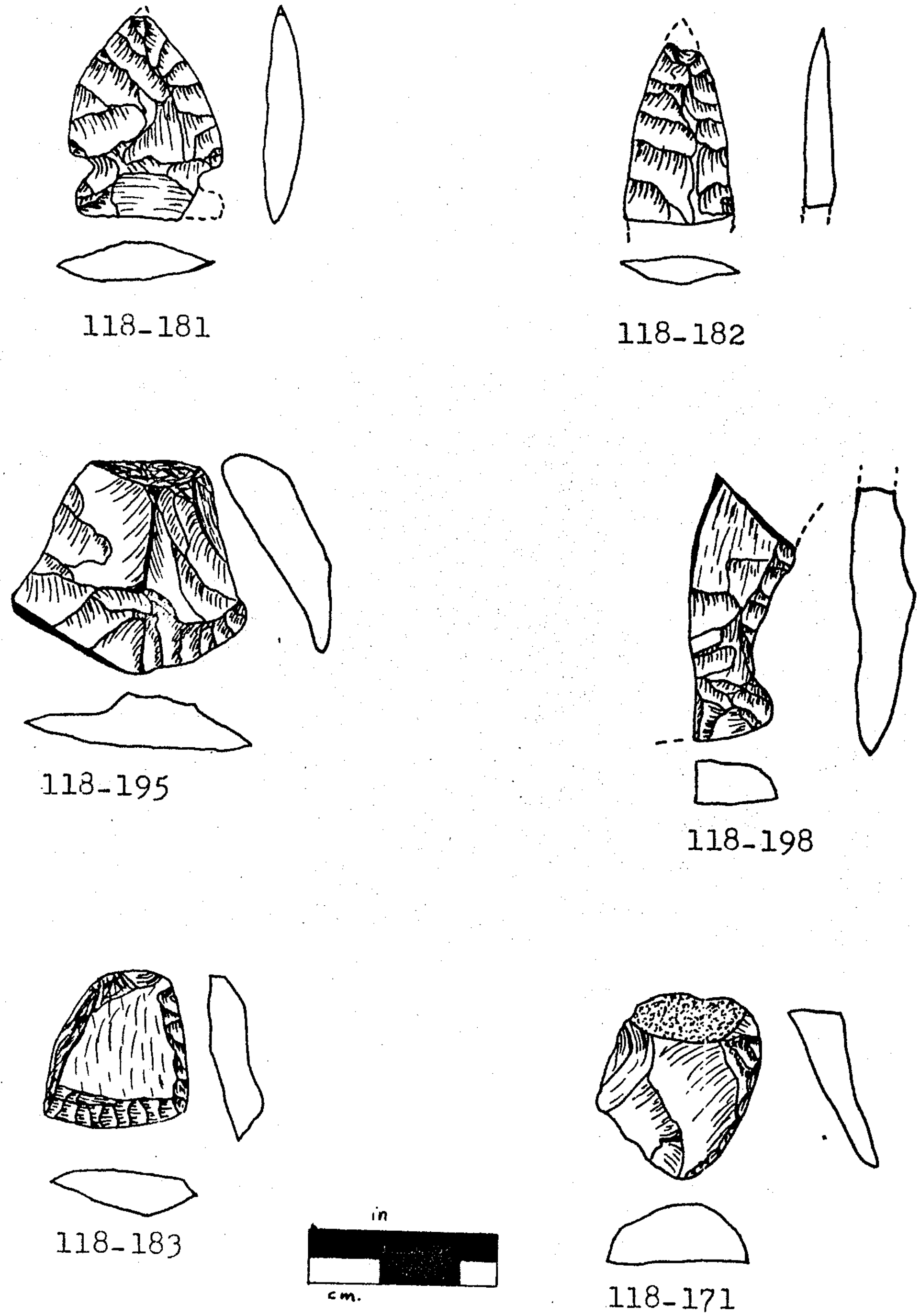


Fig. 26. Artifacts recovered from the surface of Site Fourteen: projectile point (top, left), broken projectile point (top, right) reused at the tip, end-scraper (centre, left), broken projectile point (centre, right), end-scraper (bottom, left), and a side-scraper (bottom, right).

TABLE 40

SITE FOURTEEN PROJECTILE POINTS

Attribute	Description, Spec. no. (118) 181	182	195
Blade shape	excurvate	long triang.	----
Base shape	straight	----	straight
Condition	broken	broken (no base)	broken in ½
Wear	----	on tip	dorsal surface
Polishing/grinding	on 1 notch	----	dorsal surface
Colour	2.5Y N/4	5Y 8/1	5Y 5/2, 7.5Y N/3
Primary flaking	all surfaces	all surfaces	all surfaces
Secondary flaking	edges	edges	edge
Transverse sect.	biconvex	biconvex	plano-convex
Longitudinal sect.	asym. biconvex	ovate	plano-convex
Lithic type	chert	chert	chert
Total length	2.6	2.4	3.5
Blade length	1.8	----	----
Blade width	2.0	1.5	1.3
Width inside notch	1.6	----	----
Tang width	1.5	----	----
Maximum thickness	0.5	0.4	0.7
Weight	3	2	4
Angle "a"	42/25^{o}	22/20^{o}	----
Angle "b"	-----	----	----

TABLE 41
SITE FOURTEEN SCRAPERS

Attribute	Description, Spec. no. (118)										
	158	164	165	170	171	183	189	195	196	197	202
Type	core	end	side	side	side	end	core	end	side	side/end	end
Outline	triangular	triang.	circular	oblong	irreg. triang.	irreg. triang.	square	pentagonal	irreg. circular	irreg. square	irreg. square
Material	chert	chert	limest.-chert	chert	chert	chalcedony	limes.-chert	chert	chert	chert	chert
Colour	5Y 8/1	7.5Y N2.5/	5Y 8/1	10YR 8/1	5Y 8/1	5YR 3.2	10YR 8/1	2.5 N7, 2.5Y N8	10YR 8/1	10YR 7/1	10YR 8/2
Primary flaking	on 1 area	all surf.	on 1 area	all surf.	----	det. from core	det. from core	det. from core	----	on edges	all surfaces
Secondary flaking	dorsal side	on 1 edge	on 1 edge	on 2 edges	on 1 side	1 edge & side	on 1 end	on 1 end	on 1 edge	on 1 edge	on 1 edge
Wear	on worked edge	on worded edge	----	----	----	working edge	----	on worked end	----	----	----
Weathering	all surfaces	all surfaces	all surf.	all surf.	all surf.	all surf.	all sur.	all surfaces	all surf.	all surfaces	all surfaces
Transverse section	irreg. conc.-tri.	irreg. conc.-tri.	irreg.	irreg. plano-conv.	irreg. plano-conv.	asym. biconvex	irreg. pl.-conv.	excurvate	irregular	irregular	irregular
Long. section	irregular	irreg. ovate	irreg.	irregular	asym. conc.-conv.	asym. biconvex	asym. ovate	asym. excurvate	irregular	irregular	irregular
Length	----	----	3.1	2.3	2.6	2.1	3.8	2.8	2.5	2.2	2.1
Width worked end	----	----	----	----	----	2.0	3.4	3.3	1.9	----	0.7
Width unworked end	----	----	----	----	----	1.0	2.5	1.8	1.0	----	1.1
Width mid-sect.	3.7 x 4.5	2.6 x 2.8	2.2	1.5	1.9	1.6	3.0	2.5	0.6	1.6	1.5
Maximum thickness	2.0	1.6	0.9	1.7	0.8	0.7	0.9	0.9	0.7	0.5	0.8
Weight	27	8	9	3	4	3	13	8	3	2	3
Angle	73°	63°	71°	38°	73°	62°	54°	60°	85°	63°	84°

