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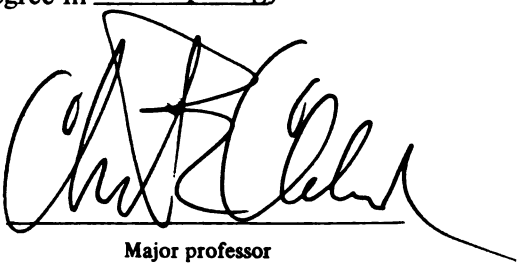
The Settlement System of the Mackinac Phase

presented by

Margaret B. Holman

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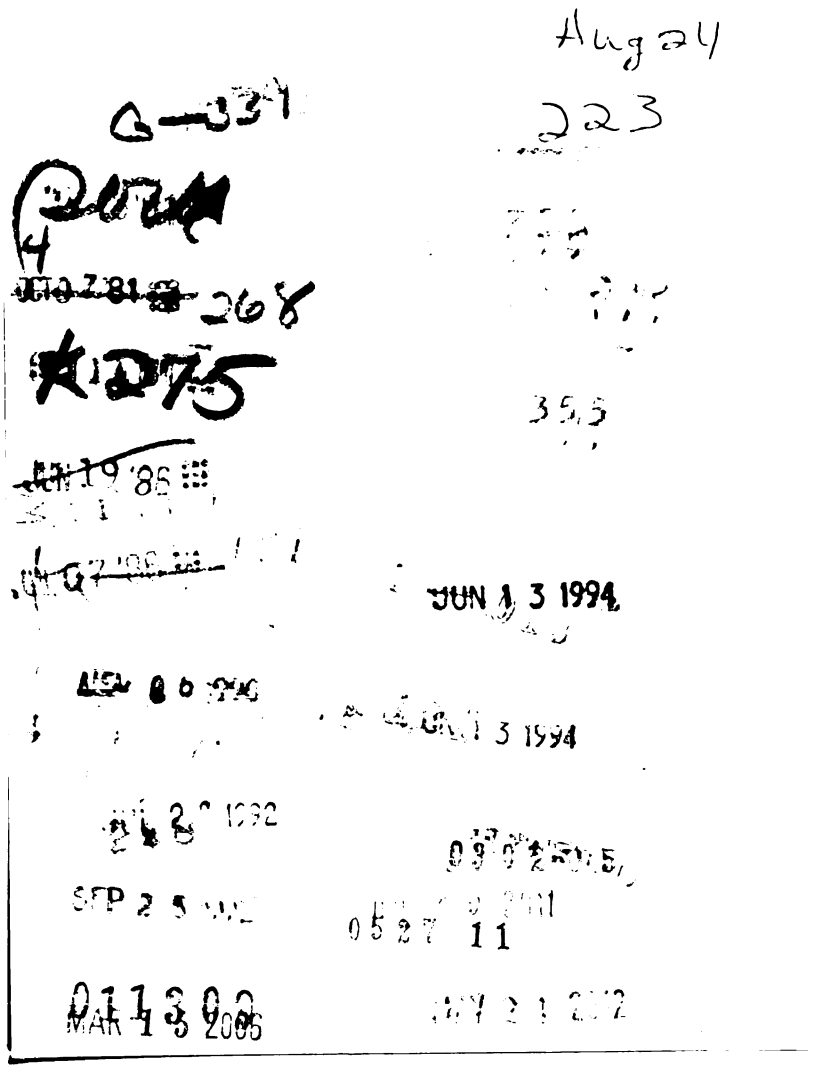
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THE SETTLEMENT SYSTEM OF THE MACKINAC PHASE

By

Margaret B. Holman

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ABSTRACT

THE SETTLEMENT SYSTEM OF THE MACKINAC PHASE

By

Margaret B. Holman

A study of fifteen sites identifies a pattern of seasonal movement for Mackinac Phase (A.D. 800 to 1000) hunters and gatherers in Michigan's northern lower peninsula. This movement normally goes from the Lake Michigan coast in the late fall to the inland lakes in the winter, through the inland waterway in the spring to the Lake Michigan coast in the summer. This pattern allowed Mackinac Phase peoples to obtain food effectively under varying environmental conditions.

Food resources utilized by Mackinac Phase peoples fluctuated in abundance and availability throughout the year. Likewise the quantity of food varied in the northern lower peninsula which is comprised of both the Carolinian and Canadian Biotic Provinces. This study is directed toward discovering how Mackinac Phase peoples solved the problem of seasonal and geographic variation in food resources.

During the historic period Indians living in the same environment and utilizing the same resources solved the problem of food variability by moving each season to be in the vicinity of resources as they become available. It was expected that Mackinac Phase peoples likewise shifted locations during the year to obtain food.

Catchment analysis developed by Higgs and Vita-Finzi (1972) for the purpose of studying prehistoric economies is used to examine the resource potential for each site for each season. During two seasons, late fall and winter, environmental constraints on resource availability are found to dictate which sites would be occupied in those seasons. Other factors such as shelter, weather, transportation and social interaction are considered in determining which sites were occupied in the early spring and warm season. Archaeological evidence from each site is examined and compared to see if the resulting determinations of seasonality corroborate the findings of catchment analysis.

The settlement system of the Mackinac Phase is defined on the basis of seasonal movements discerned. An attempt is made to establish spatial boundaries for the Mackinac Phase. The in situ development of the Mackinac Phase is postulated on the basis of ceramic evidence from the Pine River Channel site (Appendix A). These ceramics are transitional in form and style between the Mackinac

Phase and the preceeding Middle Woodland period. Finally, suggestions for further research are given.

ACKNOWLEDGMENTS

The data which forms the basis for this research was collected over a period of years from 1966 to 1975. Though many people contributed to this effort, Dr. Charles E. Cleland and Dr. William A. Lovis deserve credit for obtaining information suitable for analyzing questions of regional significance. Dr. Cleland, as chairman of my doctoral committee suggested the problem of Mackinac Phase settlement which is the focus of this study. His guidance of the subsequent research is greatly appreciated. Dr. Lovis served as a member of my doctoral committee. Our many discussions of archaeological problems have been instrumental in allowing me to formulate my own ideas about how to approach questions of the Mackinac Phase. I am grateful to Dr. Joseph Chartkoff who served on my doctoral committee and who took time to read my dissertation manuscript while on sabbatical. In addition, Dr. Moreau Maxwell was always helpful in offering advice about ceramic identifications.

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A number of individuals aided in the laboratory phase of the Pine River Channel site analysis. Mr. George Sabo supervised the washing and cataloging of artifacts. Mr. Vergil Noble accomplished preliminary analysis of the ceramic and flint materials. Plant remains were identified by Ms. Nancy Nowak. Fish bones were identified by Mr. Thomas Kramer and further faunal identifications were

performed by Ms. Melanie Gumerman. Mr. Patrick E. Martin contributed importantly to the description and dating of historic period artifacts. Illustrations were prepared by Mr. Stewart Alexander, Ms. Margaret Uland, and Mr. Martin Wykoff.

Less tangible, but nonetheless important contributions from my friends and colleagues Dr. Elizabeth E. Baldwin, Janet Brashler, Susan Martin and Deborah Sabo deserve special thanks. Finally, the support of my son Jeff is greatly appreciated. Responsibility for any errors is, of course, my own.

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CHAPTER I

INTRODUCTION

This study is an examination of the settlement system of the early Late Woodland culture in the northern lower peninsula of Michigan. An attempt will be made to determine how early Late Woodland peoples solved the problem of geographic and seasonal variation in food resources. A description of the environment will be presented so that the nature of resource variability can be understood. Despite the suggestion that climate in the Upper Great Lakes has fluctuated over time (Baerreis and Bryson, 1965), climatic change was minor and does not seem to have substantially affected environmental exploitation by prehistoric peoples. Cleland (1966) found evidence of climate change over time at the Juntunen site. He discerned a warming trend about A.D. 1000 based on the occurrence of a greater number of southern faunal species and a corresponding decrease in northern species (Cleland, 1966:181). Climatic change as reflected in Juntunen faunal remains was gradual and not of "great magnitude" (Cleland, 1966:181). Prehistoric occupations at Juntunen during both the warm

and earlier cool periods were similar in intensity, season of occupation and selection of food species. Therefore, environmental constraints on settlement in the area have remained essentially the same since, at least, the early Late Woodland.

Seasonal movement is one means of solving the problem of variation in resources that is practiced by hunting and gathering peoples. Movement allows hunter-gatherers to locate in the vicinity of resources as they become seasonally available. Documentary evidence provides a description of patterns of seasonal movement that occurred in northern Lower Michigan in historic times. Animal and plant remains from Mackinac Phase sites indicate that food resources utilized during the early Late Woodland were the same as those obtained in historic times. Thus subsistence resources as well as the geographic area and environment are held as constants between the historic period and the early Late Woodland. It is expected that the pattern of seasonal movement in the early Late Woodland in order to solve the problem of resource variability should also be the same as that practiced historically. This postulate will be directly tested in the following analysis.

A second means by which difficulties posed by resource variability are met by hunter-gatherers is through adjustments in the size of social units during the course of a year. Thus people may reside in village sized groups of several families during seasons of resource abundance.

Likewise people may disperse into smaller extended family groups in seasons of low resource availability. It is known that change in the size of social units in accordance with seasonal fluctuation in resources did occur historically in northern lower Michigan. It is expected that during the early Late Woodland the size of social units varied concommitantly with seasonal changes in resources in much the same manner as occurred historically. Various kinds of evidence bearing on the question of societal units are considered. However, the proposition that social units varied in size as one solution to the problem of varied food resources in time and space is not directly tested by this research.

The results of this research will be significant with regard to larger questions of culture change in the northern lower peninsula of Michigan. Cleland (1966:76) states that Late Woodland adaptations in the area were predicated upon the availability of fish in abundance at certain seasons of the year. He suggests that this adaptation developed after the introduction of nets during the Middle Woodland. This change to a reliance on fish resources resulted in "a higher level of population density, larger sites and more stable residency" (Cleland, 1966:77). McPherron (1967:273) likewise notes an increase in population beginning in the early Late Woodland and postulates a more successful adaptation. Further, Cleland (n.d.) observes a shift in settlement patterns from the Late

Archaic to the Late Woodland. During the Late Archaic, the largest sites showing the most intensive occupations are located on inland streams. After a period of little or no occupation in the Early Woodland, a shift in settlement is seen as evidenced by larger sites found on the coast. Though Middle Woodland sites are few, it is sometime during the Middle Woodland that the shift to a coastal emphasis occurs. In the Late Woodland the coastal orientation is intensified as evidenced by numerous large village sites on the coast. Fitting (1976:327) finds that the Late Woodland adaptation continues and is even further amplified during the early historic period in St. Ignace.

The present research focuses upon a point in time subsequent to the documented settlement shift (Cleland, n.d.) when the consequences of that shift are first observed. If the Late Woodland involves intensification of a particular form of subsistence over time, then by comparison with information provided by this study, changes occurring through time in the Late Woodland can be identified. Further, hypotheses can be formulated and tested to explain observed differences in the Late Woodland. In like manner early Late Woodland settlement data can be compared and contrasted with the Late Archaic so that changes in settlement can be better understood.

The present research should also have consequences for the study of spatial questions of the early Late Woodland. For example, studies of ceramic style (Lovis, 1973)

indicate that though ceramic variation during the early Late Woodland is sufficient to define types, many attributes of ceramic style are shared over space. In southern Michigan specific ceramic types are found to be associated with particular river valleys and/or other environmental features (Brashler, personal communication, 1977). In northern lower Michigan two early Late Woodland wares are found at sites along the Lake Michigan coast (Lovis, 1973). However, only one early Late Woodland ware is found at sites in the interior to the north and east of Little Traverse Bay. The association of ceramic types with certain locales coupled with a high frequency of shared ceramic attributes over space may reflect both social organization and settlement. Thus it is possible that shared ceramic attributes are indicative of the fluid social interaction often found in and between band level societies (Damas, 1969). Fluid social interaction is analogous to Yellen and Harpending's concept of anucleate networks of social relations (Yellen, 1977:45). Anucleate social networks are open and characterized by the relatively unrestricted movement of individuals and information throughout the area encompassed by the social system. The high degree of shared ceramic attributes in the early Late Woodland is evidence of information flow found in relatively anucleate societies.

The link between ceramic wares and geographic areas suggests that groups manufacturing pottery wares were exploiting particular regions. This study provides

information about how the makers of one kind of early Late Woodland pottery, i.e., Mackinac Ware, were exploiting Michigan's northern lower peninsula. Knowledge of settlement in one such area can provide a basis for discerning the nature of the relationship between people occupying it and adjacent areas. For example, two groups may be exploiting a single environmental zone on a seasonal basis. The relationship between groups incorporating one area into their respective seasonal cycles may be affected by such factors as the necessity to compete for resources, or the possibility of increasing resource yields through cooperation. Thus in order to understand interaction between groups during the early Late Woodland, it is important to have detailed information about settlement patterns and the ways in which environmental exploitation occurred.

Background of the Problem

The archaeological manifestation of the early Late Woodland in the area was termed the Mackinac Phase by Alan McPherron (1967). It was defined on the basis of a ceramic style occurring in the lower occupations of the Late Woodland Juntunen site on Bois Blanc Island in the Straits of Mackinac (Fig. 3). Two radiocarbon dates from these lower levels of A.D. 835±75 (M-1142; Crane and Griffin, 1961) and A.D. 910±75 (M-1141; Crane and Griffin, 1961) provide a basis for estimating a duration for the Mackinac Phase from about A.D. 800 to A.D. 1000 (McPherron, 1967:267). Thus

the Mackinac Phase was distinguished from other phases in the region on the basis of chronological placement and a characteristic ceramic form and style. McPherron (1967:269) recognized that wares similar to Mackinac Ware were found at sites to the west of the Straits of Mackinac on Wisconsin's Door Peninsula. Likewise, he noted that Mackinac Wares occurred at sites in the Traverse Corridor and Inland Waterway regions of the northern lower peninsula (McPherron, 1967:273). However, expansion of understanding of the Mackinac Phase necessitated information about these sites that was not then available.

New data, including a number of new sites containing Mackinac Phase pottery, are now available so that the problem of settlement in the Mackinac Phase can be addressed. The bulk of this new information is the result of investigations by Michigan State University under the direction of Dr. Charles E. Cleland. From 1966 to 1972 the focus was on the Lake Michigan littoral, or Traverse Corridor, between Traverse City, Michigan and Mackinaw City, Michigan (Fig. 1). Later the Inland Waterway system from Cheboygan, Michigan to Petoskey, Michigan received attention (Fig. 2). This work was directed by Dr. Charles E. Cleland and Dr. William A. Lovis in 1974 and 1975. Analysis of plant and animals remains at Late Woodland sites in the Traverse Corridor indicated that these were warm season occupations (Cleland, 1967 and Lovis, 1973). One of these warm season habitations is the Pine River Channel site in Charlevoix. Because the



Figure 1. Map of the Traverse Corridor.

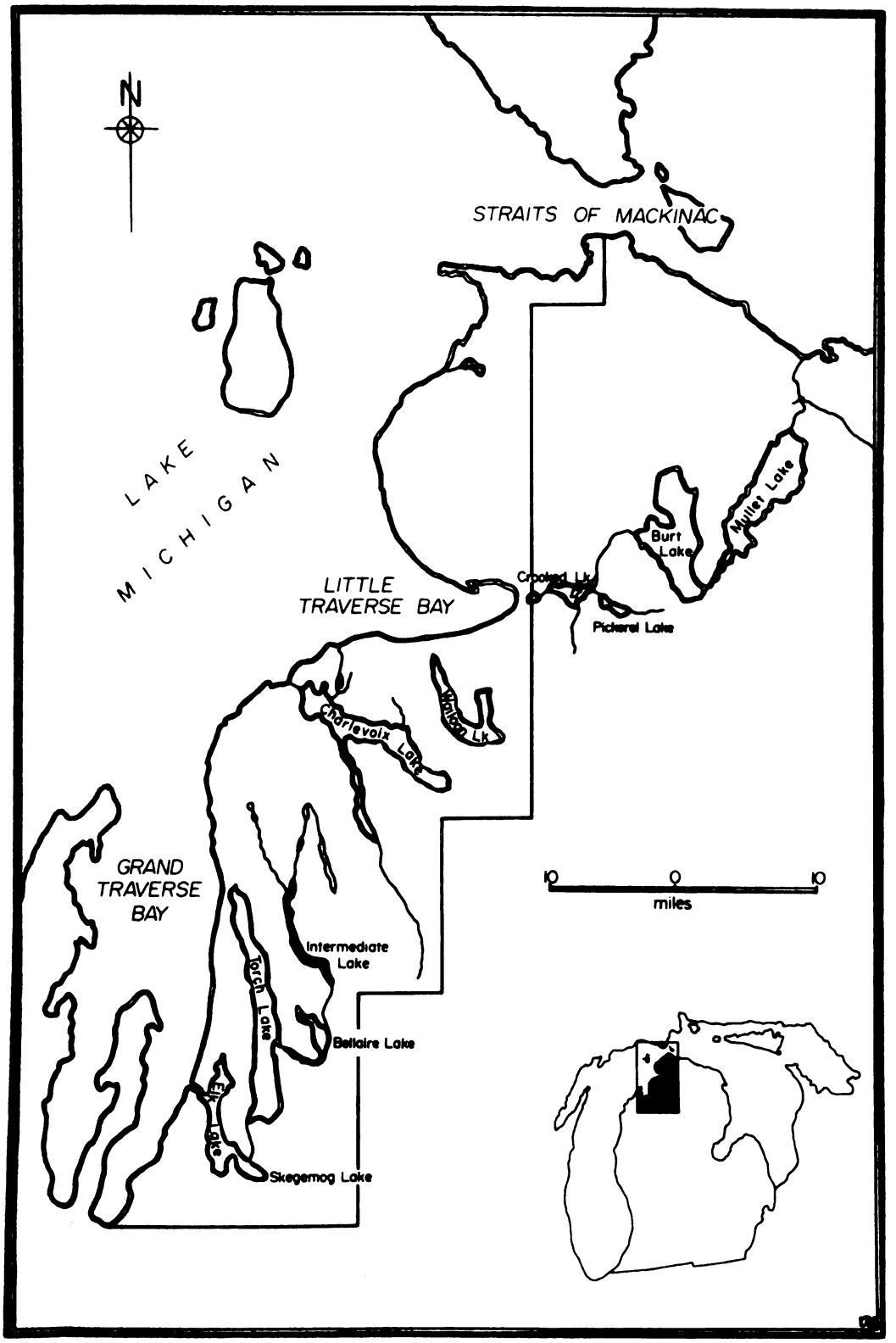
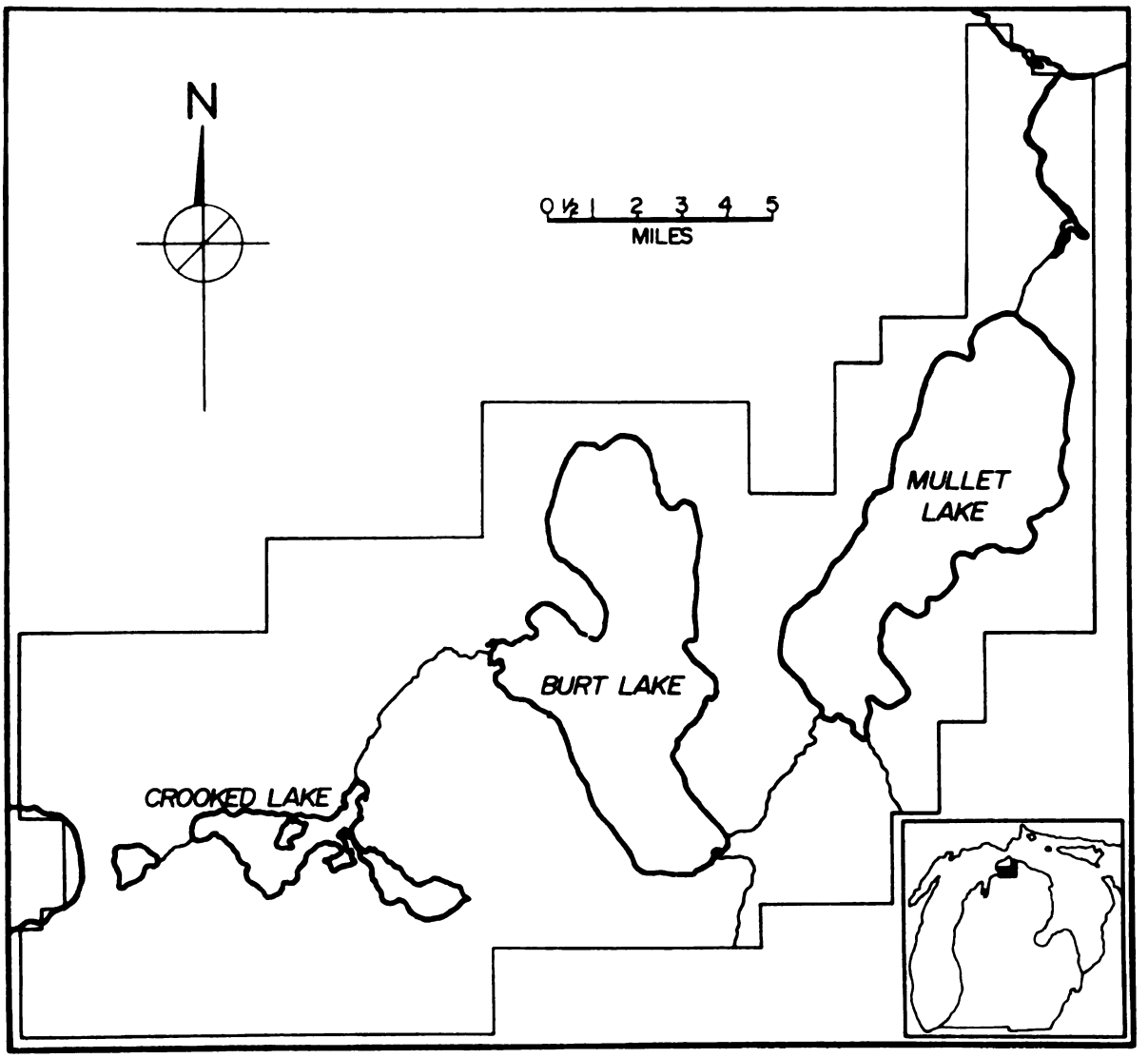

N
STRAITS OF MACKINAC
LAKE MICHIGAN
LITTLE TRAVERSE BAY
Crooked Lk
Burt Lake
Mullet Lake
Pickerel Lake
Walloon Lk
Charlevoix Lake
GRAND TRAVERSE BAY
Intermediate Lake
Torch Lake
Bellaire Lake
Elk Lake
Skegemog Lake
10 0 10
miles

Figure 2. Map of the Inland Waterway.


N
0 ½ 1 2 3 4 5
MILES
MULLET LAKE
BURT LAKE
CROOKED LAKE

Pine River Channel site is predominantly a Mackinac Phase site, it was analyzed as part of this research and is reported in Appendix A.

Since the location of cold weather habitations was unknown, survey and excavations were undertaken in the interior. The focus of these investigations was the Inland Waterway system linking the Straits of Mackinac at Cheboygan with Lake Michigan at Petoskey. This natural transportation route was shown by Lovis (1973) to be a source of ceramic style attributes brought into the Traverse Corridor from the north. It seemed likely that sites would be located there.

In addition, it was reasonable to expect that sites in the Inland Waterway would include winter hunting camps. This is indicated by historic documents, such as Alexander Henry's Journal (Bain, 1969), which report that indigenous Indian populations in the area moved inland to hunt in the winter. It likewise conforms to the Chippewa Pattern proposed by Fitting and Cleland (1969). They postulate a seasonal round characterized by village coastal occupations in the summer. Winter sites were inland hunting camps occupied by extended families. The Juntunen site in the Straits of Mackinac was offered as an example of a summer village estimated to have been inhabited by at least thirty people (McPherron, 1967:288).

Because of these investigations, data is now available from Mackinac Phase sites on the coast and in the interior. This should provide information about seasonal movements for the entire year.

Environment

The Lake Michigan coast and the interior of the northern lower peninsula of Michigan comprise two environmental settings in which Mackinac Phase sites are found. The concentration of in depth archaeological investigations, first on the coast, and then on the interior, reflect recognition by Cleland of the fact that the presence of two environmental zones probably had a significant relationship to prehistoric occupation of the area. In order to understand the environment in which Mackinac Phase peoples lived, it will be useful to first describe the special character of the coast and then to describe the interior.

The Coast-Traverse Corridor

The coastal plain of Lake Michigan, termed the Traverse Corridor is a flat, sandy area which varies in width from 50 yards to 12 miles (Cleland, 1967). The coastal plain is bounded to the north and east by high, hilly terrain marking the Valders morainic system. The Traverse Corridor is distinguished ecologically on the basis of the fact that it is an extension of the Carolinian-Canadian transition zone into a portion of Michigan which lies within the Canadian Biotic Province. This has

significance for prehistoric occupation because natural factors including milder climate and deciduous vegetation made the Traverse Corridor a favorable location for continuous settlement from as early as 8000 B.C. (Cleland, 1967:3).

Climate of the Traverse Corridor was favorable to prehistoric settlement since it is less subject to extreme temperatures than are the surrounding highlands to the east (Wagner, n.d.). The coast is warmer in winter because the prevailing westerly winds blow warm air from the lake which is slow to lose the heat it gained in summer. Likewise, extremely warm temperatures are rare in summer. During the warm season prevailing westerlies are cooled by the lake waters.