TABLE 42

SITE FOURTEEN UTILIZED FLAKE

Attribute	Description
Outline	triangular
Lithic type	chert
Colour	5Y 8/1
Primary flaking	lt. on dorsal surface
Secondary flaking	on one edge
Longitudinal sect.	irregular
Transverse sect.	irregular
Max. thickness	1.8
Width	4.6 x 2.7
Length	4.7
Weight	31

TABLE 43

SITE FOURTEEN CHOPPERS

Attribute	Description, Spec. no. (118) 155	192
Outline	roughly oblong	irregularly triangular
Lithic type	quartz	chert
Colour	white	5Y 6/1
Primary flaking	on one side	detached from core
Secondary flaking	lt., on 1 edge	on two edges
Max. thickness	1.8	2.2
Width	3.0 x 2.3	4.1 x 1.9
Length	5.7	4.2
Weight	38	33

TABLE 44

SITE FOURTEEN OSTEOLOGICAL DATA

Spec. no.	Species	Description
(118) 180	Alces alces	tarsal
194	Odocoileus sp.	femur, distal end

Site Fifteen (DbKt-1)

This site is located in the SE¼ of the SE¼ of the SW¼ of section 11, Twp. 3, Rng. 16E., 96° 19' 30" W. and 49° 12' 00" N., and is the only one not found while transect surveying, or through informants. It is located outside the research area, adjacent to the provincial campground and swimming beach, on the southern shore of Moose Lake. The material was found to extend eastward from the swings and picnic shelter, and on the more southerly of two small ridges (probably ice ridges caused by ice pushed over the shoreline during spring thaws). It is accessible via Route 308 north from Sprague. The soil, classified as "Woodridge", has developed on a Lake Agassiz beach (probably on the MaCauleyville series) that surrounds the lake on all sides except the eastern side. The terrain declines gradually southward and away from the site toward a spruce-tamarack swamp. Present vegetation on the site is Pinus banksiana, Picea glauca, Thuja occidentalis, Betula sp., and Graminae (Ehrlich and Smith soils map 1964).

Surface materials (a flake and a moose mandible) were originally found under water several feet out from the shore. Extensive surface collection on the beach resulted in the recovery of a side-scraper, graver, two utilized flakes (Table 45,46, page 125; Fig. 28, page 124) chipping detritus, and several additional bone fragments. The lithic material was largely quartz and a lesser proportion of chert. All lithic material was locally derived. The cultural material was concentrated near the picnic shelter at the swimming beach, but was also found scattered on the same ridge farther to the east. It was found in areas where the topsoil had been worn away in footpaths, which suggests that the deposit is shallow (Fig. 27, page 122).

The site was not excavated because it was frequented by tourists and located on land used for recreation during several months of the year. The form, structure, and date of occupation could not be determined in 1972. It is recommended that this site be excavated because of the density of surface material, and also because it is in a micro-environment (lake-shore, lowland) which stands in marked contrast to most of the Sandilands area. If future excavation is carried out, an extensive surface area could be exposed because of the shallowness of the deposit.