The milder climate of the Traverse Corridor affects the plant life in important ways. The growing season is greater than 140 frost free days (Yarnell, 1964:42). Thus the area has at least the potential for aboriginal agruculture. Additionally, southern deciduous species are the dominant vegetation (Cleland, 1967:1). This is important because deciduous vegetation provides better forage for many animal species than does the more coniferous inland forest (Yarnell, 1964:7). Finally, the vegetation takes a mosaic pattern which includes plant species found in the northern Canadian Biotic Province as well as those found in the southern Carolinian Biotic Province (Isleib, Nowak, n.d.). This mosaic vegetation pattern is reflective of

the edge-area, or ecotonal, effect that occurs at the transition of two environmental zones (Dice, 1952:422). The ecotonal situation applies also to animal populations in the Traverse Corridor so that both northern and southern species are present (Cleland, 1966:7). Thus the Traverse Corridor is characterized by a variety of plant and animal resources. In addition, of course, fish are found in the waters of Lake Michigan and in streams emptying into the lake. Fish are particularly abundant during spawning periods in the spring and fall (Cleland, 1966:171-176).

Interior-Inland Waterway

The interior of the northern lower peninsula contrasts ecologically with the Traverse Corridor. The topography consists of moraines and outwash plains (Sommers, 1977:15). Elevations are quite high and often exceed 800 feet.

Several large lakes are to be found in the interior. These lakes including Burt Lake and Mullet Lake exist in depressions scoured out by glacial erosion (Dorr and Eschman, 1971:195). During high water stages after the glacial retreat most of the interior was covered by water. However, with postglacial drops in water levels concurrent with a rise in the land due to isostatic rebound, shallower portions of the interior became dry land. Burt Lake and Mullet Lake occupy the deeper depressions resulting from glacial action. In addition, numerous swamps and bogs in

the area are remnants of the high water stages that are in the process of filling in. The inland lakes form part of a continuous waterway between the Straits of Mackinac at Cheboygan and Lake Michigan at Petoskey. Most Mackinac Phase sites found in the interior are located on shores of this Inland Waterway.

The interior is within the Canadian Biotic Province. Beech, maple hardwood forests form the dominant climax vegetation (Yarnell, 1964:6). However, important sub-climaxes include various kinds of conifers. The number of frost free days is generally less than 120. Thus the climate of the interior is not potentially suited for aboriginal agriculture. Climate also tends to be colder in winter, though precipitation in the form of snow is not so great as in the Traverse Corridor (Niedringhaus, 1966: 197-199) and protection from wind can be found more easily.

An important aspect of the ecology of the Canadian Biotic Province is that large game animals, such as deer, were probably never abundant (Cleland, 1966:162). The fact that large mammals were not abundantly present suggests that they could not serve as a reliable food resource for human populations. However, fish were certainly present in the inland lakes and rivers.

Historic Exploitation of the Area

Documents written by early visitors to Michigan's northern lower peninsula provide a picture of how

environmental resources were exploited in historic times. This view of historic Indian activities is amplified by the research of archaeologists such as Cleland (1966) and Yarnell (1964) into the matter of environmental exploitation.

The most complete source describing historic settlement is Alexander Henry's Journal (Bain, 1969). Henry spent a year with a Chippewa family beginning in 1763 and he describes an entire seasonal round in some detail. A further advantage conferred by Henry's work lies in the fact that the family with whom he lived resided in the northern lower peninsula. Additional sources, that are not so complete, include Nicholas Perrot (Blair, 1911) who was in the area from 1665 to 1684 and Jonathon Carver (1779) who was in Michigan during the 1760s. Both of these sources were specifically chosen because Perrot and Carver actually visited Michigan's northern lower peninsula. Most other early authors describe travels farther to the north in Michigan and Minnesota. Finally, a useful synthesis of Indian life is that of anthropologist W. Vernon Kinietz (1965) who based his work on a wide range of historic documents.

Major Subsistence Resource

The first evidence to be considered with regard to the ecological aspects of Indian settlement during historic times concerns the major subsistence resource. This has

been studied extensively by Charles E. Cleland in a series of presentations beginning in 1966 and continuing through 1977. It is his contention that the main resource utilized in the northern lower peninsula was fish. As a subsistence base fish was crucial because mammals were not a reliable resource (Cleland, 1966:196). In addition, it was abundantly available both at the beginning and end of the period of food scarcity from late winter to early spring (Cleland, n.d.). Perrot sheds some light on the difficulties of living in the northern lower peninsula in winter (Blair, 1911:127-129). He points out that bear (Ursus americanus) was the major quarry at this time because deer (Odocoileus virginanus) and elk (Cervus sp.) were lean. Fish available for the difficult cold period include whitefish (Coregonus clupeiformis) and lake trout (Salvelinus namaycush). These fish spawn in October, November, and December, are storable for winter use and are high in nutritional value (Cleland, 1966:172, 196). Alexander Henry notes in his journal that Indians in the historic period caught whitefish at Sault Ste. Marie during autumn to obtain winter provisions (Bain, 1969:62). He thus supplies documentary evidence for the importance of this species.

At the end of the lean period, during the spring, fish are also crucial. Sucker (Catostomus sp. and Maxostoma sp.) though not of such great food value as the whitefish, are abundantly available during the spring spawn (Cleland, n.d.). Likewise strugeon (Acipenser fluvescens) and

walleye (Stizostedion vitreum) are spring spawners (Cleland, 1966:171, 174).

In addition to supplying food at difficult periods, fish were important because they were available throughout the year. Species such as bass (Micropterus salmoides and M. dolomieui) and perch (Perca flavescens) were present during the summer (Cleland, n.d.). Henry states that sturgeon was a primary food objective during the summer at St. Martin's Island in Lake Huron (Bain, 1969:36). These and other species were present at the Juntunen site thus indicating they were not only available, but were utilized prehistorically (Cleland, 1966:173-175). Finally, Carver (1956) mentions that lake trout were caught through the ice with hooks at Fort Michiliamackinac, while Henry (Bain, 1969:55) notes that whitefish were also caught through the ice with nets.

Other Subsistence Resources

The historic record provides information as to other foods utilized in different localities during each season of the year. Alexander Henry's description of the year he lived with a Chippewa family from the summer of 1763 through May, 1764 is most helpful in this regard (Bain, 1969). In addition to spearing sturgeon, summer was spent hunting mammals and catching wild fowl at a village on Lake Huron which was occupied by a number of extended family groups. At an early fall hunting camp on

the Aux Sable river about 15 miles from Lake Michigan, Henry's family obtained elk, deer, raccoon, beaver, marten, and fowl. During the winter, Indians hunted in small family groups. Hunting took place from late December to March about 60 miles inland. Bear was taken in January and elk was obtained in February. In March a maple sugar camp was established, again as in the fall, about 15 miles from Lake Michigan. Here in addition to making sugar, hunting and fishing were food getting activities.

Though hunting took place throughout the year, it was the primary activity only during the winter. This is the season in which the fish, though available, are not so abundant. Likewise migratory birds are absent and most plants are nonproductive. Henry's information is supported by Kinietz (1965:237, 321) who states that hunting was a major activity in winter for both the Ottawa and Chippewa.

In addition to faunal resources, plants must be considered as part of the subsistence base. They constituted not only about one quarter of the diet, but served medicinal and other purposes as well. Indeed Yarnell (1964:74) points out that most of the plants obtained were utilized as medicine. With regard to seasonality, how plants were used is not so relevant a question as that of when they were available. Plant products were most abundant in the summer and early fall (Yarnell, 1964:75). Ritzenthaler and Ritzenthaler (1970:16) note that August was the best season for gathering medicinal herbs since they were

more easily identified at that time. Yarnell's (1964: 185-192) index of plants used for technological purposes indicates that most of these were obtained in the warm season.

The only portion of the year that plant products probably served as the major food resource in northern Michigan was during the early spring when maple sugar could be made and other foods were sparse (Yarnell, 1964:40). However, beverage plants, particularly hemlock (Tauga canadensis) may have been of crucial importance in supplying vitamins and minerals in the winter when meat formed the greater part of the diet (Yarnell, 1964:83).

Societal Aspects of Settlement

Ethnographic accounts of hunter-gatherers show that there is a distinct relationship between economics and social organization. Social organization must be sufficiently flexible to meet the problem of seasonal changes in the food base and at the same time answer societal needs such as providing suitable labor pools, obtaining marriage partners and providing social interaction. Indeed these are suggested by Jochim (1976:70) as being essential criteria in the process of making decisions about societal aggregation among hunter-gatherers. In a situation where the resource base fluctuates during the course of a year the numbers of people that can live together at any one time also fluctuates in accordance with the availability

of food. Further, food getting activities require differing levels of cooperation by groups that vary in size and composition. In a "fluid," or flexible, social order such as is found in hunter-gatherer societies the maximum decision making responsibility rests with the smallest food-getting unit that remains intact through the year. As environmental conditions change, this small group may quickly act to obtain food. Alexander Henry's Journal (Bain, 1969) provides information about social organization of the Chippewa living in the northern lower peninsula during the eighteenth century that can be used as the basis for postulating such a system for the Mackinac Phase in some detail.

Basic Economic Unit

It appears from Henry's account (Bain, 1969) that the basic economic unit was the extended family. In this case the family was headed by the eldest male and was a patrilocal residence group. The extended family was the only unit which remained intact throughout the year and apparently was nearly self-sufficient with regard to tasks involved in procurring food. This seems to be true even when larger groups gathered in a locality where food was concentrated and plentiful. Thus at the maple sugar camp witnessed by Henry, extended families obtained their own sugar even though there were several present (Bain, 1969:69).

The possible exception to economic self-sufficiency of the extended family is not treated by Henry, but involves the procurement of the whitefish and lake trout in the fall. It has been suggested by Cleland (n.d.) that operating the large nets which were used to catch these species made group cooperation on a scale larger than the extended family more economic. Group cooperation was advantageous for the spring fishing, but to a much lesser extent (Cleland, 1966:77). If this is true, there is a premium on cooperation and the extended family would not have obtained large amounts of food alone during certain critical periods in the year. Cleland (1966:49) does add a cautionary note however, when he states that the exact level of cooperation in obtaining and distributing fish is unclear. He goes on to quote Hickerson (1962:49) concerning the economic function of the village which was comprised of an aggregate of extended families. The village allots food procurement areas for fish, rice, gardens and maple sugar. If Hickerson is correct, the implication is not so much that people were working together to obtain food, but that they were organized so that nearby localities could be exploited separately. Thus a larger group could maintain itself and at the same time avoid conflict over resources.

Possibly because they were virtually self-sufficient economically, the extended family seems to have had considerable autonomy even when it resided in villages, or aggregates of such groups. Thus Henry's family independently

chose when to leave the village in late summer (Bain, 1969: 120). This autonomy, of course, would be somewhat diminished if larger groups were needed for the fall fishing. However, it is important because it allowed the extended family to act as a separate unit in a situation where environmental and perhaps social conditions were in constant flux. This was particularly important in the winter when it had to reside and make decisions alone.

In addition to near self-sufficiency in procurring food, the extended family is characterized as an economic unit in which all members, other than an infant, contributed to the food supply. In general males were the hunters, although females participated in a January bear hunt (Bain, 1969:136). Likewise the women were in charge of maple sugar preparation though the men contributed by cutting fire wood (Bain, 1969:69). With regard to fishing, men speared the sturgeon and fished through the ice while both sexes performed other fishing activities (Kinietz, 1965:324 and Ritzenthaler and Ritzenthaler, 1970:17). Children and probably women gathered plant foods and young boys hunted squirrel and bird (Kinietz, 1965:276).

Minimal Social Unit

Though the extended family, or basic economic unit, was nearly self-sufficient in obtaining food, it was not self-sufficient in some other important ways. Thus the extended family was part of a minimal social unit that

consisted of a few other extended families that were associated by virtue of kinship. This group wintered near one another, met at the sugarbush in March and maintained a burial ground (Bain, 1969:69).

The necessity for such a unit can be attributed to several things. First, in an area such as northern lower Michigan where winter resources in the form of large game are scattered and unreliable, it is important that information as to where the resources are in a given year be shared. Additionally, help needs to be available in times of emergency. This is analogous to the situation with the Montagnais-Naskapi in Labrador (Leacock, 1969:9). There an aggregate of several families must separate in the winter to hunt. However, they remain close enough to provide aid if it is needed.

The minimal social unit may provide one vehicle by which extended families are maintained at the optimum level for necessary tasks to be performed. Thus members could move from one such unit to another with little disruption because primary kin ties would be present and relationships already established. This might become necessary when deaths or conflict occurred to weaken the basic economic unit. Once again, the important factor is the maintenance of flexibility in order to adjust to changing social and economic conditions. The fluid nature of the compositions of various kinds of groups present in band level societies

is widely recognized as characteristic of this kind of social organization (Damas, 1969).

Maximum Social Unit

The maximum social unit was a warm season aggregation that included more than one minimal social group of related extended families. Henry was part of such a unit when his extended family with its kin based associated families joined with others to spend the summer at St. Martin's Bay (Bain, 1969:120).

Because not all members might be related by primary kin affiliation, such a unit might be advantageous in serving to provide membership for extended families through marriage (Jocim, 1976:70). Additionally, perhaps it provided the labor and/or equipment necessary for the fall fishing. Finally, the maximum social unit answered the need for social interaction (Jochim, 1976:70).

Discussion of Societal Aspects of Settlement

It is apparent from Henry's description of social organization during the historic period that there were units of varying size and composition (Bain, 1969). This kind of flexibility can be seen as an appropriate means of adjusting both to seasonal fluctuation of resources and to changing social conditions as well. Thus the number of people living together at any one time could vary according to abundance of available food and the level of cooperation required to procure food. Likewise, variation in social

units served purposes such as maintaining the minimal unit through membership exchange or marriage, providing aid during emergency and allowing social interaction.

Statement of the Problem

It is clear that the potential food resources present in the northern lower peninsula are varied both geographically and seasonally. This research is directed toward the problem of how Mackinac Phase peoples solved the problem of variation in food availability in time and space. It is known that historic period Indians in the area utilized the same food resources as did Mackinac Phase peoples. Further, historic period Indians solved the problem of resource variability through seasonal movements and by adjustments in group size. If it can be established that Mackinac Phase peoples practiced similar seasonal movements and change in the size of social units, then it can be concluded that these functioned to solve the problem of resource variability as they did historically. Catchment analysis which assesses the resource potential of site locations and was developed by Eric S. Higgs and Claudio Vita-Finzi (1972) specifically to study prehistoric economies will be used as a basis for the investigation of Mackinac Phase settlement.

CHAPTER II

CATCHMENT ANALYSIS AND RESEARCH DESIGN

Catchment Analysis

Background

Higgs and Vita-Finzi (1972:27) developed site catchment analysis expressly for the purpose of studying prehistoric economies. The method is economic rather than artifact oriented. Thus it places emphasis on resources and the means by which they are exploited.

In addition to providing an economic emphasis, catchment analysis was designed to avoid confusion that occurs through the use of a typological approach to economics. Thus researchers often conclude that the people responsible for an artifact type or style constituted an economic unit adapted to the environmental zone where that type or style occurs. This creates difficulties because an artifact type, such as a particular kind of projectile, may indeed be used to exploit the resources of a particular environmental zone. However, the same economic unit may have exploited resources in another environmental zone using a different

type of projectile. For this reason artifact types may not always be equated with economic units.

Higgs and Vita-Finzi (1972:27) assert that "economic units" do not operate within a single environmental zone. In fact economic units make use of the resources of different environmental zones. Therefore, catchment analysis utilizes the concept of economic zones that can encompass more than one environmental zone.

Assumptions

Catchment analysis can be utilized in the study of a range of economies from mobile to sedantary. Because the Mackinac Phase certainly involved a mobile economy, the discussion here will be confined to the use of catchment analysis for mobile economies.

The first assumption is that movement must occur (Higgs and Vita-Finzi, 1972:28). The greatest amount of time that can be spent in one place is limited by the necessary resource which is available in the least quantity. Whether or not there are social mechanisms to prevent overexploitation of the least available necessary resource, movement will take place. Efforts to discourage overexploitation are limited by the availability of a resource. Movement must occur before the possibility of overexploitation reaches the danger point. The result of movement in the long run will be to coordinate the use of resources.

An assumption essential to the catchment analysis of mobile economies is that movement is patterned (Higgs and Vita-Finzi, 1972:30). Nonrandom movement reflects knowledge of the environment. Therefore, a further assumption is that the patterning observed reflects "economic territoriality." A site territory is the "area habitually exploited" (emphasis mine) from a particular site (Higgs and Vita-Finzi, 1972:30). This is differentiated from the site catchment which also includes occasionally exploited territory. It is recognized that some sites were not used as a base from which to exploit a territory. However, it is expected that analysis of a site's territory will help to indicate whether it served as a base for exploitation or was only used temporarily.

The size of the catchment area expected for a particular site in a mobile economy is derived from studies of the !King bushmen (Higgs and Vitz-Finzi, 1972:30). It is estimated that the average hunter-gatherer catchment area encompasses 314 square kilometers with a radius of about 10 km. from a site. This is roughly equivalent to the distance that can be covered by walking over flat terrain in two hours time. Beyond this distance the return in food obtained exchange for effort expended declines significantly. The authors note that site territory is rarely circular because the shape will be distorted by terrain that is broken or hilly (Higgs and Vita-Finzi, 1972:33).

Catchment analysis focuses on food resources that probably were of the most consistent importance to prehistoric populations. Thus it is recognized that hunter-gatherers obtain a wide variety of foods including staples and casual foods such as relishes or medicines (Higgs and Vita-Finzi, 1972:29). However, it is assumed that staples are of greater importance both on the level of site choice and the level of the economic system. Obtaining staples is more consistently the concern of hunter-gatherers.

Catchment analysis takes into account the difficulty of judging whether or not sites are exactly contemporaneous (Higgs and Vita-Finzi, 1972:29). Thus sites are treated as being "archaeologically" rather than precisely contemporaneous. The assumption is that the site sample will show long-term trends in the location of sites.

Finally, it is recognized that catchment analysis may show that a site's resource potential does not fully explain its location. If this is the case, then non-economic factors in choice of site location may be considered.

Research Design

Advantages

Because the ability to obtain food resources is always important to the choice of site location, economics were given primacy in explaining the seasonal movements

of Mackinac Phase people. Catchment analysis has the advantage of being designed specifically to research prehistoric economic questions.

The purpose of catchment analysis is to determine the "resource potential" of the area likely to be exploited from a single site (Higgs, 1975:223, 224). Thus it is particularly suited for an examination of the question of how Mackinac Phase peoples solved the problem of variation in food resources over time and space. It is assumed that Mackinac Phase sites were chosen for occupation to a great extent for the purpose of being in close proximity to foods available in the different seasons.

Finally, an additional advantage to the method of site catchment analysis is that it does not make use of site collections. Therefore, differences in the extent of sampling by excavation need not be considered. Thus catchment analysis provides a means of testing ideas about Mackinac Phase settlement extrapolated from historic records.

It is important to be aware of the limitations of catchment analysis. As Foley (1977:164) points out, catchment analysis provides a qualitative description (emphasis mine) of habitat types that are available around a site. However, catchment analysis does not measure the extractive value of the habitats described, either with regard to a site or a particular technological system.

Further, it does not utilize the concept of energy balance which is basic to understanding the human use of energy.

Certainly a more refined analysis would result if it were possible to measure quantitatively such variables as the energy available to Mackinac Phase peoples and their energy requirements. Likewise it would be useful to know exactly how much energy was provided by each resource and the distance normally traversed in obtaining each resource. However, information of this kind does not exist and quantitative estimates would be extremely inaccurate. It is considered preferable to utilize a descriptive technique with reliance on what is certainly known about Mackinac Phase subsistence resources and technology.

Procedures

Before discussing the results of catchment analysis, it will be necessary to briefly describe the procedures followed in its application. In determining the catchment area for each Mackinac Phase site, a circle was drawn around each site with a radius corresponding to six miles. This is the equivalent of the ten kilometer radius used to represent the distance of the average hunter-gatherer catchment area. It is the amount that can be covered in a two hour walk over flat land (Higgs, 1975:224). In addition, for catchments in ice-free seasons, a second circle with a twelve mile radius was drawn. This expanded the area to include an estimated two hour travel by canoe.

For most sites the presence of interconnected bodies of water were much in evidence and warranted an expansion of the catchment area in this fashion. However, in a few cases this additional radius provided by water travel was not appropriate for use because the sites involved were not located on bodies of water that were connected with others sufficient to travel for twelve miles.

Once the initial radius was drawn, the site territory, or habitually exploited area, was defined by examining where food resources utilized during the Mackinac Phase could be found at various seasons. The preferred aquatic and terrestrial habitats for each species in each season was studied so that it was known when and where within the site territory they could be found. A site territory map was then made for each site, for each season. The seasons included were winter, early spring, late spring through early fall and late fall. The seasons were ordered so as to correspond to those indicated by the historic record. Since food species identified from archaeological sites are the same as those used historically, the inference is made that the seasons of exploitation were probably also the same.

Questions have been raised concerning the derivation of site territory, particularly with regard to the use of the 10 km. or two hour radius. It is true that this radius is based on the practices of the !Kung bushmen and may not be valid for groups with a differing environment and/or

technology. Thus as Foley (1977) points out, the 10 km. territory should not be assumed, but must first be tested. He proposes the development of mathematical formulas to determine the area of positive energy balance within which resources could be obtained without the loss or waste of energy (Foley, 1977:182). Foley's (1977:182) proposed means of determining site territory, or "home range" offers the advantage of quantitative application to specific habitats and specific sites. However, as Foley (1977) states, the actual site territory, or "home range," depends on levels of demand (population), balance of plants and animals and the level of technological efficiency. These variables are extremely difficult to measure and Foley's formulations are admittedly in an experimental stage. It is argued here the Foley's (1977) criticism of the 10 km. catchment are well-taken and that better ways should be developed for determining the distance measurement of site territory. However, at the present time, the alternatives he proposes involve crude measurements of critical variables such that the result is probably no more accurate a determination of site territory than is the 10 km. radius. Further, for the level of analysis used here the !Kung example is probably quite adequate. The energy requirements of the !Kung and the energy they can expend certainly does not vary greatly from that of other Homo sapiens hunter-gatherers. Differences among hunter-gatherers in the radius of site territory may occur as the result of

differences in environment and/or technology. Where possible the effects of environment and/or technology can be taken into account. Thus in the present case the possibility of travel by water resulted in some situations in the doubling of the radius of the territory that could be exploited from a single site in two hours time. It is possible too that technological efficiency greater than that of the !Kung might result in a smaller site territory within which more energy could be more easily obtained. Once again, if this can be determined, site territory size can be adjusted accordingly. In the absence of precise measurements of variables such as population size and technological efficiency, it seems reasonable to use the !Kung data as a base estimate from which to determine the radius of a site territory.

A final constraint was added to delimit the site territory. The 700' contour was chosen as a boundary to eliminate the highlands as a region of habitual exploitation from Mackinac Phase sites. This is in accord with the assumption that hunter-gatherers will generally follow the Law of Minimum Effort (Jochim, 1976:7). Thus it is assumed here that the highlands would not be regularly exploited from the sites used in this sample, because to do so represents an unnecessary expenditure of energy.

The elimination of the highlands as a zone of regular exploitation from Mackinac Phase sites is further justified because of what is known about seasonal resource

utilization during this phase. Obviously, the exploitation of fish during the late fall precludes the regular use of the highlands. During the winter, large mammals that were the principle quarry sought the shelter afforded by lowland habitats. Early spring site territories should preclude highland habitats for a number of reasons. The staple early spring resource, maple sugar, could be exploited in the immediate vicinity of a site and known Mackinac Phase sites all occur at elevations lower than 700' above sea level. Supplementary mammal resources in the early spring would remain in their sheltered lowland habitats. Likewise, fish used in the early spring would be a lowland resource. Finally, the nature of various resources found at the warm season Pine River Channel and O'Neill sites supports the idea that lowlands were the focus of habitual exploitation. The majority of mammalian and avian species found at both sites, including moose, beaver, muskrat raccoon and water fowl (Lovis, 1973 and Appendix A) prefer habitats near water. The high frequency of mammals and birds preferring habitats near water coupled with a high frequency of fish remains at both sites suggests that watercourses, not the highlands, were zones of habitual exploitation in the warm season. Therefore, it is clear from the evidence that resources known to have been utilized in the Mackinac Phase could be exploited at lower elevations in all seasons.

Criteria in determining each site's territory for each season were based on the preferred habitats of species

utilized (Table 1). Late spring through early fall territories were the largest in area that could be exploited, since a greater number of species were present in varied habitats. This included mammals, fish, plants, birds and turtles. They could be obtained in all vegetation zones plus all aquatic zones. The boundary for Lake Michigan at this warm season was placed at a depth of about 10 feet. Fish caught during this season, especially in the spring, could all be found within that limit since they are ascending streams and entering shallow water to spawn (Cleland, personal communication, 1977).

The site territory for late fall includes only a Great Lakes habitat, since the fall spawning fish are postulated as the crucial resource to be obtained. These could be caught prehistorically in streams at the lake borders and out into the lake to a water depth of 180' (Cleland, personal communication, 1977).

Winter catchments were restricted in the distance that could be covered in two hours, by the kinds of habitats preferred by food species and by a more limited number of species. Ice prohibited canoe travel so the catchment area was reduced to a six mile radius. Most large mammals hunted including moose, elk and deer could be found in coniferous forests and swamps during the winter (Cahalane, 1947). Fish could be caught through the ice, but most plants, birds and turtles, of course, were not available at all in winter.

Table 1.--Mackinac Phase Subsistence Resources.

Species	Common Name	Habitat	
		Warm Season	Cold Season
		Mammals	
Alces alces	Moose	deciduous/watercourses	conifer/swamp
Castor canadensis	Beaver	watercourses	watercourses
Cervus canadensis	Elk	open forests/openings	conifer/lowland
Erethizon dorsatum	Porcupine	deciduous	deciduous/conifer
Lepus americanus	Snowshoe Hare	conifer/swamps & thickets	conifer
Lutra canadensis	Otter	watercourses	watercourses
Lynx rufus	Bobcat	open deciduous	open deciduous
Martes americanus	Marten	mature conifer forest	mature conifer forest
Mustela vison	Mink	watercourses	watercourses
Odocoileus virginansus	Whitetailed Deer	forest border/open forest	conifer swamps
Ondatra zibethicus	Muskrat	watercourses	watercourses
Procyon lotor	Raccoon	open woods/watercourses	hibernation
Rangifer caribou	Woodland Caribou	conifer/swamp	conifer/swamp
Tamiascuirus hudsonicus	Red Squirrel	conifer/deciduous	Early Spring-Maple Sap
Urocyon cineroargentens	Gray Fox	open forest	open forest
Ursus americanus	Black Bear	mature forest	hibernation
		Birds	
Aegolis acadicus	Saw-whet Owl	conifer/swamp	conifer/swamp
Anas platyrhychos	Mallard	watercourses	absent
Bonasa umbellus	Ruffed Grouse	brushy forest	brushy forest
Brantis canadensis	Canada Goose	watercourses	absent
Ectopistes migratorious	Passenger Pigeon	woodland	absent
Gavia immer	Loon	watercourses	usually absent
Larus delawarensis	Ringbilled gull	watercourses	watercourses
Meleagris gallopavo	Turkey	mature deciduous	mature deciduous

Table 1.--Continued.

Species	Common Name	Habitat	
		Warm Season	Cold Season
		Fish	
Acipenser fulvescens	Sturgeon	spawn-late spring shallow lakes/rivers bottom feeder	
Aplodinotus grunniens	Freshwater Drum	spawn-late spring bottom feeder	
Catostomus commersoni	White Sucker	spawn-late spring shallow	shallow
Coregonus sp.	Whitefish	deep (most species)	late fall spawn shallow to 180'
Esox lucius	Pike	late spring spawn shallows	
Ictalurus nebulosus	Brown Bullhead	late spring spawn mudbottom lakes	
Ictalurus punctatus	Channel Catfish	late spring spawn shallow	
Lepisoteus osseus	Longnose Gar	late spring-spawn shallow	
Micropterus dolomieui	Smallmouth Bass	late spring-spawn	
Micropterus salmoides	Largemouth Bass	late spring spawn warm weedy water	
Moxostoma sp.	Redhorse Sucker	late spring spawn gravel bottom	
Percidae	Perch	late spring spawn shallow	
Salvelinus namaycush	Lake Trout		late fall spawn shallow/Great Lakes
Stizostedon vitreum	Yellow Walleye	spring spawn shallow	

Finally, the early spring area of exploitation involved the deciduous forests where maple trees are found, since maple sugar was the primary resource. Water was also included, both because of fishing possibilities and the extension of the distance that could be travelled.

Season of Site Occupation

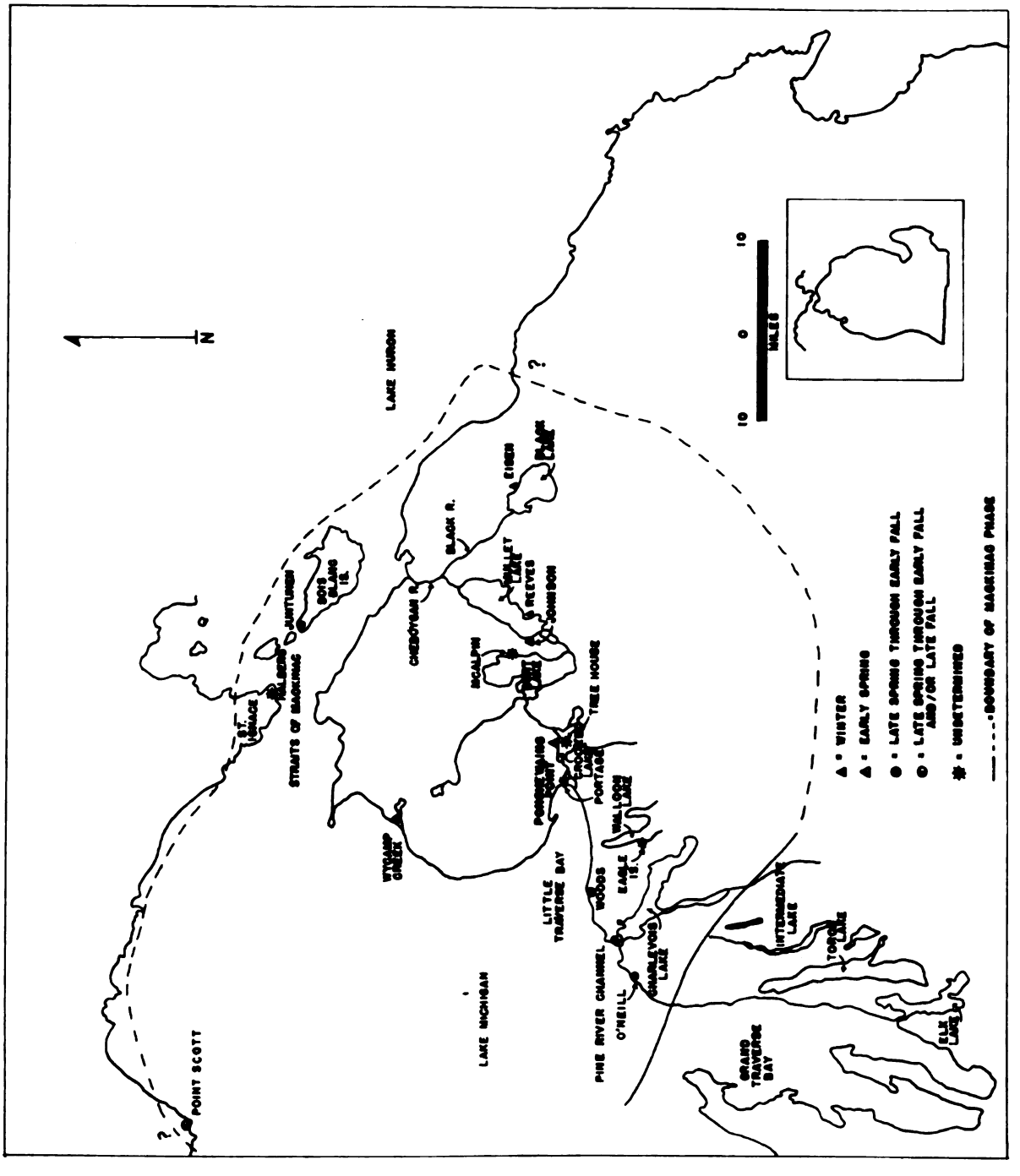
It is expected that catchment analysis in measuring the resource potential for each site for each season will provide a means of assessing the season in which each Mackinac Phase site was occupied. Documentary evidence shows where Indians lived in each season in historic times. Archaeological evidence from the Juntunen (McPherron, 1967), Pine River Channel (Appendix A) and O'Neill (Lovis, 1973) sites is supportive of the idea that Mackinac Phase peoples followed a similar seasonal round. Thus, historic documents state that warm season villages were on the coast and all three archaeological sites were warm season occupations. In addition, fall fishing occurred at large coastal villages and the Juntunen site has been identified as a fall fishing station. Finally, as stated previously, food resources identified archaeologically duplicate those used historically.

Catchment analysis will be used to test the hypothesis that seasonal movement in the Mackinac Phase for the purpose of solving the problem of food resource variability, followed the same pattern as seasonal movement

in historic times. If this is the case, the following test implications must be confirmed.

1. Sites found in the interior will be high in winter resource potential.
2. Sites found on the coast will be high in late fall resource potential.
3. Sites found on the coast will be high in summer resource potential.
4. Sites found in the interior will be high in early spring resource potential.

Figure 3. Mackinac Phase Sites Used in Analysis.

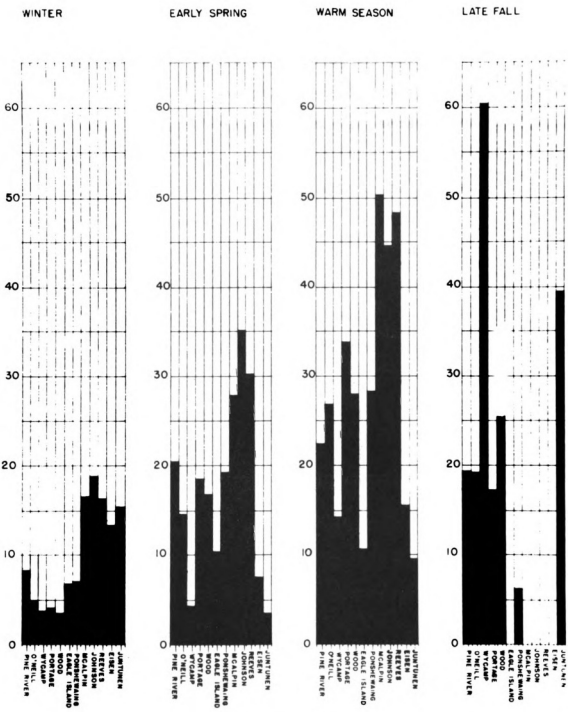

N
LAKE HURON
LAKE MICHIGAN
POINT SCOTT
STRAITS OF MACKINAC
ST. IGNACE
MACKINAC ISLAND
BOIS BLANC IS.
CHEBOYGAN R.
BLACK R.
BLACK LAKE
EIGHT MILE LAKE
REEVES
JOHNSON
SCALPIN
TREE HOUSE
PORTAGE
WALLOON LAKE
EAGLE IS.
WOODS
LITTLE TRAVERSE BAY
PINE RIVER CHANNEL
O'NEILL
CHARLEVOIX
WILLIAMSBURG
INTERMEDIATE LAKE
TORCH LAKE
ELK LAKE
GRAND TRAVERSE BAY
10
0
10
MILES
▲ = WINTER
▲ = EARLY SPRING
● = LATE SPRING THROUGH EARLY FALL
● = LATE SPRING THROUGH EARLY FALL AND/OR LATE FALL
= UNDETERMINED
----BOUNDARY OF MARKING PHASE

CHAPTER III

RESULTS AND COMPARISONS

The first test implication of the hypothesis that the pattern of seasonal movement in the Mackinac Phase duplicated that known from historic times is that interior sites will have high winter resource potential. The null hypothesis states that interior sites will not have high winter resource potential. It is apparent from the analysis of catchments considered here, that sites with a large winter site territory are virtually confined to the interior (McAlpin Johnson, Reeves and Eisen sites) (Fig. 4). The number of square miles with potential winter resources ranges between over 13 to almost 19 at these sites around Black Lake, Burt Lake and Mullett Lake (Fig. 4). All other inland and coastal sites, with the exception of Juntunen, have winter site territories of less than nine square miles. Though the cold season site territory for Juntunen is as high as that of the interior sites, the Juntunen site is a less desireable choice for winter occupation. The Juntunen site is on an island and offers fewer land resources than do the interior sites.

Figure 4. Seasonal Resource Potential of Mackinac Phase Sites.



ALL MEASUREMENTS IN SQUARE MILES

Land resources, such as deer, are important in the winter because they constitute the bulk of foods obtained. Additionally the situation of the Juntunen site in the Straits of Mackinac makes it less protected from severe weather (Fig. 5). Because the interior sites have a greater resource potential for the lean winter season, the null hypothesis is rejected. Therefore, the test implication that interior sites will be high in winter resource potential is confirmed.

The second implication to be tested is that coastal sites will be high in late fall resource potential. The null hypothesis is that coastal sites will not be high in late fall resource potential. Late fall is the period when whitefish and lake trout are found in abundance. These fish constitute a crucial resource that can be stored for the winter. Since they occur in Lake Michigan to a water depth of 180' and in certain streams emptying into the lake (Cleland, personal communication, 1977), late fall resources were certainly confined to the proximity of spawning grounds. Though fall spawning fish can be caught at any coastal site, the late fall site territory is largest at sites north of Little Traverse Bay including the Wycamp Creek and Juntunen sites (Fig. 36 and 40). These sites, especially Juntunen, are closer to the locales where winter resource potential is highest than are coastal sites south from Little Traverse Bay. The more direct route to winter sites on Burt, Mullet and Black

Figure 5. Key to Site Territory Maps.

HABITAT KEY


Sugar Maple, Beech, Hemlock


Spruce, Cedar, Tamarack


White Pine, Aspen


Water


White Pine, Red Pine


Hemlock with White Pine, Elm


Open Marsh


White Pine & Occasional Swamp


Norway, Jack Pine, Oak


Elm, Ash, Maple, Fir,
Spruce, Hemlock


Elm, Red Maple, Ash, Birch,
Cedar, Spruce, Hemlock


Mixed Coniferous with
Some Deciduous

Lakes from the Juntunen and Wycamp Creek sites is via the Straits of Mackinac and the Cheyboygan River. The most expediant means of reaching the winter camps from the Wood, Pine River Channel and O'Neill sites is through the Inland Waterway. Because coastal sites are high in late fall resource potential, the null hypothesis is rejected and the test implication is confirmed.

The third test implication states that coastal sites will be high in warm season resource potential. The null hypothesis is that coastal sites will not be high in warm season resource potential. It can be seen in Figure 4 that the resource potential for the warm season is greatest in the interior (Johnson, McAlpin and Reeves sites). However, to confirm the null hypothesis that warm season resource potential will not be high on the coast is misleading because of the nature of warm season resources. Resources for the warm season are varied in kind, are abundant and are found in various habitats. This contrasts with winter resources which are limited in kind, are few in number and are found in restricted habitats. In winter the size of the territory that can be exploited is of greater importance than in summer, because fewer food resources can be found in one square mile of territory. Thus in assessing the resource potential of winter site territories, the number of square miles in a territory is a useful measure. However, for summer site territories other means of gauging resource potential may be of value.

Certainly the large size of the summer site territories in the interior indicates that the interior is suitable for summer occupation. However, it is maintained here that the coast is equally suited for summer occupation on the basis of resource potential. The fact that the Traverse Corridor is located in an ecotone is of importance. Coastal sites in the Corridor provide access to a greater variety of plants and animals than does the interior. Thus the amount of space that can be exploited in the Corridor is not so crucial because the kinds of warm season resources are more numerous. Therefore, the null hypothesis is rejected and the test implication that coastal sites will be high in summer resource potential is confirmed.

The final test implication to be considered is that interior sites will be high in early spring resource potential. The null hypothesis is that interior sites will not be high in early spring resource potential. Maple sugar was probably the staple resource for early spring. In assessing the availability of maple sugar, it must be remembered that it is a stationary resource that can be exploited in habitats very close to a site. It is unlikely that people would go to the farthest limits of a site territory to obtain maple sugar. Therefore, the number of square miles of maple trees in a site territory is not an accurate measure of the potential of this resource. It can be seen in the site territory maps for early spring that virtually every site is located near maple trees

(Figs. 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28). It appears that this early spring resource is available anywhere in the study area. Therefore, the null hypothesis is rejected and the test implication that the early spring resource potential will be high in the interior is confirmed.

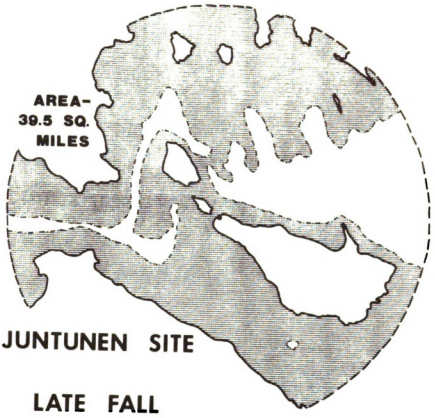
Discussion

Catchment analysis has been used here to assess the resource potential of Mackinac Phase sites in different seasons. This information concerning resource potential must now be considered in testing the hypothesis that the seasonal round in the Mackinac Phase was the same as that practiced in historic times.

The first test implication that interior sites should be high in potential winter resources was confirmed. Furthermore, with the exception of the Juntunen site, coastal and inland sites were relatively low in winter resource potential. It is probable that Mackinc Phase peoples chose to live in the interior during the winter in order to make use of the greater resource potential during this lean season.

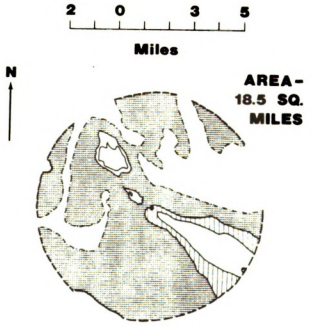
The second test implication that late fall resource potential should be high on the coast was also confirmed. As was the case with winter resources, site territories in other portions of the study area had very little potential for late fall resources. Indeed interior sites had no

Figure 6. Winter and Late Fall Site Territories--Juntunen.



JUNTUNEN SITE

LATE FALL



WINTER

Figure 7. Early Spring and Late Spring Through Early Fall Site Territories--Juntunen.

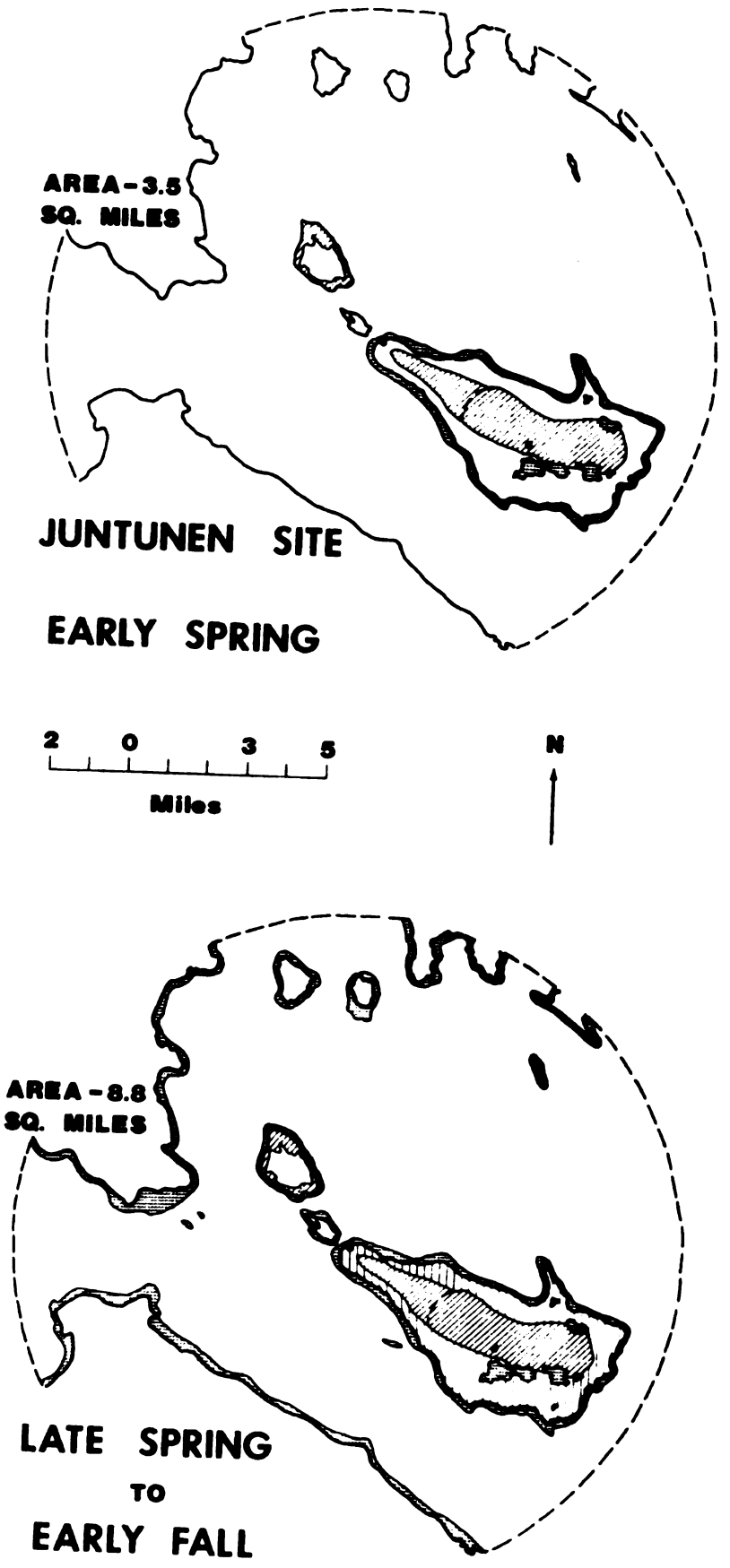

AREA - 3.5
SQ. MILES
JUNTUNEN SITE
EARLY SPRING
2 0 3 5
Miles
N
AREA - 8.8
SQ. MILES
LATE SPRING
TO
EARLY FALL

Figure 8. **Winter and Late Fall Site Territories--Wycamp Creek.**

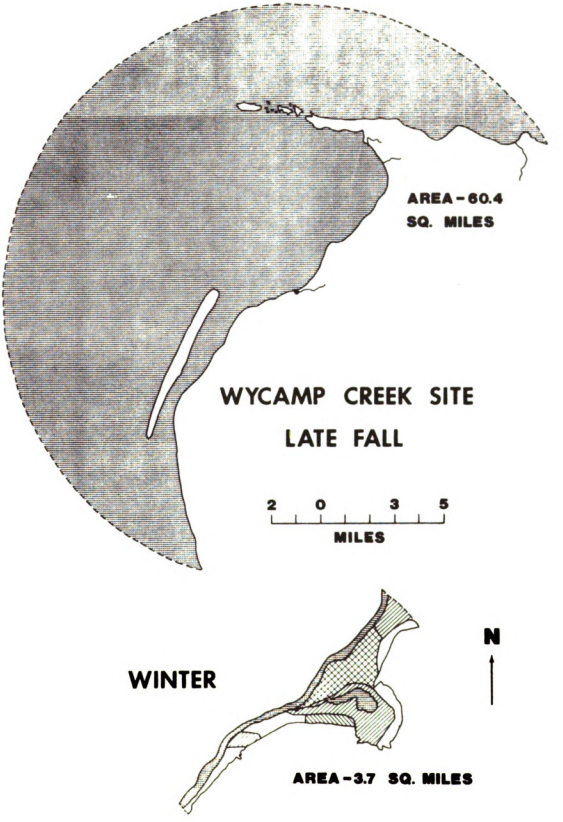

AREA - 60.4
SQ. MILES
WYCAMP CREEK SITE
LATE FALL
2 0 3 5
MILES
WINTER
N
AREA - 3.7 SQ. MILES

Figure 9. Early Spring and Late Spring Through Early Fall Site Territories--Wycamp Creek.

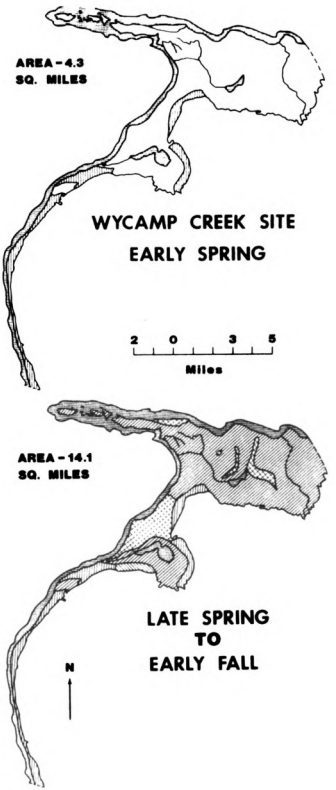
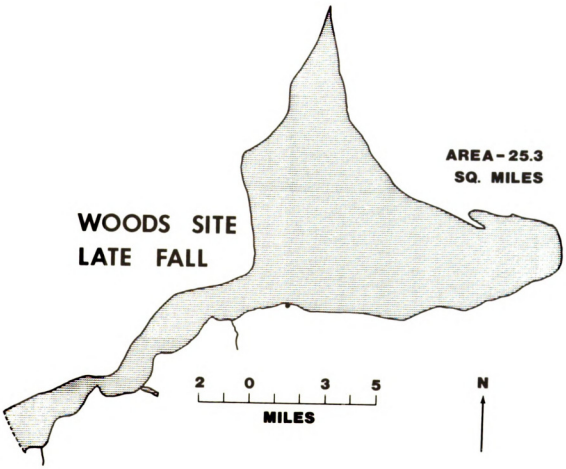

AREA - 4.3
SQ. MILES
WYCAMP CREEK SITE
EARLY SPRING
2 0 3 5
Miles
AREA - 14.1
SQ. MILES
LATE SPRING
TO
EARLY FALL
N

Figure 10. Winter and Late Fall Site Territories--Woods.