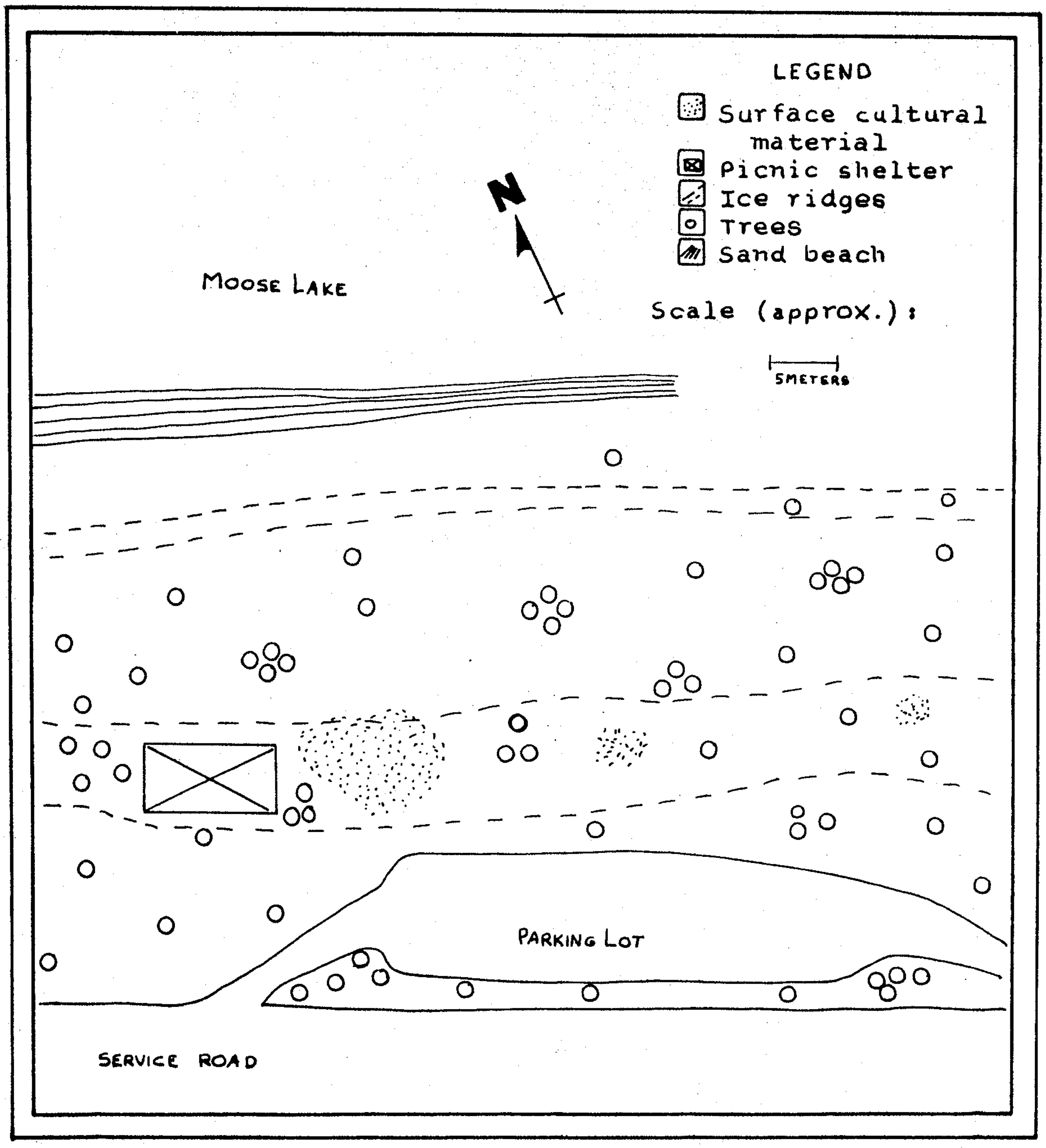


Fig. 27. Site Fifteen

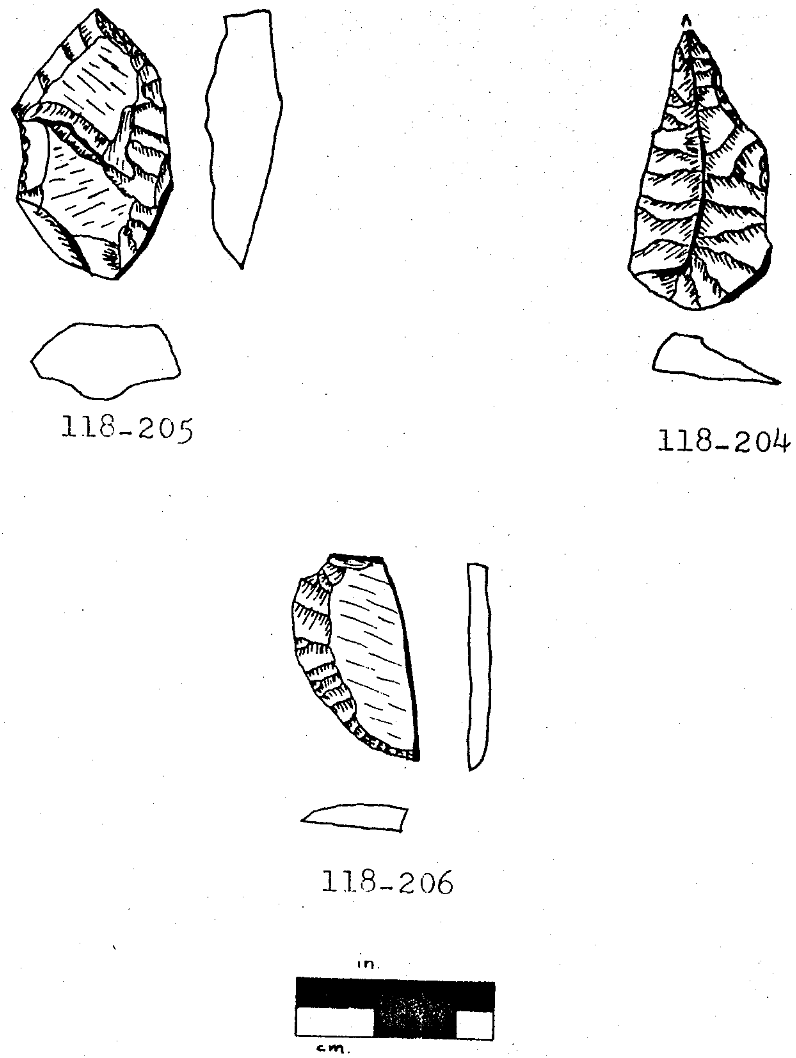


Fig. 28. Artifacts found on the surface of Site Fifteen: utilised flake (top, left), graver (top, right), and a side-scraper (bottom).

TABLE 45

SITE FIFTEEN FLAKES

Attribute	Description, Spec. no. (118) 208	209	204
Type	utilized fl.	utilized fl.	graver
Outline	triangular	square	triangular
Material	chert	chert	quartz
Colour	2.5Y 7/2	2.5Y 7/2	translus,
Transverse section	irregular	irregular	----
Longitudinal sect.	irregular	asym. conc.-conv.	----
Primary flaking	on 1 side	det. from core	det. from core
Secondary flaking	dorsal, on tip	on 2 sides	on edge
Maximum thickness	1.3	0.3	0.7
Width	1.6 x 0.5	1.0 x 0.3	0.3 x 1.7 c 1.5
Length	1.6	1.6	3.5
Weight	3	1	4

TABLE 46

SITE FIFTEEN SCRAPER

Attribute	Description (118) 206
Type	side
Outline	half-circular
Material	chert
Colour	2.5Y N3/
Primary flaking	detached from core
Secondary flaking	total edge
Wear	on one edge
Weathering	lt. - all surfaces
Transverse sect.	biplano
Longitudinal sect.	biplano
Width worked end	----
Width unworded end	----
Maximum thickness	0.3
Weight	2
Angle	35^{o}

CHAPTER FOUR

Correlation and Summary

Previous sections have dealt with a description of the research universe, the field techniques, ecological factors in resource availability and vegetative development, and a description of the sites. This portion will discuss ethnographic patterns evident in resource exploitation activities, their implications for the Sandilands area, and the relationship to the distribution of archaeological sites.

Ethnographic comparisons

Several studies are available which emphasize factors that must be taken into account in an analysis of resource exploitation and site distribution. Flannery (1971: 351-353) has noted that seasonality is a factor imposed upon populations by the nature of the resources; scheduling is a cultural activity which involves procurement of these resources. In other words, each resource item, or cluster of items, has specific restrictions on its availability throughout a yearly period. Scheduling involves the exploitation of a particular resource in a particular season, or the making of a decision in the exploitation of several resources available simultaneously. Concomitant with these concepts is the geographical availability of the resources; i.e., they may be secured from a restricted area, or they may be available for exploitation over a wide area.

Shay (1971: 72-73) noted that the variety and abundance of food resources available reflects the potential of a particular region. Resources exploited at or near a prehistoric site may be related to a site's location and length of occupation. Furthermore, the quantity of potential resources that could be exploited from a particular area may limit the population size and the length of occupancy of a site.

Although his research has been conducted in a region quite different from the Sandilands, Thomas' (1973:155-176) empirical test for Steward's model of Great Basin settlement patterns provides an elaboration of Flannery's (1971) and Shay's (1971) postulates. Steward's (1938) theory suggests that the environment places certain limitations on resource exploitation, in addition to population density, group size, mobility, and distribution. Great Basin populations had a "multiple subsistence pattern" (Thomas 1973: 157), one which was adapted to exploitation of seasonally available plant foods, supplemented by hunting. Thomas' (1973) research demonstrated a high probability that Steward's (1938) theory of subsistence-settlement systems existed in prehistoric times. In summary, the ecological characteristics of the area placed certain limitations on the number and amount of available resource species or items, their spatial distribution, and seasonal availability. The prehistoric groups made specific choices and followed certain recognizable patterns in exploiting these resources. They chose specific types (or species) of resources, adjusted their daily and seasonal activities in order to best exploit the resources, and depended on a variety of species and items.

A number of publications are available which discuss the resource exploitation patterns of Boreal Forest groups. The publications discussed in the following pages were chosen because they were written about groups living in environments which more closely resemble the Sandilands (in comparison with, for example, the Plains), and because data are more easily acquired for these groups than for groups in areas close to southeastern

Manitoba, such as northern Minnesota and southwestern Ontario.

Rogers' (1963:32-45; 1967) study of the Mistassini Cree analyzed both the amount and variety of food resources, in addition to the yearly cycle, food exploitation, and movement. He noted that although nearly all animal species were recognized as food sources, not all were exploited. Also, their exploitation varied substantially throughout a yearly period. Hunting of large mammals was formally (in early historic times) a major occupation throughout the year, but was most intense during fall and winter. Caribou, moose, bear, and beaver were the most important. Small game mammals were exploited for both food and furs. Hare was taken throughout the year, but most other small mammals were taken during the winter. All available species of birds were considered edible, but only the larger species were eaten. Fishing was an important activity throughout the year, but it was of lesser importance compared with big game hunting, and was carried out mainly in the spring and fall when hunting was not productive. Gathering of plant foods was not an important activity.

Rogers (1967) recorded a relatively high incidence of fish consumption among the Attawapiskat Cree, compared to the Mistassini. Birds, big and small game were listed in decending order of importance.

A precise seasonal cycle was not given for the Attawapiskat Cree (Rogers 1967). The Mistassini Cree (Rogers 1936) moved to trapping territories in early fall during which time large mammals were hunted, fishing was done, and migratory waterfowl were also taken. In late fall, permanent winter camps were established and trapping was the primary activity. In mid-winter, small groups dispersed from the winter camps to hunt small game and to trap. In early spring, these small groups returned to the camps to hunt migratory waterfowl and small game, and to fish. During the summer another camp was established, usually on or near a large lake.

The subsistence patterns of the Round Lake Ojibwa (Rogers 1962, 1967) and Eastern Subarctic Indians in general (Rogers 1969) have been published in some detail. The former group considered big game animals of primary importance, fish of secondary importance, and small game and birds the least important. Approximately 53 percent of all mammals available in the Eastern Subarctic were taken for food (Rogers 1967: 73). During the summer this group was gathered on a large lake, and fishing was especially important during that season. In the fall, movements were made to winter camps. Fishing declined in importance, but migratory waterfowl were taken and hunting activities increased. During early winter, trapping was practised to a large extent as small groups moved from the winter camps into hunting territories. During mid-winter most food was secured by hunting, although in late winter fishing was also done. In early spring the small hunting groups returned to the winter camps for their hunting territories. This season was a period of trapping, and hunting also increased. In late spring the Round Lake Ojibwa again gathered near a large lake for intensive fishing activities (Rogers 1962). A number of factors is also noted to account for fluctuations in game populations: (1) over-trapping and over-hunting, (2) epizootic factors, (3) forest fires, and (4) climatic fluctuations which could influence game habitats (Rogers 1967: 77). Accordingly, fluctuations which occurred in the number or species of animals <u>taken</u> may be said to be due also to the aforementioned factors, and to food preferences.

Rogers (1969:28) summarized the seasonal movements of Eastern Subarctic populations by noting that in order to subsist in this region, the groups were dispersed for most of the year and gathered only during the summer. In a study of the Berens River Ojibwa, Hallowell (1949:45) concluded that the primary factor in determining the size of a hunting territory is the abundance of game available in a given area.

The only native group known to have resided for brief periods in the Sandilands area was the Pembina band of the Ojibwa (Hickerson 1956). Beginning about 1790, this group migrated into the Sandilands in small groups from permanent summer villages in the Leech and Red Lake vicinities to the south. They followed the Rat, Rosseau, and Sprague Rivers to hunt, fish, and trap during the late fall, winter, and spring.

A summary of the ethnographic evidence given thus far can provide the basis for a hypothesis, suggesting that certain patterns in resource exploitation can be noted. These site patterns, in turn, may aid in explaining prehistoric site distribution in the Sandilands. It can be hypothesized that aboriginal groups in Eastern Sub Arctic North America congregated only during the summer months. The remainder of the year was spent in much smaller hunting-fishing parties of varying size. A great variety of animal species and plant foods was recognized as possible food sources, although plant foods were of less importance than animals. Select species, or groups, were considered of more value as food sources than were others. Presumably, this varied geographically, seasonally, and through time. Because of the wide range of habitats or places where specific food sources could be exploited, groups practised a patternd seasonal movement in order to best exploit these resources. During certain times of the year, and also over a period of a number of years, if a specific resource was unavailable (or available in small amounts), other major resource categories were exploited. Whenever a specific food item was desired, the group had several decisions to make, or environmental factors to consider. The group had to take into account (1) which species were "preferred" food items, (2) the availability of the particular food seasonally, and (3) its distribution spatially or geographically. If several food sources were available simultaneously, the decision-making process may have involved what has been termed "maximization-minimization" (Flannery 1971: 351-353, Plog and Hill 1971: 11-12). This suggests that resources were selected (and sites were located from which the resources were exploited) which would maximize the group's benefits and minimize the effort expended. In short, the group exploited food resources which would be of the greatest benefit in those places where the resources were most available.

Sandilands resource distribution summary

Ten major resource categories were isolated for study. Their geographical and seasonal availability are summarized in the following paragraphs.

Nine species of large game animals are known to have ranges which include Sandilands habitats. Of these, six species were known to have been exploited as major food items by Eastern Subarctic populations in prehistoric or early historic periods. All five species could have been found in the Sandilands; they are Ursus americanus, Odocoileus sp., Alces alces, Cervus canadensis, Rangifer, sp., and Bison bison. It should be noted that whereas Alces sp. and Rangifer sp. prefer habitats similar to the Plateau and Lowlands, the other species are noted for their wide range of movements throughout a number of microenvironments (the reader is refered to Peterson 1966: 322-330). The presence of Odocoileus sp. prehistorically in the Sandilands has been disputed; Ranson (1967) has suggested that Odocoileus virginianus is a recent migrant into the area. However, Hickerson (1956: 276) noted that the early journals of explorers in the Red River and Eastern Manitoba regions reported Odocoileus sp.

(an unidentified species) to be present. Therefore, its prehistoric presence cannot be ruled out.