AREA - 25.3
SQ. MILES
WOODS SITE
LATE FALL
2 0 3 5
MILES
N

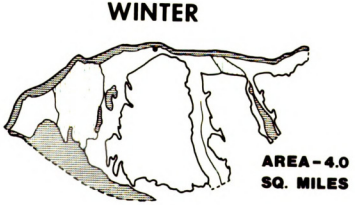
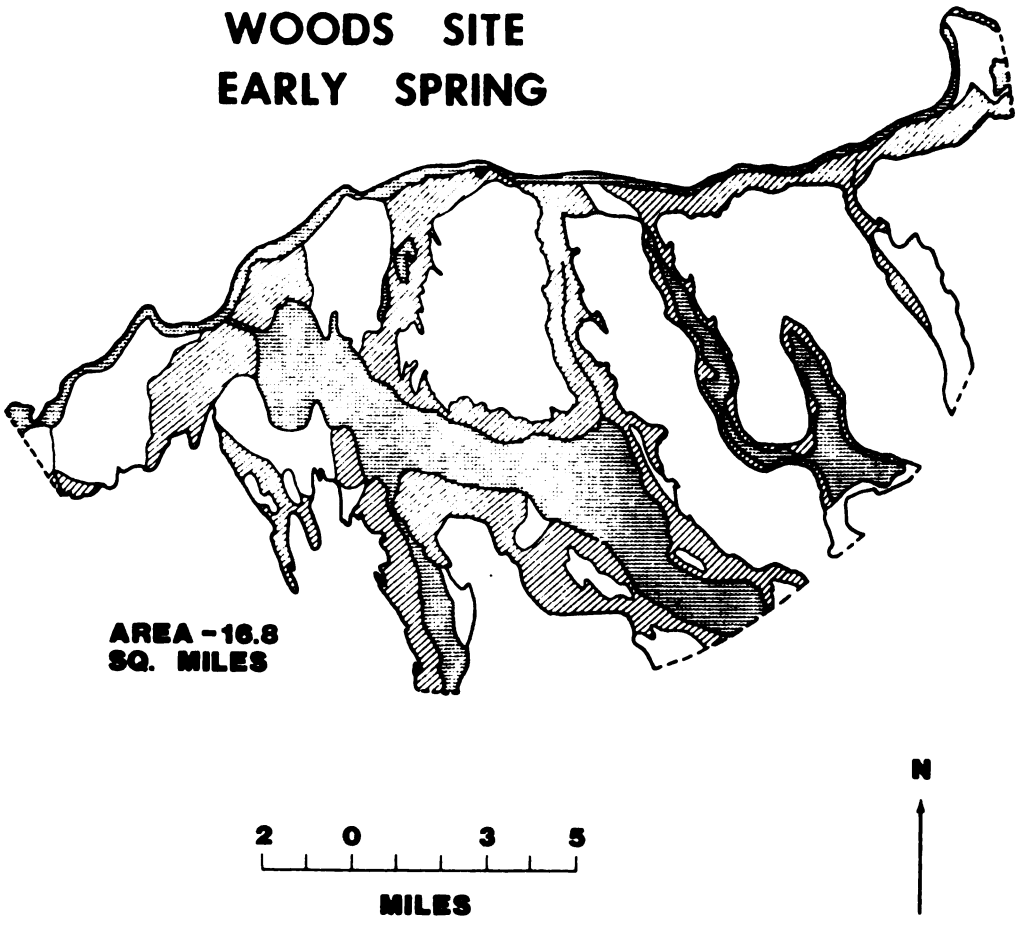

WINTER
AREA - 4.0
SQ. MILES

Figure 11. Early Spring and Late Spring Through Early Fall Site Territories--Woods.


WOODS SITE
EARLY SPRING
AREA - 16.8
SQ. MILES
N
2 0 3 5
MILES

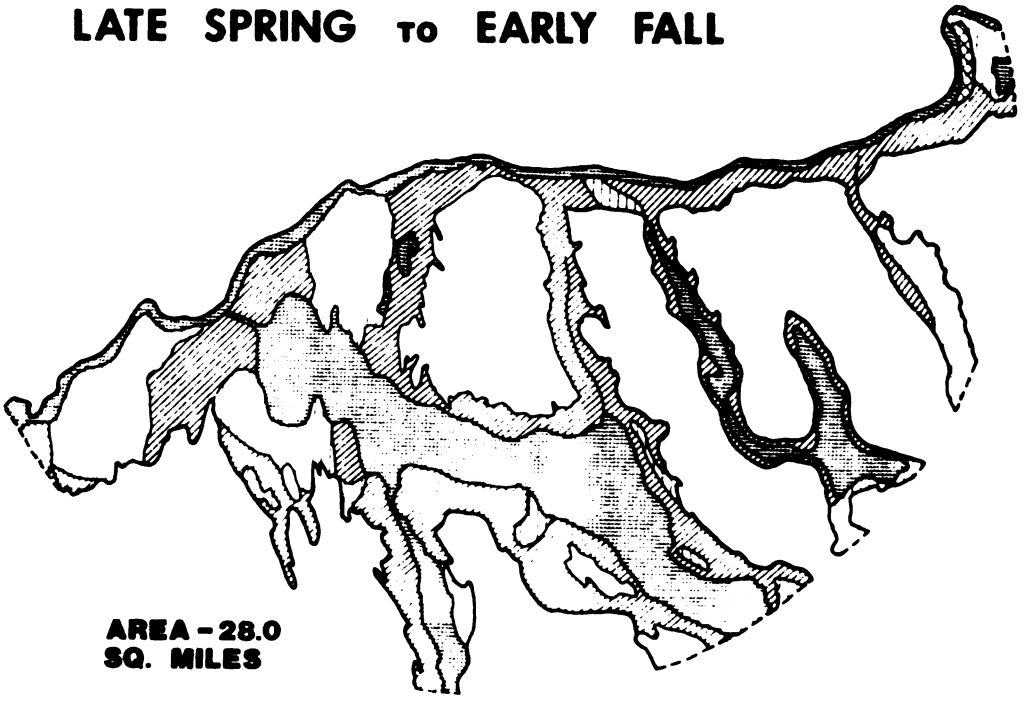
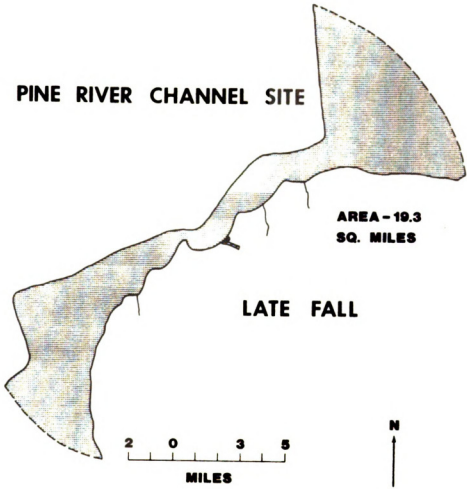

LATE SPRING TO EARLY FALL
AREA - 28.0
SQ. MILES

Figure 12. Winter and Late Fall Site Territories--Pine River Channel.


PINE RIVER CHANNEL SITE
AREA - 19.3
SQ. MILES
LATE FALL
2 0 3 5
MILES
N

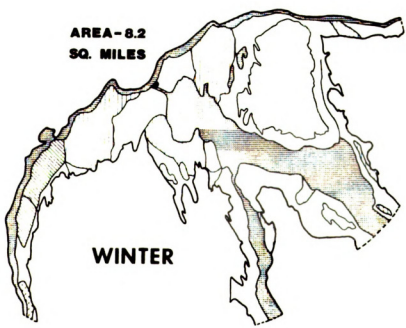

AREA - 6.2
SQ. MILES
WINTER

Figure 13. Early Spring and Late Spring Through Early Fall Site Territories--Pine River Channel.

PINE RIVER CHANNEL SITE

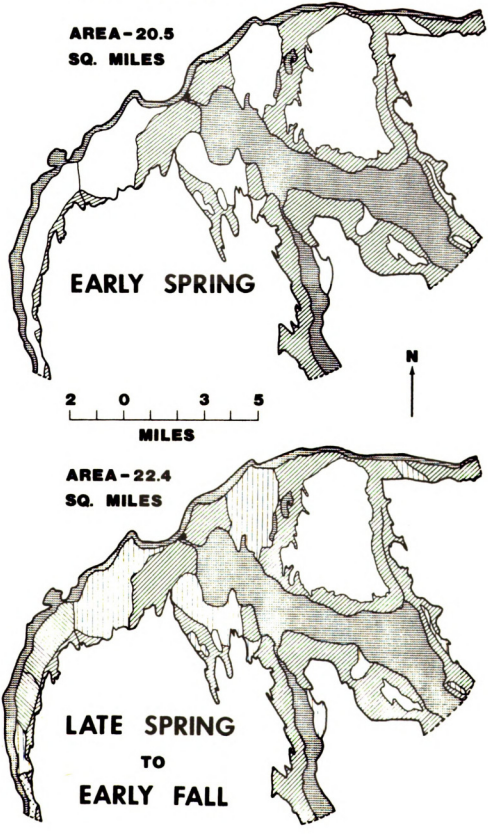
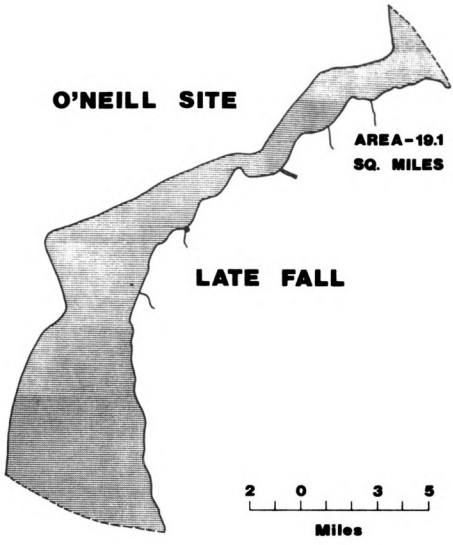


Figure 14. Winter and Late Fall Site Territories--
O'Neill.


O'NEILL SITE
AREA-19.1
SQ. MILES
LATE FALL
2 0 3 5
Miles

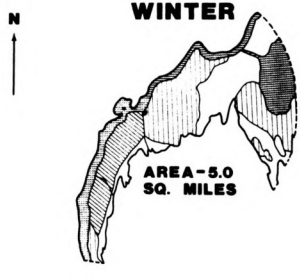

N
WINTER
AREA-5.0
SQ. MILES

Figure 15. Early Spring and Late Spring Through Early Fall Site Territories--O'Neill.

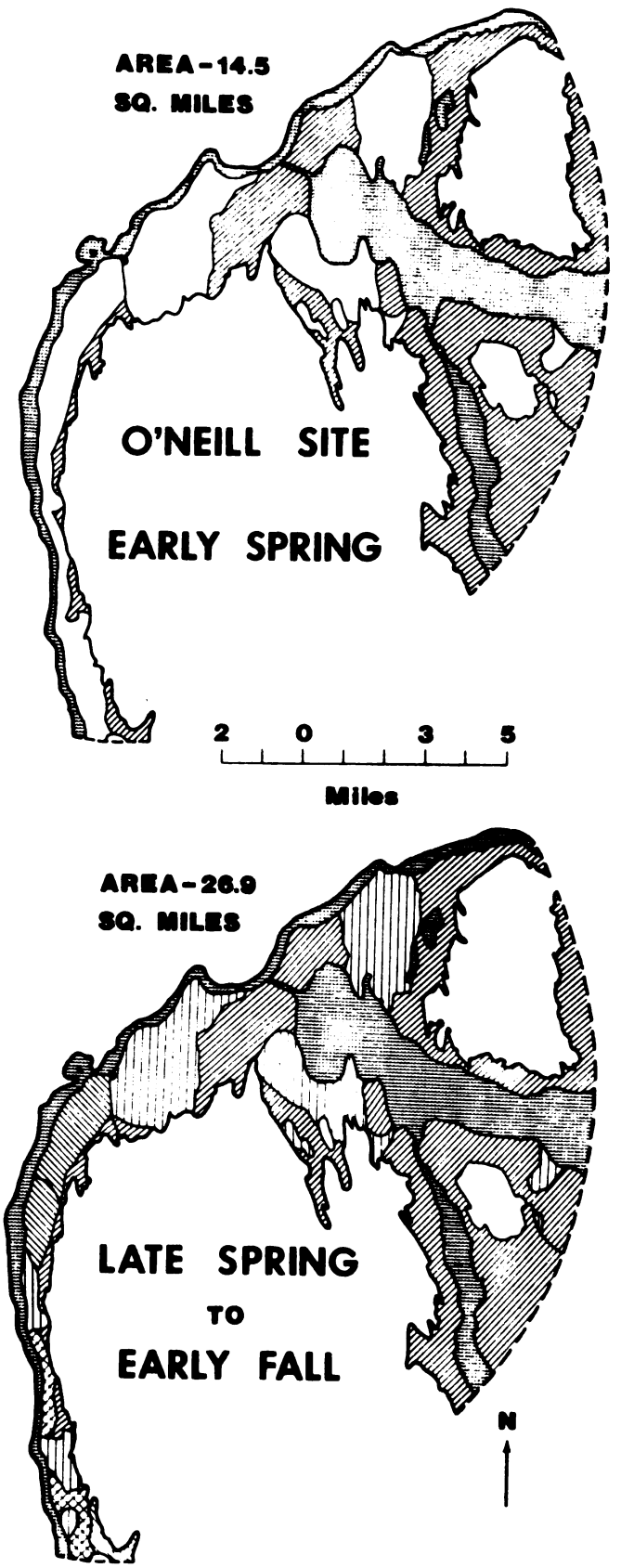

AREA-14.5
SQ. MILES
O'NEILL SITE
EARLY SPRING
2 0 3 5
Miles
AREA-26.9
SQ. MILES
LATE SPRING
TO
EARLY FALL
N

Figure 16. Winter and Late Fall Site Territories--Portage.

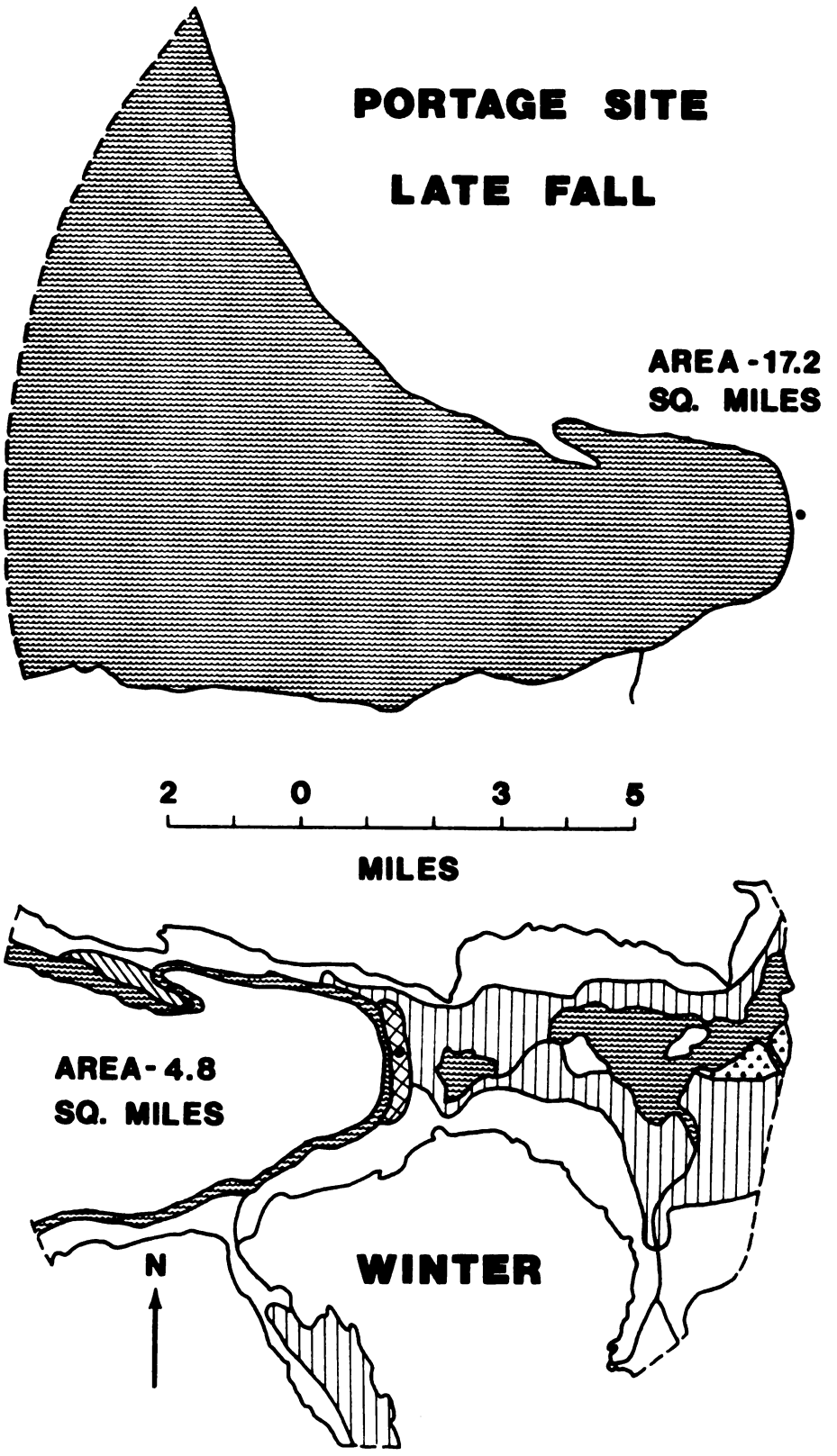
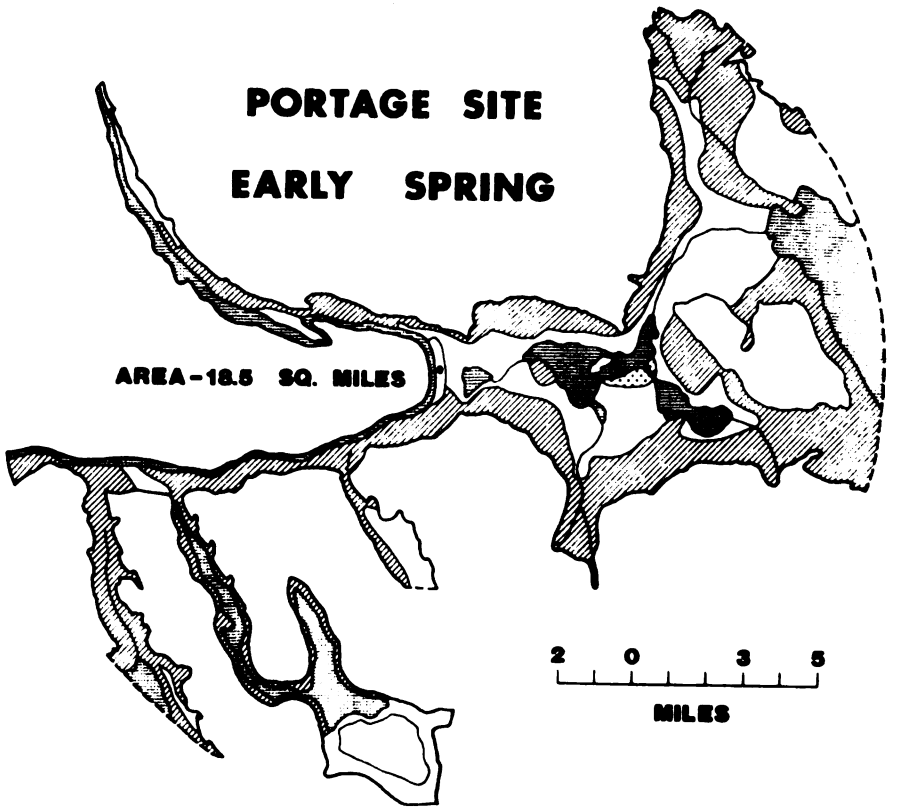

PORTAGE SITE
LATE FALL
AREA - 17.2
SQ. MILES
2 0 3 5
MILES
AREA - 4.8
SQ. MILES
N
WINTER

Figure 17. Early Spring and Late Spring Through Early Fall Site Territories--Portage.


PORTAGE SITE
EARLY SPRING
AREA-18.5 SQ. MILES
2 0 3 5
MILES

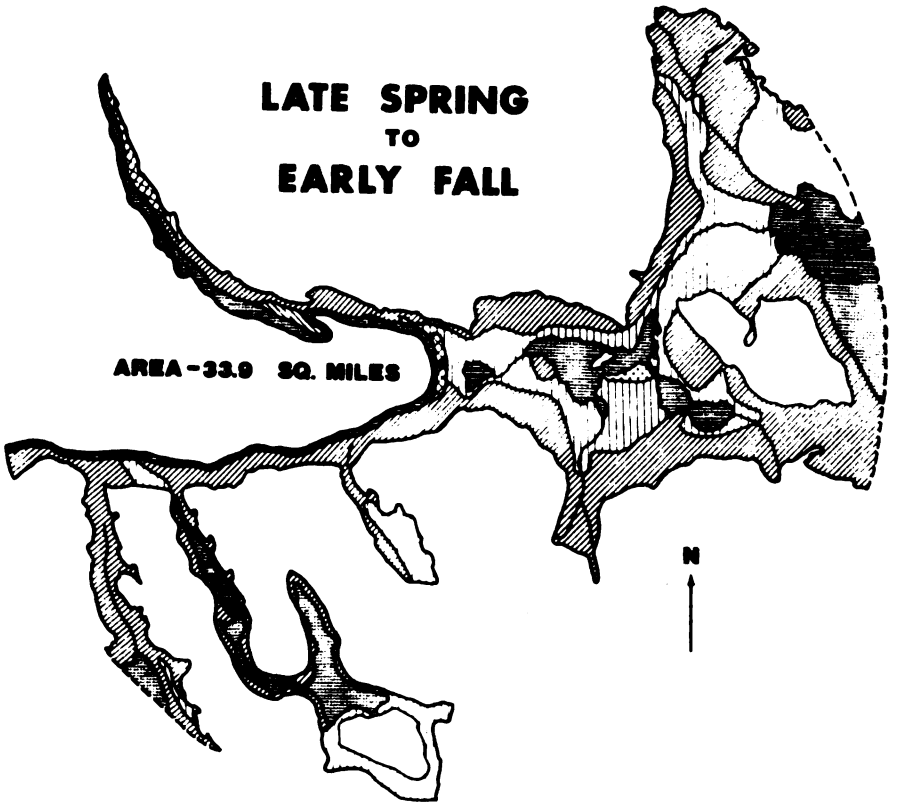

LATE SPRING
TO
EARLY FALL
AREA-33.9 SQ. MILES
N

Figure 18. Winter Site Territory--Eisen.

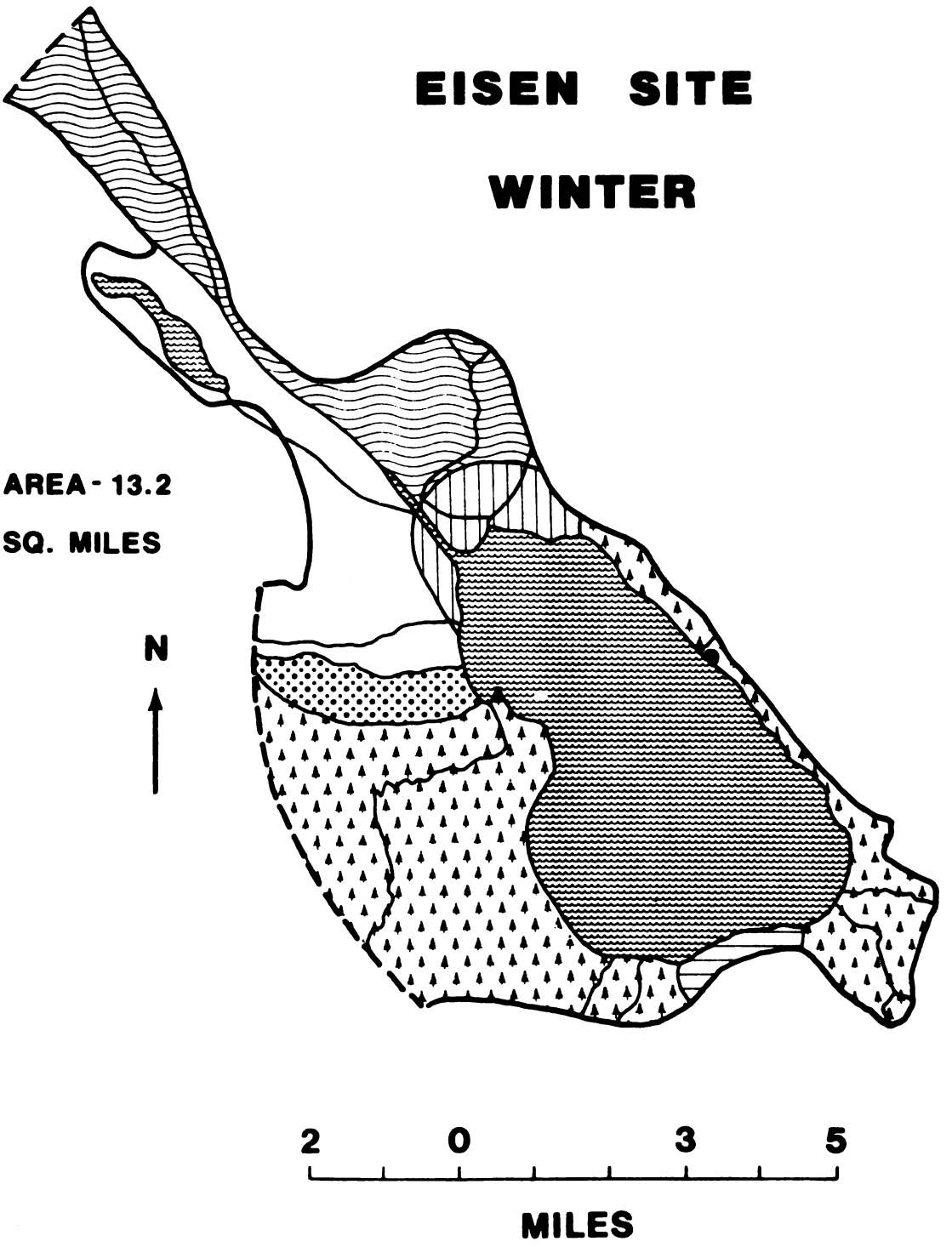
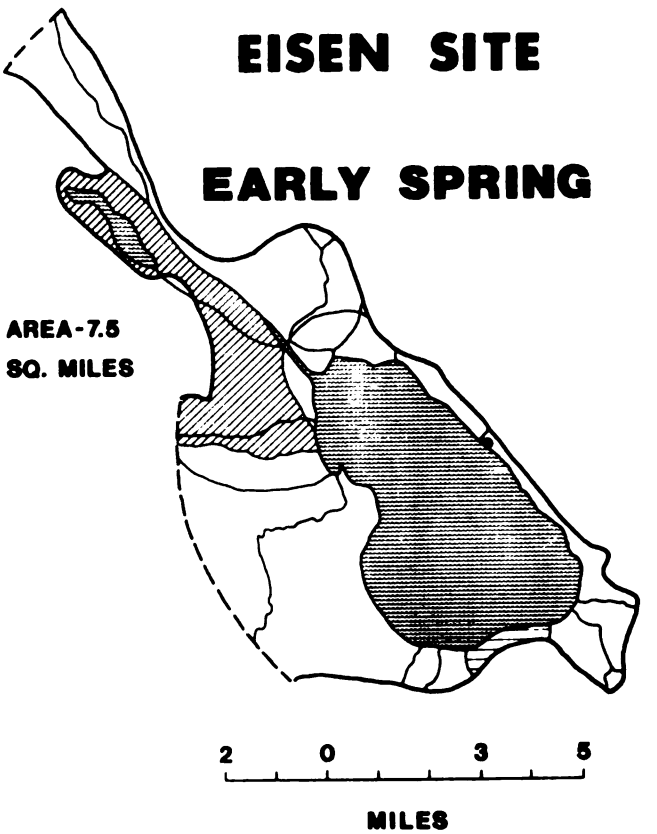

EISEN SITE
WINTER
AREA - 13.2
SQ. MILES
N
2
0
3
5
MILES

Figure 19. Early Spring and Late Spring Through Early Fall Site Territories--Eisen.


EISEN SITE
EARLY SPRING
AREA-7.5
SQ. MILES
2 0 3 5
MILES

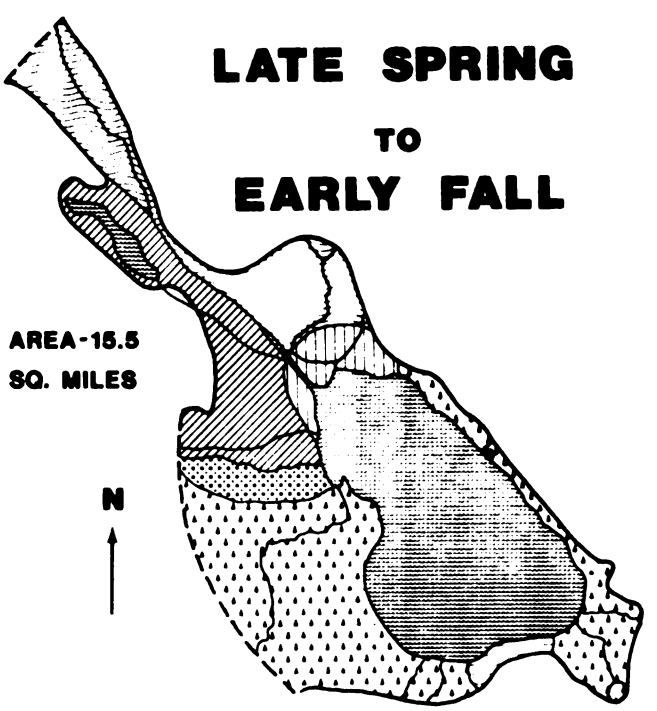

LATE SPRING
TO
EARLY FALL
AREA-15.5
SQ. MILES
N

Figure 20. Winter Site Territory--Johnson.

JOHNSON SITE
WINTER

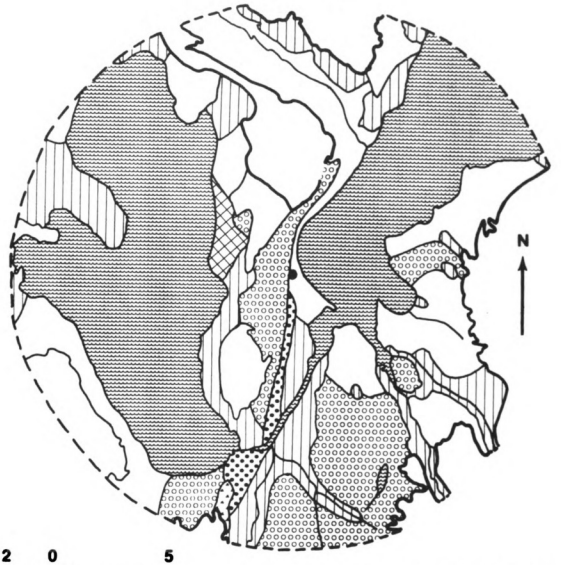


Figure 21. Early Spring and Late Spring Through Early Fall Site Territories--Johnson.

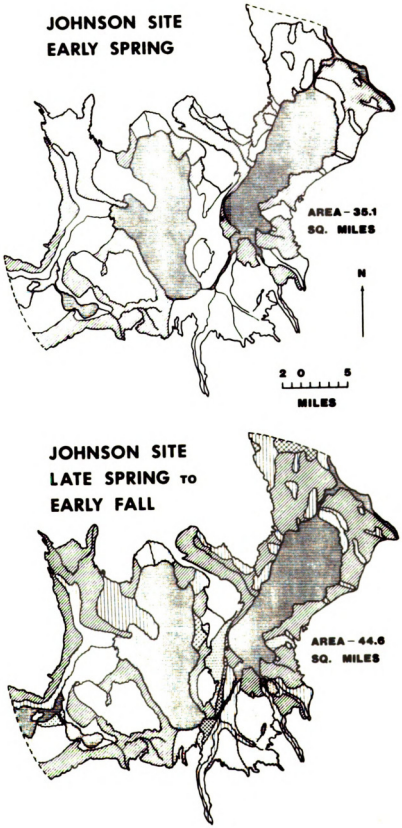

JOHNSON SITE
EARLY SPRING
AREA – 35.1
SQ. MILES
N
2 0 5
MILES
JOHNSON SITE
LATE SPRING TO
EARLY FALL
AREA – 44.6
SQ. MILES

Figure 22. Winter Site Territory--Reeves.

REEVES SITE
WINTER

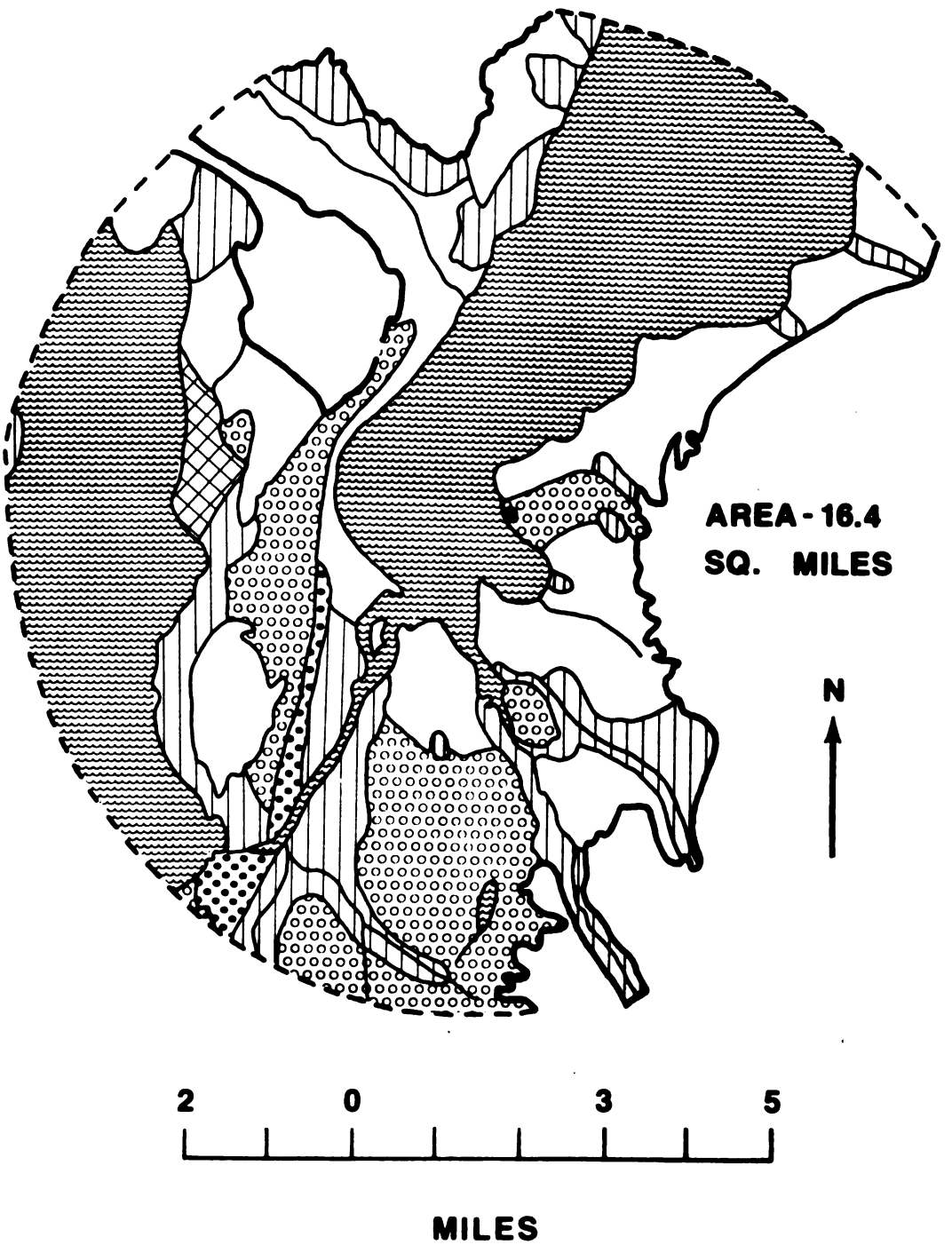
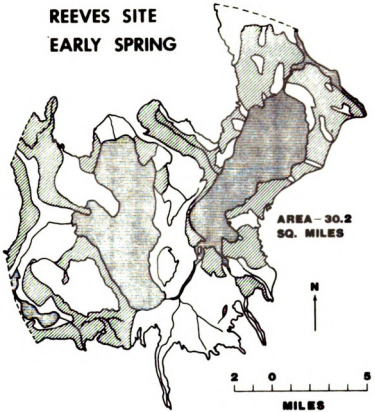


Figure 23. Early Spring and Late Spring Through Early Fall Site Territories--Reeves.


REEVES SITE
EARLY SPRING
AREA – 30.2
SQ. MILES
N
2 0 5
MILES

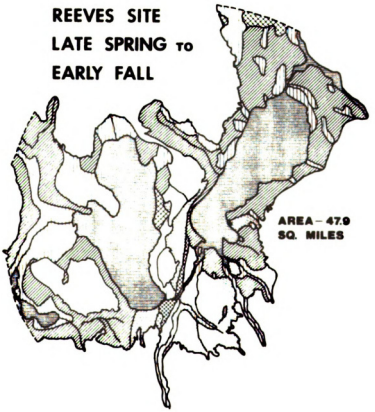

REEVES SITE
LATE SPRING TO
EARLY FALL
AREA – 47.9
SQ. MILES

Figure 24. Winter Site Territory--McAlpin.

McALPIN SITE

WINTER

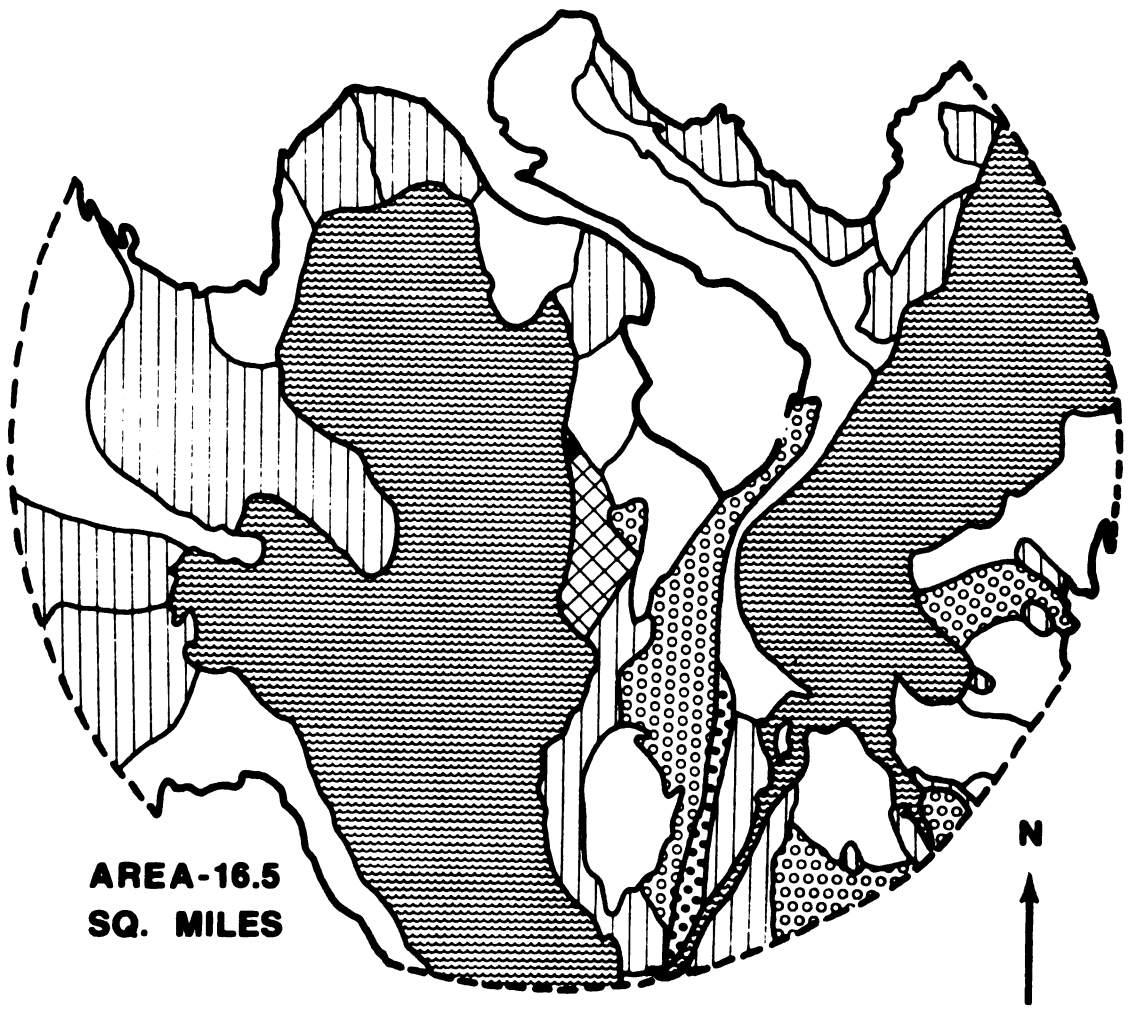
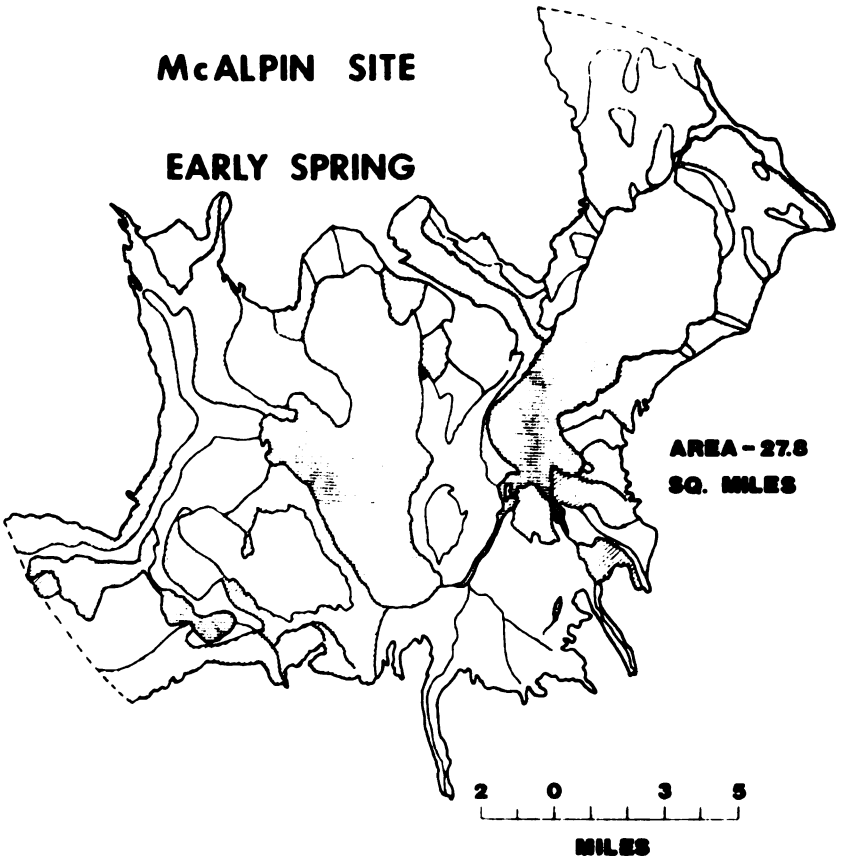


Figure 25. Early Spring and Late Spring Through Early Fall Site Territories--McAlpin.


McALPIN SITE
EARLY SPRING
AREA - 27.8
SQ. MILES
2 0 3 5
MILES

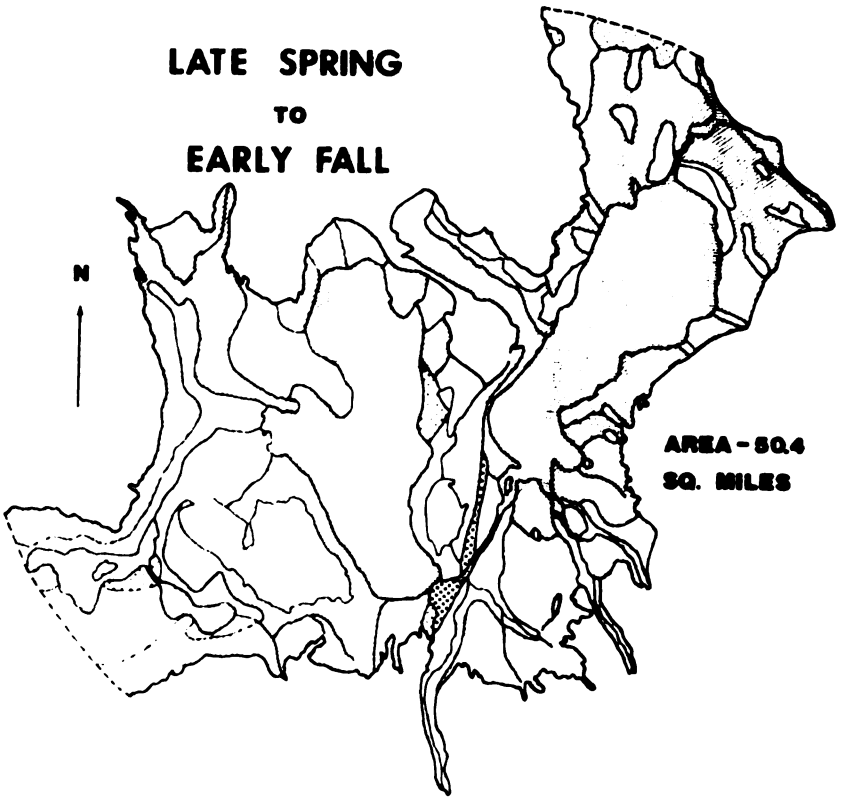

LATE SPRING
TO
EARLY FALL
N
AREA - 50.4
SQ. MILES

Figure 26. Winter and Late Fall Site Territories--
Ponshewaing.

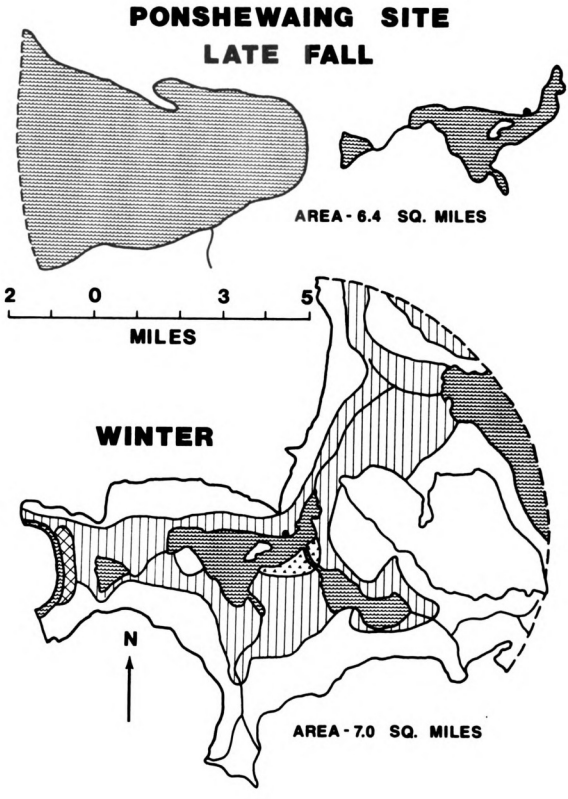
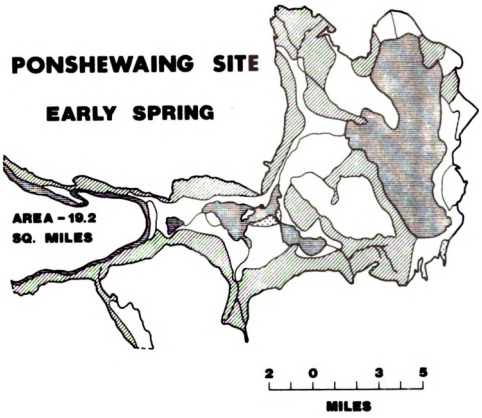

PONSHEWAING SITE
LATE FALL
AREA - 6.4 SQ. MILES
2 0 3 5
MILES
WINTER
N
AREA - 7.0 SQ. MILES

Figure 27. Early Spring and Late Spring Through Early Fall Site Territories--Ponshewaing.


PONSHEWAING SITE
EARLY SPRING
AREA - 19.2
SQ. MILES
2 0 3 5
MILES

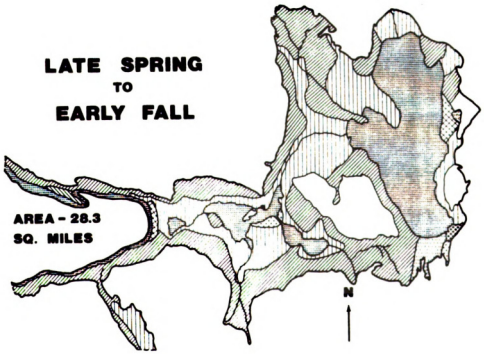
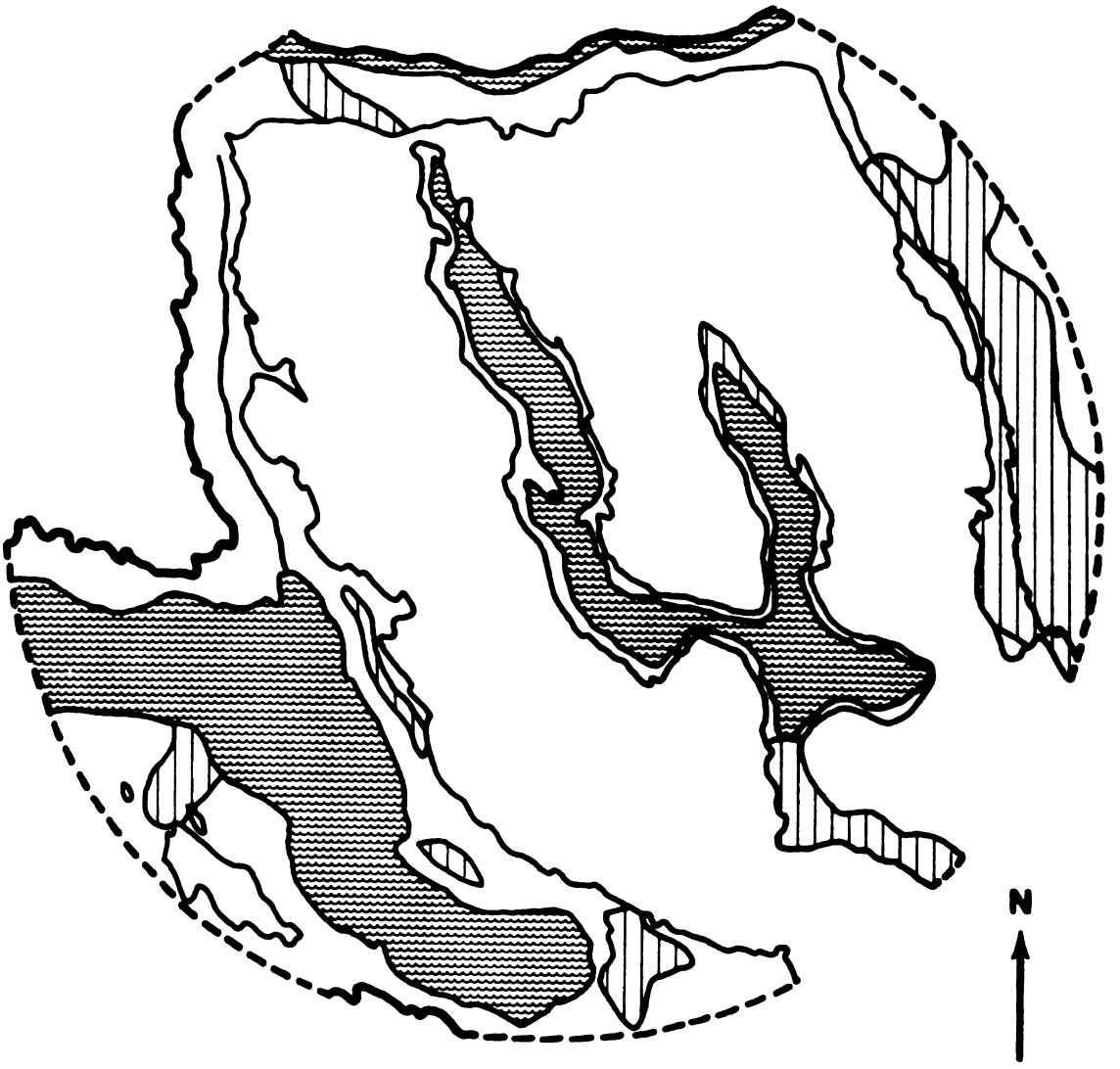

LATE SPRING
TO
EARLY FALL
AREA - 28.3
SQ. MILES
N

Figure 28. Winter and Late Fall Site Territories--Eagle Island.