Nineteen species of small game are known to have habitats which include the Sandilands (Table 2, page 27), Not all species were preferred by Eastern Subarctic groups either as food sources or as fur-bearing animals. Nine of these species are known to have been exploited in prehistoric or early historic times. There is a tendency for them to be restricted more to the Plateau and Lowlands (the reader is referred to Rogers 1962, Peterson 1966). Most of the mammal species are available throughout the entire year. As noted previously, large mammals were hunted all year, although most heavily during the fall, winter, and spring. Small mammals were generally taken in the late fall, winter, and early spring. Table 47, page 133 presents a summary of recovered surface osteological remains according to microenvironment. They were found on a random basis in the course of surface collecting near archaeological sites or while looking for sites, and may perhaps represent a span of up to one hundred years (based on the conditions under which the specimens were found).

Eleven species of fish (Table 4, page 29) are adapted to aquatic habits of the Sandilands. Fish are available seasonally throughout most of the year, except during fall freeze-up and spring thaw. However, they are easiest to secure during late spring, summer, and fall. Shay (1971:10) notes that fish were taken by the Ojibwa during early historic times through the ice in northern Minnesota in mid-winter. Geographically, fish may be found in the Sandilands in very restricted areas: Whitemouth Lake, Moose Lake, and the major streams. This restricts their spatial availability to only the Plateau and Lowlands.

TABLE 47

DISTRIBUTIONAL SUMMARY OF OSTEOLOGICAL MATERIAL

Species	Location	Microenvironment
Odocoileus sp. Aves *Equus*	NE¼-4-59E	Dry Upland
Odocoileus sp. *Taxadea taxus*	26-5-10E 36-5-9E	
Odocoileus sp. *Cervus canadensis* *Alces* or *Cervus* *Alces alces*	NW¼-4-5-9E	Dry-mesic Plateau
Odocoileus sp. *Odocoileus* sp.	NW¼-9-5-9E SE¼-4-4-9E	
Lepus americanus	SW¼-5-4-9E	
Odocoileus sp. *Alces alces*	NE¼-20-1-14E	
Equus	10-4-13E	
Alces or *Cervus*	SW¼-3-5-9E	
Alces alces *Alces* or *Cervus*	NE¼-32-1-14E	Moist-mesic Lowlands
Bison bison *Cervus canadensis*	SW¼-3-1-14E	
Aves *Cervus canadensis* *Bos* or *Equus* *Bison bison* *Lepus americanus* *Odocoileus* sp. *Canis* sp. *Ursus americanus*	SW¼-2-1-13E	
Alces alces *Odocoileus* sp. *Bison bison*	NW¼-15-1-14E	
Alces alces	SW¼-11-3-16E	
Canis latrans *Alces alces* *Canis* sp.	NW¼-35-5-8E	Dry Lowlands

Forty-five species of birds have been recognized and named by the Ojibwa (Rogers 1962:A18). Of these, only the larger species of migratory waterfowl and economic terrestrial birds were exploited for food. No specific spatial distribution can be noted for terrestrial birds, and they may be taken throughout the year. However, migratory waterfowl are available largely in the spring and fall, and to a lesser extent during the summer. They can be found only in the Plateau and Lowlands.

The spatial distribution of trees in the Sandilands, according to those known to have been used for construction, fuel, or utilitarian purposes, is also restricted. They are found largely in the Upland and Plateau. It should be remembered that the Lowlands is predominately bog that contains trees such as spruce and tamarack that were not used to any large extent.

A summary of shrub and herb resources available in the Sandilands (the reader is referred to pages 32 and 33 of Chapter Two) lists forty eight species. Of these, four of the terrestrial species are found only in one microenvironment, being restricted to dry Pinus banksiana-dominated areas. The remainder may be gathered from areas noted for a mixed vegetation developed on moist or semi-moist soils. Thus their availability is restricted largely to the dry-mesic Upland, the Plateau, and the moist-mesic Lowlands. Seasonally, the plant species may be exploited from spring to late fall.

The distribution of lithic raw material may be explained best in terms of glacial and Lake Agassiz history. Glacial advance brought material from the northwest and northeast. Subsequent deposition of sand from Lake Agassiz beach activity resulted in the exposure of gravels containing lithic raw material in the Plateau and Lowlands, and the deposition of sand over gravel deposits in the Upland. Therefore, lithic raw material is most available in the Plateau and on the raised beach areas of the Lowlands. It is also available to a lesser degree along stream channels. Several sites (sites One, Four, Five, Seven and Fourteen) contain "exotic" lithic material. With the exception of sites One, Four, and Seven, those containing lithic material of both local and non-local origins exhibit a dominance of stone of local origin. All other sites contained stone of local origin.

Fresh water may be found in shallow depressions in the Upland after spring thaw (from approximately mid-April to early June) and in winter in the form of melted snow. However, throughout most of the year fresh water is available to the greatest degree in the Plateau and Lowlands.

An analysis of each resource category has shown that although most are available throughout the research area, they tend to be available to the greatest extent in the Plateau and Lowlands. Ethnographic data suggests that large game, small game and fish may have been the primary sources of food in late prehistoric and early historic times. A comparison with the Sandilands reveals that these may best be exploited in the Plateau and Lowlands. Precise information on exploitation of terrestrial birds, migratory waterfowl, trees, shrubs and herbs, aquatic plants, and lithic raw material is not available for Eastern Subarctic groups. There is a notable tendency for groups to camp on, or in some way to make use of, bodies of fresh water. Another factor which research in the Sandilands has not been able to discern is the changes in resource availability which have occurred throughout time. In summary, the analysis of resource availability demonstrates that the Plateau and Lowlands has greater environmental potential in comparison to the Upland. Accordingly, if it can be demonstrated that site distribution also correlates with envoronmental potential of specific areas, then the hypothesis that "the number of sites in a specific Sandilands microenvironment is a product of the environmental potential of that area, influenced by the visibility factor, the total area involved, and the percentage surveyed" (page 17, Chapter One) is valid, and may be adopted for future testing.

Site distribution and sampling problems

Fourteen archaeological sites and one paleontological site were found during the 1972 survey. Of this total, thirteen archaeological sites were recorded in the research area, and all but one site was discovered as a direct result of transect surveying (the exception was Site Nine). Table 48 summarizes the archaeological site distribution according to microenvironment within the research area. For the moment those sites outside the research area will be excluded from discussion.

The research has demonstrated that the greatest site density within the designated research area may be found in the Plateau and Lowlands and is 6 to 7 times greater than the density within the Upland area. The areas were subdivided into six microenvironments (or habitats). Three of the six microenvironments were found to yield all of the sites. They are the Dry Upland, the Mesic Plateau, and the Mesic-Moist Lowland. The two sites found outside the designated research area also correspond to this site distribution. Site Five was found in an ecological situation similar to the Dry Upland and Site Fifteen was found in a setting similar to the Mesic-Moist Lowlands.

When one views the resource distribution and the site density alone, the hypothesis seems to be valid. However, the problem of sampling error must also be considered, as the case in all archaeological research.