EAGLE ISLAND SITE

WINTER



2 0 3 5

MILES

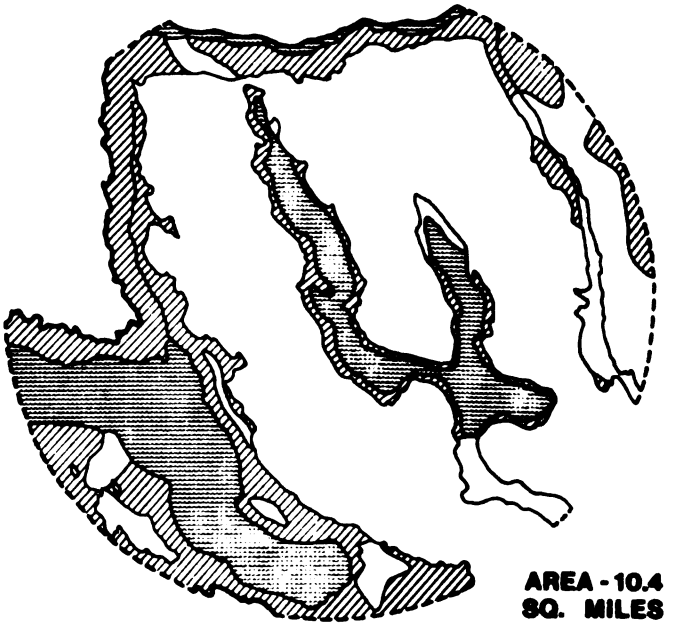
AREA - 6.7

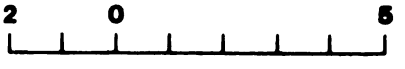
SQ. MILES

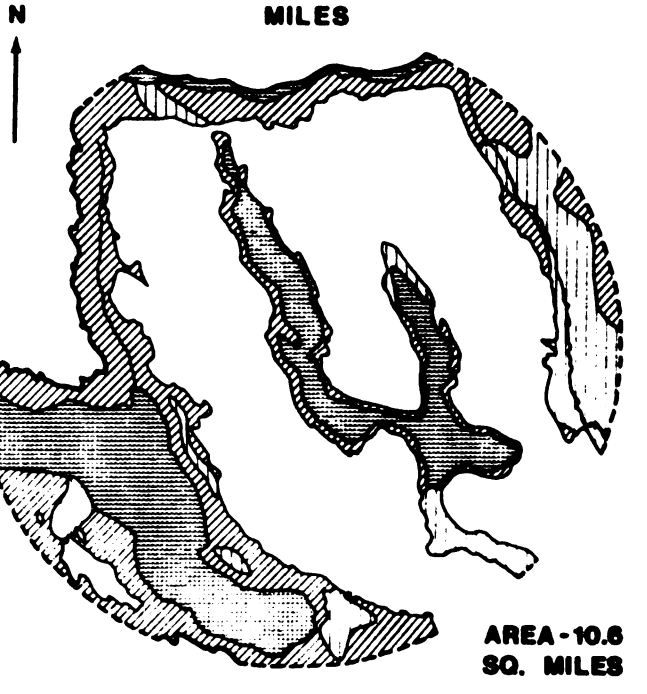
Figure 29. Early Spring and Late Spring Through Early Fall Site Territories--Eagle Island.

EAGLE ISLAND SITE

EARLY SPRING







LATE SPRING
TO
EARLY FALL

habitats within their territories that would yield the late fall spawning fish. It can be said with confidence that Mackinac Phase peoples moved to the coast in the late fall for the purpose of obtaining fish.

The third test implication that coastal sites should be high in warm season resource potential was confirmed. However, the interior also was high in warm season resources. Therefore, in order to maximize the potential for warm season resources, Mackinac Phase peoples could chose to live either on the coast or in the interior.

Finally, the fourth test implication that the interior should be high in early spring resources was confirmed. If maple sugar was the staple resource for early spring, virtually all sites have sufficient resource potential for habitation in that season and Mackinac Phase peoples could have occupied any one of them.

It is apparent from the results of catchment analysis that the seasonal round of the Mackinac Phase has two constraints where the degree of economic latitude is relatively defined. Thus late fall and winter resource potential is high in only a limited portion of the study area and sites for these seasons must be located so as to obtain the resources where they are available. However, the early spring and warm season resource potential provides more latitude as to where sites may be located. Thus for the warm season from late spring through early fall, the resource potential around Burt Lake, Mullet Lake, and

Black Lake is high because of the greater number of square miles of site territory that can be exploited. However, though coastal sites have fewer square miles of territory in the warm season, this is balanced out by the great variety of resources available. Likewise, on the basis of these results, early spring resource potential is high anywhere in the study area and there is a great degree of latitude for site choice on the criteria of the ability to obtain food resources.

Confirmation of the test implications for the winter and late fall supports the hypothesis that movement in the Mackinac Phase was like that of historic times in these two seasons. However, the question remains as to where Mackinac Phase peoples were likely to live in the early spring and warm seasons. These results are not surprising. As previously stated, a site's resource potential does not fully determine its location. Therefore, it becomes necessary to examine other factors to see how they might affect choices on the part of Mackinac Phase peoples as to seasonal site location.

Other Factors Affecting Seasonal Movement

Factors that can be considered relevant to seasonal movement in the Mackinac Phase include the principle of least effort, the necessity of aggregation and the desirability of shelter. The principle of least effort refers to the fact that hunter-gathers normally pursue an

adaptive strategy which involves the minimum expenditure of energy (Jochim, 1976:7). In accordance with this principle, transport and proximity of sites occupied in successive seasons may be important to the choice of site location. Thus it is desirable that energy not be wasted in moving from site to site. The need for aggregation has already been discussed as important for contracting marriages, maintaining the labor pool and creating the opportunity for social interaction (Jochim, 1976:68, 69). Finally, shelter is often a consideration among hunter-gatherers in choosing site locations in certain seasons.

In weighing these factors for the early spring season it is clear that the principle of least effort may be of importance only if early spring sites were located some distance to the south of Little Traverse Bay (Fig. 3). Any other location would be relatively close to sites occupied in the preceding winter season. Thus most sites in the study area can be easily reached from Burt, Mullet, and Black Lakes where winter sites should be found and energy would not be wasted in travel from winter to early spring sites.

The factor of shelter probably was significant in choosing where early spring sites should be in the Mackinac Phase. The weather in the study area is inclement in all locations during the early spring months. Considerations of shelter suggest that protection from cold westerly winds might be better found away from the coast.

The matter of aggregation probably was not given primacy in choosing early spring sites. Though there is evidence that small scale aggregation did occur during the early spring (Bain, 1969:69), this was limited to a few extended families who wintered in the vicinity of one another. Early spring resources would not support large numbers of people.

Thus far it has been ascertained that for reasons of shelter, coastal sites might be least likely to be early spring habitations. The uncertainty of the early spring season suggests another possible clue as to which sites are most likely to be early spring sites. That is that early spring occupation in the interior maximizes the options available to best exploit food resources. Thus if warm weather was slow in coming, mammals that could be hunted to supplement maple sugar would remain in the shelter of the coniferous forests that are more varied in the interior. With regard to hunting, winter conditions would prevail and catchment analysis shows that the interior has greater resource potential than the coast. By remaining within easy reach of this winter resource potential, Mackinac Phase peoples could take advantage of it when necessary. At the same time, should warm weather and the fish runs come early, Mackinac Phase peoples could quickly move to the coast or to a stream emptying into an inland lake.

In summary then, considerations of shelter and maintenance of options in the uncertain early spring favor habitation of noncoastal sites. Which of the interior sites were preferred is not clear at this point.

The principle of least effort is important to the question of which Mackinac Phase sites were warm season sites. In this case it is related to the need for aggregation into groups larger than the extended family. Social activities could occur during the warm season when food resources were predictably abundant. Indeed after the winter spent in isolation, society was probably welcome. Because coastal sites are easily accessible from several directions by water so that people could visit and gather together with little effort, they were probably summer habitation sites. It must be remembered that coastal sites were also occupied during the late fall so that little effort was involved in travel to late fall fishing sites. Indeed a single site could be occupied in both seasons. Summer resources are either terrestrial or obtained at the shoreline, whereas late fall resources are obtained in the waters of the Great Lakes. Therefore, the site territories for these two seasons do not overlap. Resource depletion due to continued occupancy of a site for the two successive seasons cannot occur. Finally, considerations of shelter are not paramount during the warm season. Thus ease of transport and social interaction could be given primacy and favor the argument that coastal sites during the

Mackinac Phase were warm season sites. It will be recalled that this was also the case in historic times.

Indications that sites on the coast were probably warm season sites has a bearing on the question of which sites were early spring sites. A location midway between winter sites on Burt, Mullet, and Black Lakes and warm season sites on the coast would have the effect of maintaining the option of being within easy reach of resources in an uncertain season. At the same time an intermediate locus would involve the least travel effort from winter to spring to warm season sites. In addition there would be little or no overlap of early spring site territories with those of winter and warm season sites. Thus resource depletion from occupying the same territories in succeeding seasons would certainly be avoided. Finally, use of the Inland Waterway as the route to warm season sites provides easy access to all sites on the Lake Michigan coast. The Ponshewaing Point site on Crooked Lake occupies an intermediate location that would serve as a good situation for an early spring site.

Site Comparisons

The postulated settlement system poses a dichtomy in seasonal site location between the coast and the interior. This dichtomy suggests the use of two environmental zones in obtaining food resources. Further, each of the two environmental zones was exploited in different

seasons during which primary emphasis was placed on obtaining different food resources. Because of this difference in resources, technological equipment for seasonally procuring and processing various foods likewise differed to some extent. For example, fishing required equipment different from hunting. The archaeological record should exhibit variation in site assemblages reflecting functional differences in artifacts utilized in the procurement and processing of food resources. However, the situation is complicated by the fact that site artifact assemblages should also show functional overlap because hunting was practiced almost all year, though it was emphasized only in winter, and hunting equipment should always be found. Further, some items, such as ceramic vessels, could be used to process all foods. However, if the coastal-interior division is correct differences in site assemblages between the two zones should be discernible and should follow a consistent pattern. Coastal sites are hypothesized to have been occupied in the warm season and/or late fall. Resources procured during the warm season were diverse and virtually all technological equipment is to be expected at warm season sites. Additionally, some warm season sites, particularly those north of Little Traverse Bay were occupied in the late fall for the purpose of fishing. These dual function sites should exhibit the greatest diversity in artifact assemblages. Interior sites, on the other hand, are expected to differ from one another to a

greater extent than do coastal sites. Interior sites were occupied either in the winter or early spring, but not both. Winter site assemblages should show less variety in kinds of artifacts than do warm season sites because food procurement was directed mainly toward hunting. Early spring sites likewise should exhibit less diverse assemblages because maple sugar was the primary resource. Further, winter and early spring site assemblages should differ from one another since emphasis was placed on different resources in each season. A comparison of Mackinac Phase sites on the coast and in the interior should yield information as to whether this dichotomy with regard to settlement is valid. The following test implications of the hypothesized settlement system can be used to help establish or reject the existence of the proposed settlement system.

1. If the two environmental zones were utilized differently in different seasons, coastal sites should resemble one another more than they resemble interior sites.
2. If coastal sites were occupied during the warm season and late fall when the widest range of activities were performed, their assemblages should closely resemble one another.
3. If noncoastal sites were occupied during winter and early spring when activities involved in food procurement were different and more limited, they

should show greater variation among them than do coastal sites.

Since the best implications are based on degree of similarity between sites, they are amenable to statistical testing. With this in mind, collections from Mackinac Phase sites were examined and the frequency of artifacts at each site was recorded. In addition, the percentage of each kind of artifact as it occurred in each assemblage was determined.

Unfortunately, when artifact frequencies and percentages were viewed in tabular form (Tables 2 and 3) it became apparent that the disparity in site sampling would yield misleading statistical comparisons. For example, a single artifact, such as a drill, from a site with only four test pits occurs as a high percentage of the assemblage. It cannot be determined whether this high percentage of drills is meaningful or an accident of sampling. Thus this site assemblage cannot be legitimately compared with an extensively sampled site where sixteen drills might reflect a low percentage of the assemblage. Additionally, most artifacts occurred in such low percentages that comparisons would be virtually meaningless.

A table prepared showing the kinds of artifacts at each site that were also present at each other site is very revealing as to the nature of the sampling problem (Table 4). Sites are listed according to the extent to which they were sampled. With the exception of the Eisen

Table 2.--Percent of Pottery and Flint in Site Assemblages.

	Pottery	% Pottery	Rims	% Rims	Flint	% Flint	Flint Tools	% Flint Tools
Juntunen	101,542	84%	4750	4%	17,921	16%	660	2%
O'Neill	9,154	19%	- -	- -	34,074	78%	176	1%
Ponshewaing	24,423	74%	531	2%	8,738	27%	368	2%
Pine River	24,644	12%	1088	.5%	182,029	88%	761	1%
Johnson	31,279	95%	550	2%	1,713	5%	273	1%
Wycamp	8,022	31%	287	1%	17,220	67%	476	2%
Eagle Island	9,191	62%	394	3%	5,801	39%	161	2%
Wood	3,383	35%	60	.6%	6,270	64%	161	1%
McAlpin	6,168	76%	209	3%	2,013	24%	73	1%
Halberg	245	21%	- -	- -	906	79%	28	3%
Point Scott	627	58%	11	1%	448	40%	49	5%

Table 3.--Percent of Specific Flint Tools in Total Site Assemblages.

	Projectiles	% Projectiles	Scrapers	% Scrapers	Bifaces	% Bifaces	Knives	% Knives	Drills	% Drills	Gravers	% Gravers	Utilized Flakes	% Utilized Flakes	Retouches Flakes	% Retouched Flakes
Juntunen	154	.1%	245	.2%	44	.04%	--	--	--	--	--	--	--	--	217	.2%
O'Neill	19	.04%	4	.009%	14	.03%	13	.03%	3	.007%	2	.005%	53	.1%	68	.2%
Ponshewaing	31	.09%	41	.1%	64	.2%	3	.009%	5	.02%	--	--	125	.4%	99	.3%
Pine River	83	.04%	83	.04%	258	.1%	73	.04%	16	.008%	5	.002%	1051	.5%	239	.1%
Johnson	8	.02%	10	.03%	5	.02%	--	--	--	--	1	.003%	36	.1%	45	.1%
Wycamp	52	.2%	39	.2%	46	.2%	3	.01%	2	.007%	2	.007%	167	.7%	163	.6%
Eagle Island	28	.2%	6	.04%	19	.1%	2	.01%	6	.04%	--	--	70	.5%	30	.2%
Wood	11	.1%	8	.08%	26	.3%	3	.03%	1	.01%	3	.03%	53	.5%	56	.6%
McAlpin	11	.1%	1	.01%	3	.04%	--	--	1	.01%	--	--	24	.3%	33	.4%
Halberg	2	.2%	2	.2%	2	.2%	1	.008%	--	--	--	--	19	2%	2	.2%
Eisen	3	.2%	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Point Scott	2	.2%	4	.4%	2	.2%	1	.009%	--	--	--	--	29	3%	11	1%

Table 4.--Number of Artifact Classes Shared at Mackinac Phase Sites.

	Juntunen	O'Neill	Ponshewaing	Pine River	Johnson	Wycamp	Eagle Is.	Wood	McAlpin	Halberg	Eisen	Pt. Scott
Juntunen	24	21	17	22	17	17	14	14	13	11	6	10
O'Neill	21	31	20	27	18	21	15	17	13	11	6	13
Ponshewaing	17	20	21	21	17	16	17	15	15	12	8	12
Pine River Channel	22	27	21	32	19	20	16	17	14	12	7	13
Johnson	17	18	17	19	22	14	14	14	13	9	6	11
Wycamp	17	21	16	20	14	21	15	16	13	10	5	11
Eagle Is.	14	15	17	16	14	15	18	15	15	11	7	11
Wood	14	17	15	17	14	16	15	18	14	9	6	11
McAlpin	13	13	15	14	13	13	15	14	16	8	7	11
Halberg	11	11	12	12	9	10	11	9	8	12	5	12
Eisen	6	6	8	7	6	5	7	6	7	5	8	5
Pt. Scott	10	13	12	13	11	11	11	11	11	12	5	13

Sites are ordered according to the extent sampled, beginning with the most extensively sampled site.

Artifact Classes Used in Table 4

debitage
utilized flakes
retouched flakes
cores
bipolar cores
projectile points
scrapers
drills
gravers
knives
unidentified chipped stone
choppers
hammerstones
anvils
celts
adzes
abraders
pestles
netsinkers and/or plummets
unidentified groundstone
gorgets and/or pendants
unidentified slate
grindstones
whetstones
body sherds
decorated sherds
rim sherds
juvenile vessels
effigies
unidentified pottery
copper beads
copper fishhook
copper fragments
copper ring
awls
metates
chisels (beaver tooth)

site which has a disproportionate assemblage, all sites show must artifacts in common with the most extensively sampled sites. As might be expected, the middle range of shared artifacts is with the moderately sampled sites.

Because of the certainty of problems caused by disparity in site sampling, it was decided to forego statistical consideration of the test implications. However, a range of information about each site, including artifact assemblages, will be presented. Then comparisons will be made in light of the test implications. The approach is admittedly a biased one, since in most cases it is based on the judgments of a single observer. Nonetheless, it is worthwhile to present the information so that independent judgments can be made by others. Two sites discussed here, the Point Scott site and the Halberg site were not analyzed in terms of site catchment. In both cases information as to habitat and/or topography was inadequate for preparation of site territory maps.

The Point Scott Site

Location: (Fig. 3)

North shore of Lake Michigan to the west of the Straits of Mackinac. Mackinac County.

Extent and Nature of Excavation:

Four 5 x 5 foot test pits = 100 square feet

Testing in 1967 by University of Michigan field party directed by Dr. James E. Fitting

Dating of Prehistoric Occupation:

Pottery present from Mackinac, Juntunen and possibly Bois Blanc phases.

Impressions and Comments:

The Point Scott site was an historic period fishing village in 1880. Its situation is such that varied aquatic habitats are adjacent to the site. A sketch map prepared by the investigators indicates a rocky beach on the point itself and a sandy beach on the coastline to the east of the point. This suggests somewhat different bottom conditions as well. Site location near two different beach types is comparable to the situation at the O'Neill and Pine River Channel sites on the northeast coast of Lake Michigan. It is suggestive of locating so as to take advantage of varied fish resources offered by the large lake. The faunal material in the site collection includes numerous fish bone. Although some of these are no doubt attributable to the historic occupation, fish must also have been utilized here prehistorically. In addition, both bird and turtle remains were observed in the collection implying at least some occupation during the warm season.

The Point Scott assemblage gives the impression that the site may have been large and intensely occupied. In comparison to the nearby Halberg site (Fig. 3), the number of artifacts found is nearly the same. However, the excavated Halberg site area was greater with a ratio of 5 to 1. In addition, the variation in artifacts was nearly

the same. At the Halberg site 12 different kinds of artifacts appear in the collection, while the Point Scott site collection has 13. Finally, at the Point Scott site a hearth feature was discerned. At the Halberg site no features were recovered.

Table 5.--Artifact Assemblage--Point Scott Site.

Artifact Class	Total	Percent of Assemblage
Debitage	380	35%
Utilized flakes	29	3
Retouched flakes	11	1
Cores	19	2
Bifaces	2	.2
Scrapers	4	.4
Projectile Points	2	.2
Knife	1	.009
Slate	1	.009
Body sherds	589	55
Decorated sherds	26	2
Rim sherds	11	1
Miniature vessels	1	.009
Total	1076	100%

The Halberg Site

Location: (Fig. 3).

North shore of Straits of Mackinac, East of Lakeside Cemetary in Mackinac County.

Extent and Nature of Excavation:

500 square feet excavated by Michigan State University field party under the direction of Dr. Charles E. Cleland in 1967. Five 10 x 10 foot units.

Dating of prehistoric occupation:

Pottery present from Mackinac and Bois Blanc phases.

Impressions and Comments:

The Halberg site seems to have been characterized by relatively minimal and non-intensive occupations. No features were found and the artifact yield was low. Perhaps these were temporary campsites of short duration. Most bones were those of medium to large mammals with possibly some bird. Food resources of this kind might be expected at a short term camp, if the object was to supply enough food for immediate use. It is noteworthy that no fish bone was observed in the collection. Thus it is clear that the Halberg site was not a large fishing village.

There is an historic component at the Halberg site. In terms of artifacts, it too seems minimal. Historic artifacts recovered include clear glass sherds, nails and tin cans.

Table 6.--Artifact Assemblage--Halberg Site.

Artifact Class	Total	Percent of Assemblage
Debitage	876	76%
Utilized flakes	19	2
Retouched flakes	2	.2
Cores	2	.2
Bifaces	2	.2
Knife	1	.08
Projectile points	2	.2
Scrapers	2	.2
Hammerstones	2	.2
Ceramics	243	21
Miniature vessels	2	.2
Copper	1	.08
Total	1154	100%

The Wycamp Creek Site

Location: (Fig. 3). Catchment maps (Fig. 8, 9).

Northeast shore of Lake Michigan where Wycamp Creek empties into the lake north of Cross Village.

Emmet County.

Dating of Prehistoric Occupation:

Middle Woodland: Laurel Wares present.

Late Woodland: Pine River, Mackinac, Bois Blanc and Traverse Wares present

Impressions and Comments:

As is the case with other coastal sites, the Wycamp Creek site is located in conjunction with water resources and transportation routes. Numerous fish bones were observed in the collection. However, the most striking think about the artifact assemblage is the variety of ceramic wares present. For the early period, southern Traverse Corridor Bowerman Ware (Cleland, n.d.) occurs in addition to Pine River and Mackinac wares. The impression gained is that site utilization involved either considerable social interaction, or at least population movement. This site must have been occupied during the warm season when most travel occurred and/or during the late fall fishing period when groups gathered together. In looking at the catchment maps, it is immediately apparent that resource potential at Wycamp Creek is far greater in late fall than it is for any other season (Figs. 8, 9). Thus it is probable that Wycamp Creek was a late fall site.

The Woods Site

Location: (Fig. 3). Catchment maps (Figs. 10, 11).

South shore of Little Traverse Bay at Nine Mile Point.

Extent and Nature of Excavation:

625 square feet excavated in 1967 by Michigan State University field party under the direction of Dr. Charles E. Cleland.

Table 7.--Artifact Assemblage--The Wycamp Creek Site.

Artifact Class	Total	Percent of Assemblage
Debitage	16,615	65%
Utilized flakes	167	.7
Retouched flakes	163	.6
Cores	129	.5
Bifaces	46	.2
Projectile points	52	.2
Scraper	39	.2
Knives	3	.01
Drills	2	.007
Gravers	2	.007
Body sherds	7,458	29
Decorated sherds	268	1
Rim sherds	287	1
Groundstone tools	17	.07
Hammerstones	2	.07
Bone tool	1	.004
Cut stone	1	.004
Pipes	9	.04
Flint nodule	1	.004
Unidentified chipped stone	1	.004
Copper awl	1	.004
Unifacial artifacts	2	.008
Chopper	1	.004
Igneous biface	1	.004
Total	25,358	100%

Dating of Prehistoric Occupation:

Pine River, Mackinac and Juntunen wares present. C-14 - A.D. 1000± 140 (M-2401) in context with Juntunen ceramics.

Impressions and Comments:

The situation of the Woods site on a coastal point provides access both to aquatic resources and transportation routes. As far as it was possible to determine, faunal remains included fish, mammal, bird, and turtle. This range of fauna is comparable to that seen at large sites such as O'Neill, Pine River Channel, and Juntunen. In addition, the presence of Skegemog and Traverse ware vessels from southern portions of the Traverse Corridor (Cleland, n.d.) indicates that the site's location on the coastal transportation route was a factor in settlement. Catchment maps support the argument that the Woods site was occupied during the warm season and/or late fall (Figs. 10, 11).

The site currently has several cottages in the vicinity. In addition, it is probable that portions of it have been bulldozed.

The Portage Site

Location: (Fig. 3). Catchment maps (Figs. 16, 17).

East end of Little Traverse Bay.

Table 8.--Artifact Assemblage--The Woods Site.

Artifact Class	Total	Percent of Assemblage
Debitage	6097	65%
Utilized flakes	53	.5
Retouched flakes	56	.6
Cores	12	.1
Projectile points	11	.1
Knives	3	.03
Scrapers	8	.08
Drill	1	.01
Gravers	3	.03
Groundstone tool	1	.01
Body sherds	3295	34
Decorated sherds	27	.3
Rim sherds	60	.6
Pipes	1	.01
Bifaces	26	.3
Pottery waste	1	.01
Copper bead	1	.01
Chopper	1	.01
Total	9657	100%

Extent and Nature of Excavation:

725 square feet excavated in 1974 and 1975 by Michigan State University field party under the direction of Dr. Charles E. Cleland and Dr. William A. Lovis.

Dating of Prehistoric Occupation:

Mainly a Laurel Middle Woodland site. However, this stratified site had Pine River Ware and Mackinac Ware in upper levels.

Impressions and Comments:

The excavated portions of this site are mainly attributable to the Middle Woodland. However, the site was used during the Mackinac Phase. Current indications are that the site indeed served as a portage. It is located at the nearest point of access for travel between the coast and the Inland Waterway. It's situation is in a flat area behind the sand dunes and adjacent to a north-south break in the dunes. Thus it is protected from the wind. Additionally, goods can easily be carried through the notch in the dunes. The fact that catchment maps indicate a relatively high resource potential for all seasons but winter, suggests the utility of the Portage site as a stopping place in almost any season (Figs. 16, 17).

The Juntunen Site

Location: (Fig. 3). Catchment maps (Figs, 6, 7).

Western end of Bois Blanc Island in the Straits of Mackinac. Mackinac County.

Extent and Nature of Excavation:

4750 square feet excavated by University of Michigan field parties under the direction of Alan McPherron in 1960 and 1961. Published reference: McPherron, 1967.

Dating of Prehistoric Occupation:

Mackinac, Bois Blanc and Juntunen phase pottery present. C-14: early Late Woodland dates = A.D. 835± 75 (M-1142; Crane and Griffin, 1961). A.D. 910± 75 (M-1141; Crane and Griffin, 1961).

Impressions and Comments:

Published research of the Juntunen site indicates that it was primarily a fishing station. Occupation could have occurred at any season. Catchment analysis is supportive of this conclusion. However, the site was certainly inhabited during the late fall and in the summer.

The O'Neill Site

Location: (Fig. 3). Catchment maps (Figs. 14, 15).

Mouth of Inwood Creek where it joins Lake Michigan south of the City of Charlevoix. Charlevoix County.

Extent and Nature of Excavation:

3675 square feet excavated by Michigan State University under the direction of Dr. Charles E. Cleland in 1969 and 1971.

Table 9.--Artifact Assemblage--The Juntunen Site.

Artifact Class	Total	Percent of Assemblage
Body sherds	96,636	80%
Rim and decorated sherds	4,750	4
Miniature vessel sherds	91	.008
Debitage	16,178	13
Cores	1,083	.9
Projectile points	154	.1
Bifaces	44	.04
Scrapers	245	.2
Retouched flakes/causal scrapers	217	.2
Groundstone artifacts	5	.004
Celt	1	.00008
Adze	1	.00008
Slate artifact	1	.00008
Red palette	1	.00008
Hammer/anvil	20	.02
Copper lumps	670	.6
Copper awls	57	.05
Copper knives	8	.007
Copper beads	25	.02
Copper pendants	2	.002
Triangular copper point	1	.00008
Conical copper point	1	.00008
Other copper	12	.001
Bone awls	69	.06
Bone harpoon points	9	.007
Incisor tools	26	.02
Bone tubes	7	.006
Bone needle	1	.00008
Pipes	65	.05
Total	120,388	100%

Dating of Prehistoric Occupation:

Mackinac and Juntunen wares present

C-14: early Late Woodland date = A.D. 1000±140 (M-2401).

Published reference: Lovis, 1973, Ph.D. dissertation, Michigan State University.

Impressions and Comments:

The O'Neill site, like the Pine River Channel site, is essentially a warm season occupation. Catchment analysis supports this conclusion, since the site is high in warm season resource potential. Faunal and floral remains are very similar (Lovis, 1973 and Nancy Nowak, personal communication, 1977). Additional, both sites were clearly the locus of stone tool making.

The Pine River Channel Site

Location: (Fig. 3). Catchment maps (Figs. 12, 13).

North shore of the Pine River Channel where it empties into Lake Michigan at the City of Charlevoix. Charlevoix County.

Extent and Nature of Excavation:

2513 square feet excavated by Michigan State University field parties under the direction of Dr. Charles E. Cleland and Dr. William A. Lovis.

Reference: Appendix A this volume.

Dating of Prehistoric Occupation:

Mackinac, Bois Blanc and Juntunen ceramics present.

Table 10.--Artifact Assemblage--The O'Neill Site.

Artifact Class	Total	Percent of Assemblage
Debitage	33,716	77%
Utilized flakes	53	.1
Retouched flakes	68	.2
Cores	181	.4
Bifaces	14	.03
Projectile points	19	.04
Knives	13	.03
Scrapers	4	.009
Drills	3	.007
Gravers	2	.005
Ceramics	9194	19
Chipped chopper	1	.002
Other bifaces	4	.009
Netsinkers	3	.007
Anvils	2	.005
Hammerstones	10	.02
Grindstones	3	.007
Whetstone	1	.002
Slate and shale	192	.4
Gorget	1	.002
Pendant	1	.002
Slate knife	1	.002
Abrader	2	.005
Other groundstone	7	.001
Copper bead	1	.002
Copper knife	1	.002
Copper fragments	3	.007
Stone pipe	1	.002
Ceramic pipe	1	.002
Bone awl	2	.005
Bone chisel	1	.002
Other bone	6	.01
Total	43,520	100%

C-14: A.D. 1110±80 (N-1266; Yamasaki, Hamada, and Hamada, 1974).

Impressions and Comments:

The Pine River Channel site is a warm season village where stone tool making was a primary activity. It closely resembles the O'Neill site both in artifact content of the assemblage and in floral and faunal remains. Likewise the catchment maps for the two sites show a high potential for warm season resources.

The Eisen Site

Location: (Fig. 3). Catchment maps (Figs. 18, 19).

Northeast shore of Black Lake. Cheboygan County.

Extent and Nature of Excavation:

Test trenches and test pits excavated by amateur crew trained and directed by Mr. Leonard Giffin in 1963. Published reference: Leonard Griffin, 1969.

Dating of Prehistoric Occupation:

Pottery present from Mackinac Phase only.

Impressions and Comments:

An unusual aspect of the Eisen site is the startling lack of chipped stone artifacts. Only three chipped stone projectile points were found. Mr. Richard Albyn, a member of the crew who generously provided further information, confirms the data provided in Mr. Griffin's publication. He recalls that there was no debitage found. Large amounts of pottery, including pipe fragments and small wads of

Table 11.--Artifact Assemblage--The Pine River Channel Site.

Artifact Class	Total	Percent of Assemblage
Debitage	181,005	87%
Utilized flakes	1,051	.5
Retouched flakes	239	.1
Cores	263	.1
Bifaces	258	.1
Projectile points	83	.04
Knives	73	.04
Scrapers	83	.04
Drills	16	.008
Gravers	5	.002
Hammerstones	14	.007
Anvils	2	.0009
Celts	4	.002
Adzes	2	.0009
Abraders	3	.001
Pestles	2	.0009
Netsinker	1	.0005
Chopper	1	.0005
Other groundstone	5	.002
Gorget	3	.001
Slate	10	.005
Slate fragments	82	.04
Copper beads	2	.0009
Copper fishhook	1	.0005
Copper awls	2	.0009
Copper fragments	3	.001
Body sherds	22,794	11
Decorated sherds	712	.3
Rim sherds	1,088	.5
Miniature pots	42	.2
Pipes	8	.004
Other chipped stone	4	.002
Total	207,861	100%

fired clay were found. It is difficult to attribute this entirely to sampling error. The situation is similar at the Johnson site on Mullet Lake. While the Johnson site was more extensively excavated and stone artifacts were found, they occur in low frequency. Both sites are located some distance from outcrops of Norwood chert at Lake Michigan. Thus stone artifacts, including debitage is to be expected. Additionally, however, it can be assumed that stone tool manufacture was not intended to be of importance at either site. Therefore, it was not a factor in choice of site location.

Another aspect to consider with regard to the Eisen site is its situation somewhat out of the way of the main water routes. While travel is certainly possible, it too was probably not of importance in choosing the Eisen site. Therefore, it appears that the site was located primarily to exploit resources rather than for the purposes of social interaction. Such would be the case for a winter occupation. This is in accord with catchment analysis which shows the site to be high in winter resources. The immediate environment is characterized by low swamp near the lake shore. The site is on well-drained higher land along a small stream which empties into the lake.

Historic occupation of the Eisen site for earlier periods is not known. However, presently there are cabins in the vicinity. The site appears to be undisturbed.

Table 12.--Artifact Assemblage--The Eisen Site.

Artifact Class	Total	Percent of Assemblage
Projectile points	3	.2%
Slate netsinker (plummet)	1	.06
Ceramics	1600	99
Pipes	4	.2
Clay lumps	?	?
Total	1608	100%

The Johnson Site

Location: (Fig. 3). Catchment maps (Figs. 20, 21).

West side of Mullet Lake about 2½ miles south of Topinabee. Cheboygan County.

Extent and Nature of Excavation:

1750 square feet excavated by Michigan State University field parties under the direction of Dr. Charles E. Cleland and Dr. William A. Lovis in 1974 and 1975.

Dating of Prehistoric Occupation:

Laurel Middle Woodland wares present.

Late Woodland represented by Mackinac, Bois Blanc and Juntunen ceramics.

Impressions and Comments:

The Johnson site, like the Eisen site is located on a dry spot slightly inland from the lake. In this case

too, the area between the site and the shore is low and is currently somewhat swampy. The site is protected from the elements by a Nipissing beach ridge to the west. This aspect of protection is well illustrated by the fact that all occupational debris is compacted together. Thus the first pottery concentration uncovered contained sherds from all phases of the Late Woodland plus Laurel sherds as well. In addition, there are no signs of soil deposition or erosion in any portion of the site (William Monaghan, personal communication, 1977).

There are a number of interesting aspects about artifacts found at the Johnson site. One is that though the frequency of all chipped stone, including debitage, is low, bipolar cores are the most common artifact (Table 12). Some of these appear to have been made from flakes rather than worked as cores. All are small and would yield only diminuative flakes for tool making. It is true that the site is far from a reliable chert source and cores would thus be worked to the limit of usefulness. However, these bipolar cores look like tools. Some specialized activity making use of them is suggested.

Two unusual artifacts were recovered from the Johnson site. These were large groundstone metates. The first assumption was that they were used for grinding plant foods. However, the paucity of plant remains from the site as compared with other sites in the study area (Nancy Nowak, personal communication, 1977) argues against

this. Another possibility is that they were used for pounding meat (William Lovis, personal communication, 1977). Unfortunately, there is very little animal bone too, so the problem cannot be resolved.

Other unusual artifacts found at the Johnson site are a fired clay bear effigy and several effigy fragments. The fragments include a bear's head and pieces of an unidentified animal. The bear, at least, was associated with the remains of a fire. This suggests some ritual activity, perhaps for hunting magic.

The presence of features, postmolds and the heavy groundstone metates argues for the use of the Johnson site as a base camp of some kind. The fact that it is protected from windy weather poses the possibility that it was used at least during the winter. Catchment analysis shows that the Johnson site is highest in the study area in winter resource potential. On the basis of early spring and warm season resource potential, it could have been occupied in these seasons as well.

Historical disturbance of the Johnson site is minimal. A logging operation took place there, but few historic artifacts were found.

The Reeves Site

Location: (Fig. 3). Catchment maps (Figs. 22, 23).

Southeast shore of Mullet Lake. Cheboygan County.

Table 13.--Artifact Assemblage--The Johnson Site.

Artifact Class	Total	Percent of Assemblage
Debitage	1,348	4%
Utilized flakes	36	.1
Retouched flakes	45	.1
Cores	92	.3
Bifaces	5	.02
Projectile points	8	.02
Scrapers	10	.03
Gravers	1	.003
Fired clay lumps	79	.2
Body sherds	27,855	85
Decorated sherds	2,667	8
Rim sherds	550	2
Pipe fragments	128	.4
Effigy fragments	18	.05
Hammerstones	7	.02
Groundstone	45	.1
Copper	12	.04
Iron pyrite	1	.003
Total	32,907	100%

Extent and Nature of Excavation:

Survey collection by Michigan State University field party in 1974 under the direction of Dr. Charles E. Cleland and Dr. William A. Lovis.

Impressions and Comments:

The Reeves site, like the Eisen site, is situated on a small stream where it empties into the lake. There is presently a house on the property where the site occurs. An assessment of the nature of the occupation would be premature, because the collection is minimal. However, attributes of its location suggest that it may be similar to the Johnson and/or Eisen sites.

Table 14.--Artifact Assemblage--The Reeves Site.

Artifact Class	Total
Debitage	25
Ceramics	5
Total	30

The McAlpin Site

Location: (Fig. 3). Catchment maps (Figs. 24, 25).

Northeast shore of Burt Lake. Cheboygan County.

Extent and Nature of Excavation:

550 square feet excavated in 1974 and 1975 by Michigan State University field parties under the direction of Dr. Charles E. Cleland and Dr. William A. Lovis.

Dating of Prehistoric Occupation:

Pine River, Mackinac, Bois Blanc and Juntunen wares present.

Impressions and Comments:

The McAlpin site is at least 475 yards long. Because excavation of only about 90 yards at the south end was possible, it is probable that the sample obtained is not representative of the site. The excavated portion is bounded by a steep bank at the lake and by a high Algonquin beach ridge about 50 feet inland. Thus this part of the site is very narrow. The remainder of the site is at least three times wider because the shoreline has a more gentle slope and the beach ridge bends away further to the east. The excavated ceramic assemblage consists almost entirely of early Late Woodland material. However, survey of the northern end of the site produced Juntunen Ware as well.

The excavation of the McAlpin site yielded the impression that the site was unusual in comparison to others in the Inland Waterway. Though the artifact inventory was similar to other sites, there were no postmolds and only one possible feature. Fire-cracked rock was so numerous that it could not be discarded, but had to be reserved for backfill. In addition, there were high quantities of mussel shell. The site appears to have been occupied for periods of short duration. Possibly some special activity, such as maple sugaring was carried out there. Quantites of fire-cracked rock in the absence of

hearths or roasting pits might characterize such a site. In addition, mussels are certainly not a preferred resource in the area. These might well be obtained mainly in the lean periods, such as early spring.

The site has a relatively high resource potential for all seasons except late fall. A factor of some importance lies in the fact that nowhere is the McAlpin site well protected from the wind. Despite a high winter resource potential this argues strongly against a winter occupation. Likewise it would not provide shelter in early spring.

During historic times the northern portion of the site was a landing for boats crossing Burt Lake. Perhaps it served this purpose prehistorically as well. Thus it might have served as a short term camp for people in transit. Currently summer homes are being built on the site and large amounts of it will be destroyed before excavation can take place.

The Ponshewaing Point Site

Location: (Fig. 3). Catchment maps (Figs. 26, 27).

Northeast shore of Crooked Lake. Emmet County.

Extent and Nature of Excavation:

3100 square feet excavated by Michigan State University field parties in 1967 and 1970 under the direction of Dr. Charles E. Cleland.

Table 15.--Artifact Assemblage--The McAlpin Site.

Artifact Class	Total	Percent of Assemblage
Debitage	1931	23%
Utilized flakes	24	.3
Retouched flakes	33	.4
Cores	9	.1
Bifaces	3	.04
Projectile points	11	.1
Scrapers	1	.01
Drills	1	.01
Body sherds	5802	71
Decorated sherds	146	2
Rim sherds	209	3
Minature vessel sherds	11	.1
Pipes	2	.02
Copper ring	1	.01
Clay wads	34	.4
Groundstone	1	.01
Total	8219	100%

Dating of Prehistoric Occupation:

Pine River, Mackinac, Bois Blanc and Juntunen Phase ceramics present.

Impressions and Comments:

Though in the Ottawa language Ponshewaing means "winter home," there are some characteristics of this site that suggest a warmer season of occupation. One of these is the presence of a greater number and variety of plant seeds than was found further inland at the Johnson site (Nancy Nowak, personal communication, 1977). Another is that a relatively large quantity of turtle shell was observed in the collection. This floral and faunal evidence in itself is not, of course, conclusive proof of warm season occupation. All sites subjected to floral analysis yielded seeds of plants gathered in warm season and historically plants were preserved for later use (Nancy Nowak, personal communication, 1977). Turtle shell can be utilized for artifacts and may be present for that reason. However, such evidence provides an indication of warm weather site utilization.

An additional indicator of site utilization in seasons other than winter is provided by ceramic materials. Four vessels of Bowerman Ware and three of Skegemog Ware were found. These wares defined by Dr. Charles E. Cleland (n.d.) are characteristic of sites in the southern portion of the Traverse Corridor. Their presence at the Ponshewaing Point site is suggestive of travel or trade with

people of this more southerly area. Since the site is accessible from both the coast and Inland Waterway during ice free seasons, movement of peoples is likely to occur then.

Interestingly, despite the suggestion of some use of the site during warm periods, the Ponshewaing Point site shares some characteristics with the Johnson site. Unfortunately, it is not known whether these are the result of winter occupation or some other factor. Like the Johnson site, the occupation at Ponshewaing Point is very compacted and lacks the one or two foot deep black midden found on coastal sites. This could be due to the nature of soil deposition. Certainly at the Johnson site there was little or no depositing of new soil over the years. This is due to the fact that the site is well protected from the wind. At coastal sites, on the other hand, windblown sands are an important depositional factor. Perhaps, though the Ponshewaing Point site is situated in the prevailing winds, deposition did not occur because of vegetation cover or for some similar reason.

Another possible reason why artifacts at both sites are so compacted could be that they were occupied by fewer people and thus thick middens did not occur. Both the factors of deposition and amount of occupation could be relevant. Further, both could imply cold weather habitation. Lack of deposition suggests protection from the

elements and winter sites historically were occupied by small groups.

A second shared characteristic of the Ponshewaing Point and Johnson sites is uneven distribution of cultural material. In both cases 10 by 10 foot units with dense cultural content were located next to virtually sterile units. For example, the site itself may not have been used for many daily activities. Perhaps fewer people lived there. Possibly too, natural conditions were such that materials of any kind were less likely to be redistributed.

Finally, two artifacts that may have been metates were observed in the Ponshewaing Point site assemblage. As with those at the Johnson site, their function has not been determined. Therefore, their presence can only be noted as a point of similarity between the two sites.

Conclusions about the Ponshewaing Point site must be regarded as tenuous. However, it does not seem to be solely a "winter home." Given its location midway between the coast and Burt and Mullet Lakes, it might best be viewed as a base camp used in transit between the two. Not only is the site between the two zones, but the resources of both are accessible. Such as location might be important during intermediate periods such as early spring or early fall when changing conditions require the availability of alternative resource strategies.

The Ponshewaing Point site has been disturbed by modern activity. Part of the site was moved for use as landfill.

The Tree House Site

Location: (Fig. 3).

Oden Island on the eastern side of Crooked Lake. Emmet County.

Extent and Nature of Excavation:

Surface collection made in 1974 by Michigan State University field party under the direction of Dr. Charles E. Cleland and Dr. William A. Lovis.

Dating of Prehistoric Occupation:

Late Woodland.

Impressions and Comments:

The Tree House site is surrounded by low swampy land. This may be a modern condition occurring after a rise in water levels which resulted when a dam was built on the Cheboygan River (Cleland, personal communication, 1977). The Tree House site is within one-fourth miles of the Ponshewaing Point site, thus suggesting the possibility that it was a special activity area for people living at Ponshewaing Point. The Tree House site is undisturbed by modern activity.

Table 16.--Artifact Assemblage--The Ponshewaing Point Site.

Artifact Class	Total	Percent of Assemblage
Debitage	8331	25%
Utilized flakes	125	.4
Retouched flakes	99	.3
Cores	39	.1
Bifaces	64	.2
Projectile points	31	.09
Drills	5	.02
Scrapers	41	.1
Knives	3	.009
Body sherds	23,817	72
Decorated sherds	58	.2
Rim sherds	531	2
Miniature vessel sherds	10	.03
Clay wads	3	.009
Pipe fragments	14	.04
Copper fragments	7	.02
Unknown groundstone	37	.1
Hammerstones	48	.1
Slate artifacts	2	.006
Anvils	5	.02
Hammer/anvil	1	.003
Abrader	1	.003
Plummet	1	.003
Other slate	1	.003
Metates	2	.006
Total	33,276	100%

Table 17.--Artifact Assemblage--The Tree House Site.

Artifact Class	Total
Debitage	58
Utilized flakes	2
Projectile points	2
Ceramics	60
Total	122

The Eagle Island Site

Location: (Fig. 3). Catchment maps (Figs. 28, 29).
Point of land at narrows on western shore of Walloon Lake. Charlevoix County.

Extent and Nature of Excavation:
1125 square feet excavated in 1969 by Michigan State University field party under the direction of Dr. Charles E. Cleland.

Dating of Prehistoric Occupation:
Late Woodland. Predominantly Mackinac Phase.

Impressions and Comments:

The Eagle Island site is located somewhat off the main transportation routes of the coast and Inland Waterway. It is situated so as to be protected from the prevailing winds. The same highlands that provide such protection however, also prevent easy access to the resources of the land. This coupled with the location of the site on a point midway from either end of the long western arm

of Walloon Lake suggests that aquatic resources might have been exploited. Indeed bones from the site are predominantly fish. It is suggested here that the Eagle Island site was occupied during some season of inclement weather and that only immediate resources were procured. Early spring might be an appropriate season for habitation.

Interestingly, this site produced a fired clay turtle effigy. It is the only site, other than the Johnson site, where such artifacts were found. Finally, the only features recovered were two hearths.

Discussion

Despite the fact that statistical comparisons of artifact occurrence could not be made, evidence provided by individual sites can be evaluated in the light of the suggested test implications. It will be recalled that if the postulated seasonal round is correct, sites along the coast should resemble one another more closely than they resemble inland sites. In addition, the degree of likeness among coastal sites should be greater than is the case with interior sites. This is based on the idea that warm season occupations involved a wide range of activities performed in procuring a variety of foods. Not only would the same artifacts be used, but most of the Mackinac Phase tool inventory would be involved. On the other hand interior sites should show a greater degree of dissimilarity among themselves because both early spring and winter activities

Table 18.--Artifact Assemblage--The Eagle Island Site.

Artifact Class	Total	Percent of Assemblage
Debitage	5489	37%
Utilized flakes	70	.5
Retouched flakes	30	.2
Cores	151	1
Bifaces	19	.1
Projectile points	28	.2
Scrapers	6	.04
Knives	2	.01
Drills	6	.04
Body sherds	8676	58
Decorated sherds	99	.7
Rim sherds	394	3
Groundstone artifacts	42	.3
Hammerstones	2	.01
Minature vessel sherds	7	.04
Pipe fragments	12	.08
Effigy	1	.007
Clay wads	3	.02
Total	15,035	100%

are limited to the exploitation of a few resources that differ in each season.

The first question to be considered is whether or not coastal sites resemble one another more than they resemble noncoastal sites. All coastal sites, except the Halberg site, seem to have been large intensively occupied sites. This contrasts with the interior sites. Even apparent base camps in the interior, such as Ponshewaing Point and the Johnson site do not exhibit such intensive occupation. Distribution of archaeological materials is very uneven at these interior base camps, whereas at coastal sites, materials occur much more evenly throughout the sites. Fewer features are found at interior campsites and inferior sites lack the organic middens characteristic coastal sites. The only other excavated sites in the interior likewise were not intensive occupations. Eagle Island had few features as was the case at the McAlpin site. Excavation of the Eisen site did not lead to conclusions that the site was large and intensively occupied (Griffin, 1962).

In assessing the coastal sites, it is apparent that at least three kinds can be identified. One of these, the Juntunen site, appears to be both a late fall fishing station and a summer site (McPherron, 1967). The Pine River Channel and O'Neill (Lovis, 1973) sites were occupied mainly during the warm season only. The Woods, Wycamp Creek and Point Scott sites were likewise occupations that

could have been inhabited in the warm season and late fall. Finally, the Halberg site occupation was less intensive than any site sampled. This implies a temporary encampment rather than a village.

The identification of five kinds of sites does seem to indicate a greater diversity in the interior. The Eisen, Reeves and Johnson sites have the most in common. They share a location slightly removed from the lakeshore, perhaps in the interests of shelter. Both the Johnson and Eisen sites produced an abundance of pottery and relatively little stone. Both of these sites also had a minimal quantity of bone. The McAlpin site differs from these in the impression gained of short term occupation with a situation of little shelter. Ponshewaing Point is clearly a base camp. It shows characteristics of both warm and cold season occupations. Additionally, nearly Late Woodland pottery is not confined to Mackinac Wares as is the case with sites deeper in the interior. Finally, the Eagle Island site is situated in a less accessible and sheltered spot suitable for obtaining aquatic resources.