TABLE 48

SUMMARY OF SITE DISTRIBUTION

Percentage of total Research Area surveyed: 9%

Bedford Hills (Uplands)	
Total area	(approximately) 265 square miles
Site yield	One site
Total surveyed area	40 square miles
Percentage of total surveyed area within Uplands	3.7%
Site density according to surveyed area	.03 per square mile
Dry Upland	
Total surveyed area	33.50 square miles
Site yield	1 site
Mesic Upland	
Total surveyed area	6.25 square miles
Site yield	no sites
Whitemouth Lake Plateau (Plateau)	
Total area	(approximately) 335 square miles
Site Yield	Seven sites
Total surveyed area	37 square miles
Percentage of total surveyed area within Plateau	3.4%
Site density according to surveyed area	.19 per square mile
Mesic Plateau	
Total surveyed area.	20.25 square miles
Site yield	7 sites
Mesic-Moist Plateau	
Total surveyed area	16.50 square miles
Site yield	no sites
River Lowlands (Lowlands)	
Total area	(approximately) 480 square miles
Site yield	Four sites
Total surveyed area .	19 square miles
Percentage of total surveyed area within Lowlands	1.8%
Site density according to surveyed area	.21 per square mile
Mesic-moist Lowlands	
Total surveyed area .	13,50 square miles
Site yield	4 sites
Moist Lowlands	
Total surveyed area .	5.50 square miles
Site Yield	no sites

The Plateau and Lowlands combined cover more square miles than does the Upland. This fact alone <u>may</u> lead one to believe that the low site numbers in the Upland is due to the fact that the Upland covers a relatively smaller area. However, the Upland was surveyed more thoroughly than either of the two other areas. Therefore, the low site density of this area must be explained by some other factor.

The hypothesis stated that "site visibility" is a factor in site density or distribution. A question can accordingly be raised as to whether the Upland soil conditions, vegetation or lack of disturbance may in effect tend to "cover" the sites or make them less visible. Geologic and Lake Agassiz conditions, it should be remembered, have resulted in the deposition of large quantities of wind-blown sand throughout much of the Upland . This may tend to reduce the visibility of sites. However, the only places where sand has been deposited in large quantities is in the extreme northwestern region of the research area near the beach escarpments. The remainder of the Upland area may in fact have shallow sand deposits, because prevailing northwesterly or westerly winds would have redeposited the sand in the Plateau. Also, the area where stabilized sand dunes and remnants of Lake Agassiz strandlines, bars, and spits are most notable (i.e., in the western Plateau, near the Campbell beach) is also an area which yielded the largest number of sites. If sand deposition is a factor reducing site visibility, it should be noted that it has been most active in the Plateau (demonstrated by the fact that this area is characterized by stabilized sand dunes) where most sites were found. Thus, sand deposition alone may not be a factor in explaining the relatively large proportion of sites in the Plateau and Lowlands.

Since the majority of the transect survey lines was confined to margins established by road, forestry-trail, and fire-guard networks, the sample may have been biased accordingly. However, the majority of the Upland is covered by economically important trees, Pinus banksiana for the most part, and Populus sp. to a lesser degree. Thus, the Upland contains a greater number of roads, forestry-trails, and fire-guards than the Plateau and Lowlands. This tends to increase surface visibility, yet the site density in this area is low. If the survey has been biased by adherence to the already-established road networks, it has tended to affirm that the site density is greater in the Plateau and Lowlands than in the Upland.

Because of the presence of economically important trees, large areas of the Upland are periodically cut or burned, bulldozed, and ploughed in order to facilitate regrowth of Pinus banksiana. Again, surface visibility is increased in comparison with the Plateau and Lowlands as a result of large areas so exposed.

The Plateau has a number of disturbed areas as well, although in lesser proportion than the Upland. Roads and forestry trails exist, gravel pits are more numerous than in the Upland, and agricultural areas are found near the Sprague and Piney Rivers. Fewer areas in the Plateau are noted for forestry cutting, ploughing, or burning.

The majority of the disturbed areas within the Lowlands consist of roads, gravel pits, and agricultural land. Agriculture is confined to the southern and southeastern portions of the research area. The majority (approximately 340 square miles) of the Lowlands consists of inaccessible marsh, sprucetamatack swamp, and bog. Locating sites in an environment such as this is difficult if not impossible. Those sites found in the Lowlands are located in higher, drier areas of the Mesic moist microenvironment.

It can be demonstrated that the Upland area, with perhaps the most suitable surface conditions for discovering archaeological sites, has a far lower site density than is the case in the Plateau and Lowlands. Extensive sand deposition, the survey practice of adhering to road networks, and small surface area alone cannot account for the variation in site density. A difficulty in the sampling design exists because much of the Lowlands is inaccessible. The writer believes, however, that the proportion of sites in the Plateau and Lowlands will be found to be significantly greater than in the Upland, as more survey work is done in the Sandilands. An additional bias, which cannot be controlled for, is the possibility that most of the sites located are of recent age. It was not feasible to date the majority of the sites, and the possibility that a number of quite early sites in the research area have gone undetected because they are more deeply buried (and may continue to go undetected) cannot be ignored.

Discussion

The field research has demonstrated that the greatest number of sites found in the research area are within the Plateau and Lowlands, specifically the Mesic Plateau and the Mesic-Moist Lowlands. The greatest site density, in comparison with percentage of area surveyed, was found to be in the Lowlands. Sampling error may have reduced the number of sites found in the Lowlands, and the sampling design may not have been adequate to discover large numbers of early sites because of soil depositional factors. Generally speaking, sampling error or research bias were probably not factors which resulted in a proportionate small site density in the Upland.

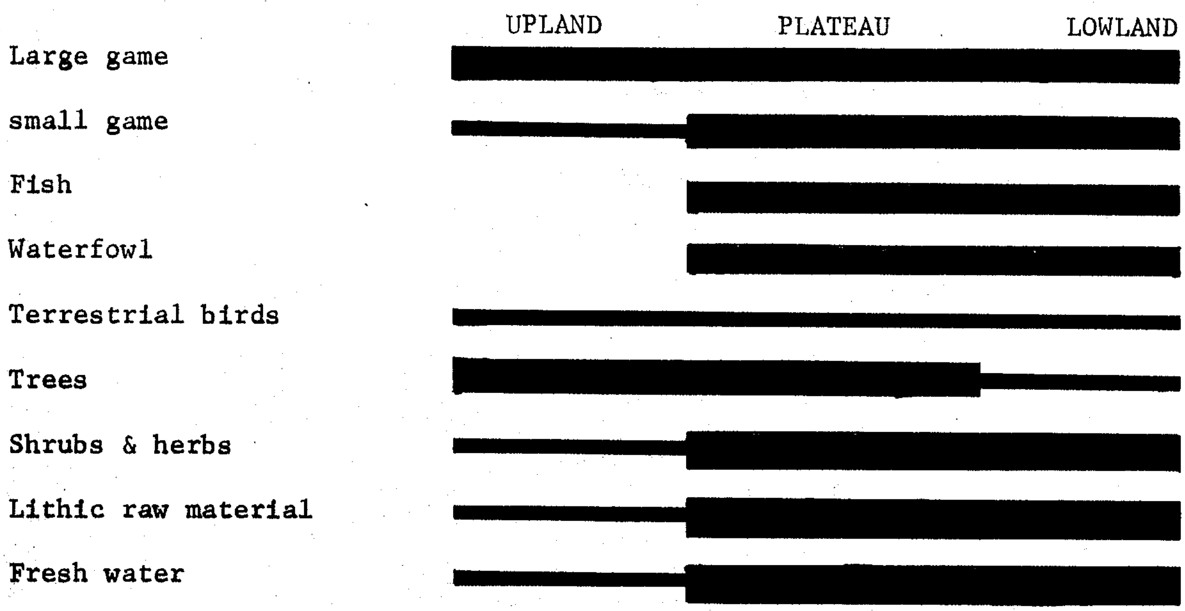
The hypothesis states that the site density (or number of sites) in a specific area (or microenvironment) is a product of the area's environmental potential, influenced by the visibility factor, the total area, and the percentage of the total area surveyed. An analysis of ethnographic evidence suggests that prehistoric groups will tend to locate sites for resource exploitation in those areas which contain the greatest number or variety of resources, taking into account the resource's seasonal availability and spatial distribution. In short, sites will tend to be found in areas with the greatest "environmental potential" (Fig. 29, page 142 summarizes resource distribution).

A study of the Sandilands resource distribution has revealed that the Plateau and Lowlands have the greatest environmental potential. While big game animals may have been distributed more or less evenly over the entire research area, other resource categories (particularly fresh water, fish, small game, lithics, migratory waterfowl, and various plants) were found in greatest abundance in the Plateau and Lowlands. It is most difficult to state what the environmental potential of each microenvironment was at a particular period in the past; and the writer has presented only what the environmental potential may have been during late prehistoric or early historic times. However, it was demonstrated, by a study of the region's vegetational succession, that the Upland may have been dominated at various times by prairie, savanna, or pine-forest environments; whereas the Plateau and Lowlands may have had more diverse environments (the reader is referred to Chapter Two, pages 24-27). The writer has hypothesized that the pine-forest environments of the Sandilands were of significantly less environmental potential than the Plateau and Lowlands. A similar observation of pine-forests was made by Fitting (1968:442) who quoted:

FIGURE 29

SANDILANDS RESOURCE DISTRIBUTION*

Resource Category Physiographic Region



*Note: Width of lines represents only the comparative abundance of each resource category in a particular region: they do not represent a comparison of species or numbers of species within each resource category.

> Indians procurred very little, if any, kind of food from conifers ... Animals whose flesh made human food could not subsist upon resinoid kinds of trees whereas fruits, nuts, berries, sugars, building barks, and browse for some of the animals came from other types of vegetable growth. The gloomy recess of the pine woods, monotonous and scant in nutrional plants, were not often frequented by animals and bird life in appreciable numbers (Hinsdale 1932:7).

It should be remembered that during the periods when the upland may have been dominated by prairie or savanna, the Plateau also was dominated by a similar environment and, futhermore, probably remained more abundant in resources - in comparison with the Upland. The vegetational cover of an area is just one factor of many to consider in an evaluation of a microenvironment's environmental potential. One of the primary factors which may have influenced site location in the Sandilands is the lack of fresh water in the Upland.

It has already been suggested that sampling errors may have somewhat distorted to locate all of the archaeological sites within the research area (due to an ideal 100% "visibility factor ") more sites may be found in the Lowlands, and in those areas of the Upland and Plateau which are covered by extensive sand deposits. However, the writer believes that the proportion of sites discovered under "ideal" surface conditions would remain significantly greater in the Plateau and Lowlands because these microenvironments were of the most suitable environmental potential, and were regularly selected for habitation (Fig. 30, page144, compares the area surveyed with the microenvironments). The writer has considered site visibility in equal proportion to other factors which may have influenced site density throughout the research area. Other publications are currently available which discuss survey problems in great detail, but yet only very briefly mention factors that may have biased the survey sample (Mueller 1974:15). The present writer asserts that site visibility

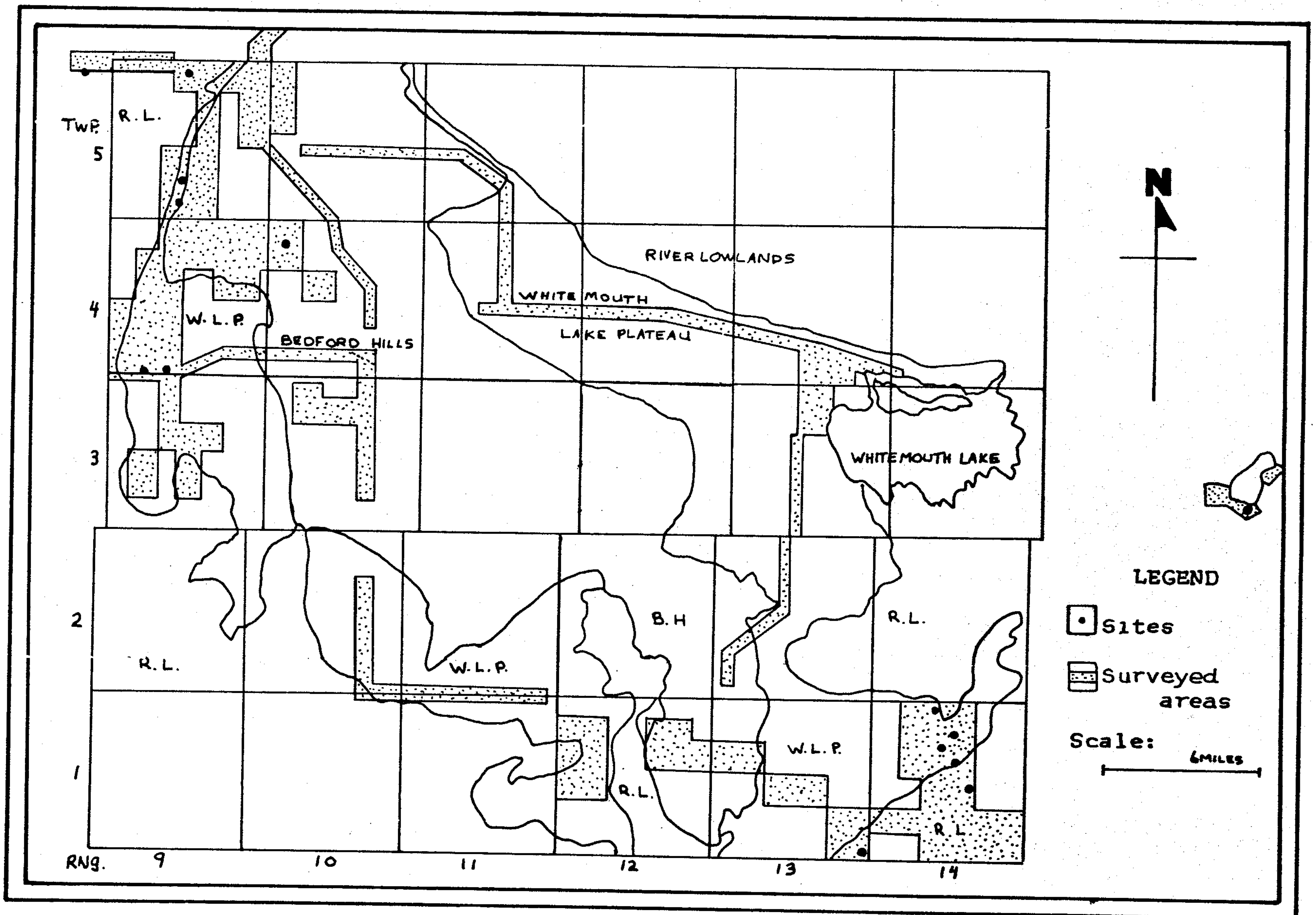


Fig. 30. The research area showing the surveyed area in relation to the major physiographic regions.

must be considered as an independent variable in all surveys and in all studies of site distribution.

A substantial amount of the thesis has been devoted to discussing resource distribution. Every attempt was made to present resource distribution as it would have been during late prehistoric or early historic times. The distribution of fresh water, lithics, migratory water-fowl, and fish has probably not changed significantly since the time of European contact; however, distribution of game animals and plant resources may be quite different at the present time due to modern exploitation of the region. Also, this study has covered a substantial time span - approximately 10,000 years. Yet no attempt was made to reconstruct the resource availability throughout this time span. However, environmental trends were presented which demonstrated that throughout time the Upland has had a vegetative cover that may not have supported either an abundance of game animals or an abundance of plant foods, in comparison with the habitats of the Plateau and Lowlands. The writer further hypothesizes that resource distribution patterns and aboriginal exploitative patterns at the time of contact will not differ significantly from those patterns in late prehistoric times.

In essence, the central hypothesis states that most archaeological sites will be found where resources are greatest, or where the most food may be found. Although similar archaeological work has been conducted in the Great Basin and Southwestern areas of the United States, no archaeological work had previously been done in Manitoba to suggest that site distribution may be related to specific ecological characteristics of the region in which the survey was done. Surveys, for example, have demonstrated that prehistoric man exploited Lake Agassiz beach environments.

However, the surveys did not demonstrate to what degree, or for what purposes, the beaches were utilized nor were these environments compared to adjacent ones. At Southern Indian Lake in northern Manitoba, where the region has as yet been relatively undisturbed by modern industrial activites, the researchers have been unable to study in depth <u>all</u> of the area's microenvironments and the total resource distribution. They have instead been restricted to a short distance inland from the major waterways. Previous researchers in this province have tended to decide where sites may most likely be found <u>prior</u> to field research, and to subsequently state factors which resulted in sites being found in specific areas. In most cases, only a few sub-areas of the larger survey area were examined; if sites were found in large numbers, the researchers tended to believe that those subareas containing sites were selected for exploitation, without consideration of all subareas or all factors influencing site visibility.

Secondly, the Sandilands survey adhered to a rigid sampling design with as few preconceived ideas concerning site location as possible. No attempt was made in the field to sample to the greatest extent those areas with the greatest site visibility (i.e., the Upland), in order to subsequently suggest that site density is greatest elsewhere, where the site visibility is poorer (i.e., the Plateau or Lowlands). Factors such as site density, site visibility, total surveyed area, and environmental potential were determined (after field research,and) on the basis of the field research.

Finally, the hypothesis provides a basis for recommending survey procedure in both the Sandilands and other areas of the Lake Agassiz basin. The survey has provided a hypothesis for elaboration or deletion of factors influencing site location. The majority of the analysis was done with respect to ecological factors. If subsequent researchers desire to investigate Sandilands sites for analysis of other factors, the 1972 survey has provided a prediction of site location and density for subsequent investigation. Also, if a similarly-designed survey were attempted for the western Lake Agassiz beaches, for example, the procedure of investigation followed in 1972 has provided a means by which site distribution may be juxtaposed with ecological characteristics for purposes of framing hypotheses applicable to this and other areas.

Conclusions

The Sandilands archaeological survey has resulted in the formulation of a hypothesis suggesting a relationship between site distribution and environmental characteristics of the area. Two subordinate hypotheses were stated: (1) the resource distribution and the aboriginal exploitative patterns noted in early historic times are probably similar to those of late prehistoric times; and (2) vegetative development trends suggest that throughout time the Upland has been of less environmental potential than either the Plateau and the Lowlands. Several unavoidable biases resulted from the field research. They are, first, the probability that only late-period sites were found; and, secondly, that it was not possible to discern site density patterns in the moist, peat-covered Lowlands. It was discovered that site density is greatest in those areas with the highest environmental potential, the Plateau and Lowlands.

A study was made of geologic history of the research area, and the vegetative development. Glacial advance and subsequent sand deposition in the Upland resulted in the area having very little fresh water, well-drained soils, and a vegetational development of pine forest, grasslands, or savanna. The Plateau had a diverse vegetational development, and a geological history noted for clay deposition, beach development, and mesic soil conditions. The Lowlands is characterized by poorly drained soils, predominately peat. After deglaciation, beaches blocked drainage, and peat development has continued until the present time. Analysis of resource availability has determined that those areas with the most diverse vegetational history also are of the highest environmental potential, and contain the greatest site density.

The hypothesis which has been formed may be used for additional research in the Sandilands, and it establishes a research procedure for further study of prehistoric land-use patterns in Manitoba. The field research did not establish the specific exploitative behavior (the season of occupation, the specific resources exploited, and so forth) at each of the fourteen sites.

Archaeologically, it was noted that prehistoric man migrated into the area (perhaps following Lake Agassiz beaches) sometime after 10,000 years B.P. The majority of the sites, when it was possible to suggest dates of occupation, seem to have been occupied from approximately 3,000 years B.P. onward. Most of the sites that were found were too badly destroyed or disturbed to suggest continued excavation. Those sites found during transect surveying tended to be clustered in the western portion of the research area near the Campbell strandline, and in the southern portion of the research area near the Sprague River. The osteological data which was randomly recovered during transect surveying suggested that the greatest variety of mammals within the past one-hundred years were found in the Plateau and Lowlands. Several sites underwent detailed soil analysis which enabled the writer to (1) narrow the occupational period for the earliest site, and (2) suggest different environments that existed at various sites in the past. The vast majority of the lithics recovered were of local origin.

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