The test implication that coastal sites should resemble one another more than they resemble interior sites is confirmed. Further, the test implications that the degree of resemblance between coastal sites should be greater than the resemblance between interior sites are also confirmed. These test implications are based on what should be expected if seasonal movement in the Mackinac

Phase was similar to that of historic times. Therefore, confirmation of the test implications lends support to the argument that this was indeed the case.

CHAPTER IV

CONCLUSIONS

This research has focused on the question of how Mackinac Phase peoples solved the problem of variation in food availability in time and space. Initially, it was hypothesized that seasonal movement to obtain food in the Mackinac Phase followed the same pattern as seasonal movement in historic times. Briefly, this involved late fall fishing from Great Lakes coastal sites followed by the hunting of mammals in the interior during the winter. In the early spring people moved to maple sugar camps which were still in the interior, but closer to the coast than were winter hunting camps. Finally, historic Indians moved again to the coast in time for late spring fish runs and remained at the coast through the summer.

Because seasonal movement of hunter-gatherers is predicated on the need to obtain food resources, catchment analysis was used to measure the resource potential of Mackinac Phase sites. Resource potential was measured for each site for each season. The catchment area for each site was delimited by a circle around the site with a

radius equivalent to the distance that could be covered in two hours time. Normally the radius used in site catchment analysis is 6 miles or the equivalent of 10 kilometers. This represents the amount of distance usually traversed by hunter-gatherers walking over flat terrain for two hours. However, most sites in the study area are located on connected bodies of water. Therefore, a 12 mile radius was used to bound catchment areas in ice free seasons. Twelve miles was estimated to be the distance that could be travelled by water in two hours. The 6 mile radius was used for winter catchments when water travel was prohibited by ice. Additionally, for sites not located on interconnected bodies of water, the 6 mile radius was used for all seasons.

Once the site catchment area was determined, the next step was to discern the site territory, or habitually exploited portion of the catchment area. First, the highlands were eliminated from the site territory because considerations of time, energy and evidence of habitual exploitation of lowland resources suggested they were less likely to be exploited on a regular basis. Second, the site territory was delimited by mapping the vegetational and aquatic habitats where food resources were likely to be found in each season.

The seasonal resource potential of Mackinac Phase sites as determined by catchment analysis was then used in testing the hypothesis that seasonal movement in the Mackinac

Phase was like that observed historically. The following test implications of the hypothesis were all confirmed.

1. If interior sites were winter sites, they should be high in winter resource potential.
2. If coastal sites were late fall sites, they should be high in late fall resource potential.
3. If coastal sites were warm season sites, they should be high in warm season resource potential.
4. If interior sites were early spring sites, they should be high in early spring resource potential.

Despite the fact that the test implications were all confirmed, only portions of the general hypothesis could be confirmed on the basis of catchment analysis alone. Because winter resource potential was high only for sites in the interior, Mackinac Phase peoples must have occupied the interior during the winter as hypothesized. Likewise only sites on the coast were high in late fall resources. Therefore, Mackinac Phase peoples must have moved to the coast in late fall as did the Indians in historic times. Additionally, though all sites on the coast have high late fall resource potential, those from Little Traverse Bay to the north are the highest in late fall resource potential. It is possible that these northern coastal sites were preferred as late fall fishing stations.

Catchment analysis showed that resource potential for the warm season was high on the coast as expected. However, warm season resource potential was high also at

interior sites located on Burt, Mullett and Black Lakes. Thus Mackinac Phase peoples did not necessarily move to the coast in the warm season even though this was the case in historic times. However, consideration of noneconomic factors suggest that the coast was a better choice for warm season occupations. Warm season resources are abundant permitting people to travel and aggregate in groups larger than the extended family without having to worry about obtaining enough food. The coast is easily assessible by water from several directions and thus is more suitable for social interaction than is the interior. Because social interaction is a necessity to hunter-gatherers and occurs during seasons of food abundance, it is likely that Mackinac Phase peoples moved to the coast in the warm season.

Finally, catchment analysis showed that early spring resource potential was relatively high anywhere in the study area. However, there are some reasons suggesting that early spring sites were located between interior winter sites on Burt, Mullett and Black Lakes and warm season sites on the coast as was the practice historically. Although considerations of least travel time between sites in successive seasons are always important (Jochim, 1976, 127), travel time is particularly crucial in early spring. Uncertainties of the early spring in the study area make it advantageous to be able to be within reach of areas high in winter resources if the season is unusually cold. Likewise, it is necessary to quickly reach the streams where

they empty into the lakes as soon as the spring fish runs begin. The ability to catch fish is crucial at the end of the winter season. Thus an early spring location midway between winter and warm season sites confers the advantage of being within easy reach of both winter and warm season resources in a season where alternative strategies are needed.

The hypothesis that seasonal movement in order to obtain food resources in the Mackinac Phase was like that in historic times is confirmed by this study. However, alternatives to the basic pattern have been delineated as well. Under certain circumstances Mackinac Phase peoples might have chosen to spend the warm season or early spring in the interior. For example, an extended family might chose to avoid social interaction if conflict was certain to occur. Though an interior location in the warm season is the least likely choice over the long run, it is characteristic of the hunting and gathering way of life that alternatives are available. Flexibility is crucial to settlement systems adjusted both to environmental and social variability.

Catchment analysis has proved useful in discerning seasonal movement during the Mackinac Phase. However, just as resource potential alone was not sufficient for understanding seasonal movement, it is likewise not sufficient for judging the functions of specific sites. Though most sites do appear to have functioned as predicted on the

basis of catchment analysis, there is at least one anomoly. In particular the McAlpin site deserves attention as being unusual. Though the McAlpin site is located on Burt Lake where winter resource potential is high, it surely was not a winter base camp. It is exposed to the prevailing wind and affords little shelter. There was no evidence of structures and only one possible feature. The enormous amount of fire-cracked rock implies a special function for this site other than that of winter base camp.

In addition to the possibility of specific activity sites, there are aspects of other sites which are not related to food resource potential, but which are nonetheless important to an understanding of the Mackinac Phase. Both the O'Neill and Pine River Channel sites are located near the source of Norwood chert and both served as loci of stone tool manufacturing. There is some evidence that Norwood chert was not only a utilitarian item. According to Leudtke (1976, 408-411), Norwood chert was exchanged in the form of gifts or minor trade items. Her conclusion is based on the fact that within the Traverse Corridor Norwood chert is distributed at sites so that it decreases in quantity at an exponential rate with distance from the source (Leudtke, 1976, 408). However, to the north and south of the Corridor Norwood chert is randomly distributed and does not seem to reflect a system of patterned interaction. Thus exchange of chert was generally confined to the Traverse Corridor and may have served to cement relations

between people of different cultural identities who occupied the Corridor during the course of their yearly round.

Social Organization

The ways in which settlement in the Mackinac Phase involved adjustment in the size of social units in accordance with changing resource availability and societal needs are difficult to test. Judgments about aggregation have been made on the basis of catchment analysis, noneconomic factors of settlement and site descriptions. Explicit measures of site size, artifact density and structural evidence were considered as possibilities for estimating the number of people in a single occupation. In all cases the data are incomplete and/or alternative explanations are as likely. For example, these considerations can as easily indicate the number of times a site was occupied. However, while it is not possible to state specifically the numbers of people inhabiting a site, inferences about social organization can be derived from the evidence.

It will be recalled that an argument was made to the effect that sites in the Traverse Corridor were probably summer sites because resources were plentiful and ease of access created the opportunity for social interaction. Cleland (1967:2) recognized that the Traverse Corridor was a favorable locus for interaction since it was the only area in the northern lower peninsula that was continuously favorable to settlement both from the north and the south.

Lovis (1973) studied the attributes of ceramic styles in the Traverse Corridor. He concluded that stylistic "input" and concomittantly populations entered the Traverse Corridor from at least three directions (Lovis, 1973:319). During the early phases, people manufacturing Mackinac Wares apparently entered the Traverse Corridor from the north along the Lake Michigan coast and from the east via the Inland Waterway. This evidence certainly is consistent with the patterning of seasonal movement discerned in the present study. However, according to Lovis (1976:319), people manufacturing early Late Woodland Bowerman and Skegemog wares entered the Traverse Corridor from the south along the coast of Lake Michigan. Thus two groups of people responsible for differing ceramic styles were using the Traverse Corridor and the opportunity existed for social interaction there. Further, while some stylistic attributes are patterned to the extent that different ceramic types can be defined, other attributes are shared and may occur randomly on each of the different wares. The sharing of attributes of ceramic style implies that not only was there an opportunity for social interaction, but that it did in fact occur in the Traverse Corridor.

In contrast to the Traverse Corridor, sites in the Inland Waterway located on Burt, Mullett and Black Lakes yield ceramics that can almost exclusively be attributed to the Mackinac Phase. Only one early Late Woodland vessel, from the Johnson site, appears to be of a southern Michigan

type. Such a situation is to be expected if these were winter encampments occupied by small extended family groups. Variability in ceramic style should decrease in situations where social interaction is minimal because ideas about ceramic style would be limited to those of one group. Extensive interaction apparently did not take place in the interior and it was probably available for use on a more limited basis than was the Traverse Corridor.

Finally, important implications for social organization are present in the lack of clearcut political or social boundaries in the Traverse Corridor. Statistical testing of variables pertaining to ceramic style within the Traverse Corridor shows that strict boundaries were not maintained between northern Mackinac Phase peoples and southern groups (Lovis, 1973:319). Different people were apparently using some of the same sites in this region without obvious restraint. This implies that the social system allowed for flexibility of choice in site location in the Traverse Corridor. As noted previously, flexibility is very important to the kinds of social systems hypothesized here because it provides alternatives as economic and social conditions change.

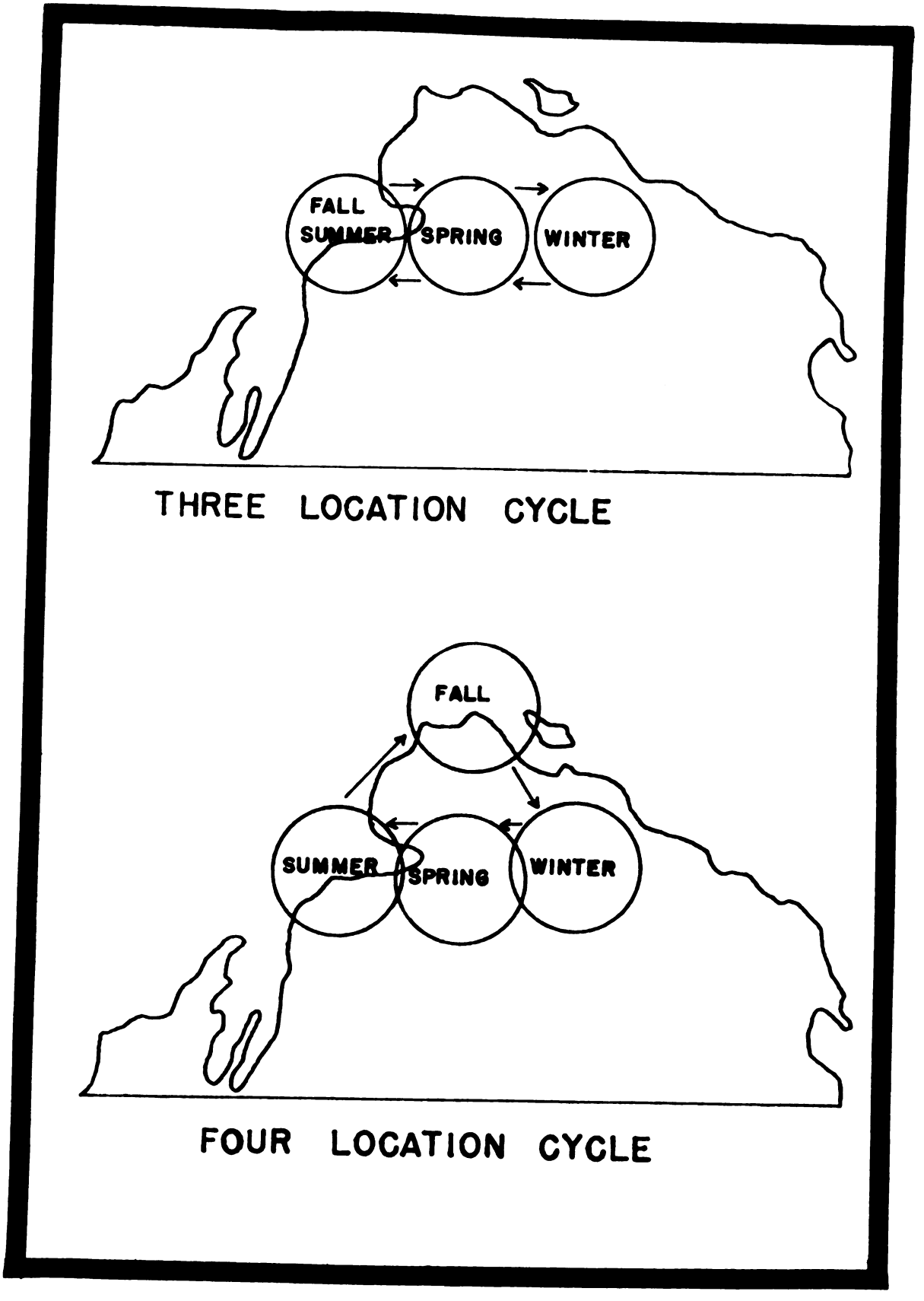
The Mackinac Phase

At this point it is appropriate to reasses the Mackinac Phase and its place in Michigan's prehistory. This study has broadened the definition of the Mackinac

Phase to include a fairly detailed description of the seasonal movements utilized in the northern lower peninsula of Michigan (Fig. 30). It is clear that Mackinac Phase peoples solved the problem of variability in food resources by locating sites in the vicinity of food resources as they became available in the different seasons. Further, the pattern of movement involved at least two alternatives which insured that sites occupied in one season would be located between those of the preceeding and succeeding seasons. Thus the time and energy spent in shifting camp locations was minimized (Fig. 30). For example, movement could proceed from a winter site on the inland lakes to an early spring site on the Inland Waterway to a warm season site on the coast to a late fall site in the Straits of Mackinac and back to the inland lakes via the Cheboygan River. The other movement pattern differs only in the use of the Inland Waterway in moving from the coast in the late fall to the interior in winter.

There is some evidence that Mackinac Phase peoples solved the problem of resource variability by varying the size of social units as well as by shifting site location. In particular, warm season and late fall coastal sites tend to be large with a relatively even distribution of artifacts and features. Further, a variety of pottery wares at coastal sites suggest that aggregation of peoples took place in seasons of resource abundance. To the contrary at interior winter sites archaeological materials are

Figure 30. Patterns of Seasonal Movement in the Mackinac Phase.


FALL
SUMMER
SPRING
WINTER
THREE LOCATION CYCLE
FALL
SUMMER
SPRING
WINTER
FOUR LOCATION CYCLE

unevenly distributed and pottery is limited to Mackinac Ware. This implies that small extended family sized groups occupied sites during seasons when resources were not abundant.

Though some understanding of the settlement system of the Mackinac Phase has been gained, the problem of the spatial boundaries of this phase still remains. Determining boundaries for the Mackinac Phase on the basis of ceramics is difficult. As McPherron noted (1967:276)

> A blending of attributes and an absence of sharp geographic borders thus seems to prevail with respect to pottery styles for the early Late Woodland period over a broad area, linking together areas as widely separated as tidewater Virginia and the northern Plains.

In his conclusions McPherron suggests that one research priority should be to acquire a controlled sample of artifacts from the Lake Michigan area to determine the occurrence of attribute clines which may in turn represent interband relationships (1967:299). His suggestion is a valid one. However, boundaries can be hypothesized to some extent on a ceramic basis. Mackinac-like wares have been found to the north at the Whitefish Island site in the St. Mary's River by Sault Ste. Marie (Conway, 1976). Surely Thor Conway (1976:22) is correct when he states that though he broadly uses a Mackinac Straits classification of artifacts, he is observing a "separate focus of cultural activity." Likewise to the south in the Traverse Corridor, Skegemog Ware is similar to Mackinac Ware, but is recognized

as representing the product of culturally distinct groups (Cleland, n.d.). Finally, to the southeast of the study area beginning around Saginaw Bay there is the distinctive early Late Woodland Wayne ceramic tradition (Fitting, 1965). Therefore, it is suggested here that the Mackinac Phase be limited spatially to a region bounded by the Mackinac Straits and the western shore of Lake Michigan on the north and bounded by the northern edges of Traverse Bay and Saginaw Bay to the south (Fig. 3).

The Mackinac Phase and the Middle Woodland

New evidence concerning another important question about the Mackinac Phase has been uncovered during analysis of the Pine River Channel site (Appendix A). McPherron (1967:274, 275) pointed out that in the north-central portion, or Canadian Biotic Province, of the Upper Great Lakes there is a cultural and temporal gap between the Middle Woodland and the Late Woodland. This occurs at the Mero site on Wisconsin's Door Peninsula, at the Juntunen site in the Straits of Mackinac and at the Inverhuron site on the east side of Lake Huron. This situation is contrasted to the more southerly areas of the Upper Great Lakes where the Late Woodland follows an easily discernable transition from the Middle Woodland.

McPherron (1967:275) suggests that those parts of the Great Lakes where the gap occurs may have been uninhabited for some time and then reoccupied in the Late

Woodland when adaptive capability was improved. He sees reoccupation occurring first to the south in the Mackinac Straits area. Late Woodland occupations then occur to the north with the appearance of Blackduck Ware about A.D. 900. This south to north temporal gradiant in the occurrence of Late Woodland occupations is seen by McPherron (1967) to be the result of acquiring adaptive "devices" such as maize from the south.

Analysis of ceramics at the Pine River Channel site has shown that there is a discernable transition between the Middle and Late Woodland in the study area. The evidence offered is Pine River Ware which exhibits patterned stylistic change from Laurel to Mackinac Wares and occurs in an intermediate stratigraphic position between the two at the Portage site.

Some interesting conclusions can be reached from the evidence. The cultural and temporal gap in the area no longer exists. The Mackinac Phase resulted from changes pertaining to northern Middle Woodland people already resident in the area. This may have been true of the western edge of the Upper Peninsula as well. I have observed pottery found by Marla Buckmaster on the Menominee River that can be classified as Pine River Ware. A similar phenomena has been reported for the Birch Lake region north of Lake Superior in Ontario where the Potato Island site yielded ceramics that are considered to be stylistically "transitional" between Laurel and Blackduck wares (Keozur

and Wright, 1976:38). Additional ceramics of this kind have been found to the north of the Potato Island site in the Albany River basic (Dawson, 1976:53). Koezur and Wright date these "transitional" ceramics to about A.D. 700 (1976:38).

The evidence indicates that there is at least no temporal gap between the Middle and Late Woodland. Further, the Late Woodland does not necessarily appear earlier in the south. However, it is important that the evidence for a clear progression from the Middle Woodland to the Late Woodland is absent from certain large sites such as Mero, Inverhuron and Juntunen. These sites were apparently not utilized until the Late Woodland. This implies that the transition was not merely a change in ceramic style, but involved change in settlement and/or population size as well. These sites may not have been occupied during the Middle Woodland because they were not pertinent to the seasonal round. Likewise there may simply have been fewer people and thus fewer sites. This is consistent with the suspicions of a number of authors including Cleland (1966), McPherron (1967) and Lovis and Holman (1976) who see the Late Woodland as representing a change in adaptive strategy involving a new energy source and larger populations. Though local transitions have been demonstrated, the evidence still suggests that these views postulating a change in adaptation have some validity.

The Mackinac Phase and the Late Woodland

A related question raised as the result of this and other recent archaeological studies of the area concerns changes throughout the Late Woodland. Lovis (1973: 319) found continuity through the Late Woodland in the patterning of ceramic style input into the Traverse Corridor. Likewise, most Mackinac Phase sites used in this research yielded ceramics from other Late Woodland phases. Thus it can be said that the basic settlement pattern probably remained essentially the same throughout the Late Woodland. However, indications are that some change did occur, though it nature is not yet clearly understood.

The present evidence points to change in the size or distribution of Late Woodland populations. Certain sites such as Pine River Channel, Portage, McAlpin and Eisen appear to have either much larger Mackinac Phase components or no later components. The possibility that some change in population was occurring is likewise indicated by a sequence of ceramic variation sufficient to define types and phases for the Late Woodland. Lovis and Holman (1976: 274) observed that over the course of the Late Woodland it becomes increasingly easier to discern and define regional ceramic styles. They propose that this may represent increased "regional identity" involving a greater degree of scheduled aggregation or cooperation of a group of smaller social units. This in turn seemed to be related to a rise in resource carrying capacity brought about by a

change in fishing technology. Over the long run this produced an increase in population and greater necessity for seasonal aggregation. The larger social units involved in aggregation created a situation of increasing differentiation of regions.

Certainly, the importance of fishing is characteristic of settlement in the Late Woodland. Likewise the increasing ability to define regional ceramic types as a reflection of a corresponding increase in regional identity is consistent with the ethnographic observations of Yellen and Harpending (1972). They note that in the case of !Kung bushmen, artifact styles had more consistently covarying attributes in situations of settlement "nucleation." Nucleation refers in this instance to larger and more stable occupations rather than urbanization. Perhaps the lack of evidence of subsequent occupation of some Mackinac Phase sites is a further indication that greater aggregation of population was taking place. An alternative explanation is that population size decreased instead of increased after the Mackinac Phase. The result in terms of ceramic phenomena could be the same if this were the case. Decreased population might result in a more concentrated distribution of people in the area.

Suggestions for Future Research

It will be recalled that the functions of some sites, such as the McAlpin site, could not be discerned

solely on the basis of resource potential as measured by catchment analysis. Similarly while the Pine River Channel and O'Neill sites apparently were warm season sites as predicted by catchment analysis, the fact that they were of some importance as chipping stations was overlooked by catchment analysis. The settlement system of the Mackinac Phase as described here could be further tested and understood in more detail if each Mackinac Phase site were studied and reported separately as the O'Neill, Pine River Channel and Juntunen sites have been. Thus it could be seen whether the seasonality of specific sites corresponds with that predicted by catchment analysis. Furthermore, an understanding of special activity sites and how they functioned in the total system would be gained from site reports.

Finally, understanding of the early Late Woodland would be enhanced if interband relationships could be discerned. Some hints as to the nature of interband relationships have been put forward. It is apparent that two groups of people were utilizing the Traverse Corridor as evidenced by two kinds of related, yet distinct pottery styles (Cleland, n.d.). The fact that the northern Mackinac Wares and southern Skegemog Wares are found at the same sites underscores Lovis' (1973) contention that strict boundaries were not maintained in the Traverse Corridor.

Leudtke's (1976) study of chert distribution is significant for understanding the relationship of groups

utilizing the Traverse Corridor. This area is in the transition zone between biotic provinces where most of the exchange of chert took place in the form of gifts or minor trade items (Leudtke, 1976:408-411). Exchange in the form of reciprocal "gift" giving is well-known as a means of cementing social relations within or between hunter-gatherer groups (Service, 1966:17). The evidence for such exchange in the Traverse Corridor coupled with the lack of political boundaries argues for a friendly, working relationship among the groups there. This view is in accord with Leudtke who suggests that there were,

> people from several cultural traditions who shared a common adaptation. They practiced a mixed economy, and maintained contact with neighboring groups through visits, marriage, and exchange of gifts. These contacts would have given them increased flexibility needed to deal with an environment that was rich but variable and sometimes unpredictable (1976:402).

The Traverse Corridor apparently did not serve as a buffer zone between hostile social units during the early Late Woodland. Rather it was used seasonally on a regular basis at least by peoples of the Mackinac Phase. This is in accord with Lovis' (1973:319) suggestion that occupation of the Traverse Corridor was not permanent on the part of any one group of people, but rather involved use of the Corridor by different peoples at certain times during the year. It would be interesting to know how the Traverse Corridor was utilized by the southern makers of Skegemog Ware. The degree to which the Traverse Corridor was utilized by the southern group would affect the character

of their relationship with peoples of the Mackinac Phase. Certainly, the Skegemog site where the southern ware was defined, was a village of some size and suggests regular occupancy of the Corridor (Cleland, n.d.). If this were the case, a high premium should have been placed on maintaining friendly relationships among groups in the Traverse Corridor.

It remains to echo McPherron's (1967:299) suggestion that the attributes of Mackinac and Mackinac-like wares be studied in a controlled fashion to determine the occurrence of attribute clines. This in turn might allow the delineation of interband boundaries. It is to be expected that situations similar to that seen in the Traverse Corridor may be discerned elsewhere to the north of the study area. In the case of the Traverse Corridor relationships are maintained with separate groups whose seasonal rounds articulate in the use of the Corridor at some point in the year. As an ecotone, the Traverse Corridor provided an abundance of varied resources that were exploited by both groups. Late fall fishing in the Straits of Mackinac and along the western shore of Lake Michigan may likewise have been articulating points in the seasonal rounds of people who exploited different site territories during the rest of the year. Unlike the situation in the Traverse Corridor, however, late fall fish resources are concentrated and may be better exploited using cooperative techniques of net fishing (Cleland, 1966:66). Therefore, the

relationship between people occupying late fall fishing sites might be a closer one than that found in the Traverse Corridor and differences in pottery attributes even more difficult to discern. The nature of pottery attribute clines and the delineation of geographic boundaries is crucial to understanding social interaction in the early Late Woodland.

APPENDICES

APPENDIX A

THE PINE RIVER CHANNEL SITE

APPENDIX A

THE PINE RIVER CHANNEL SITE

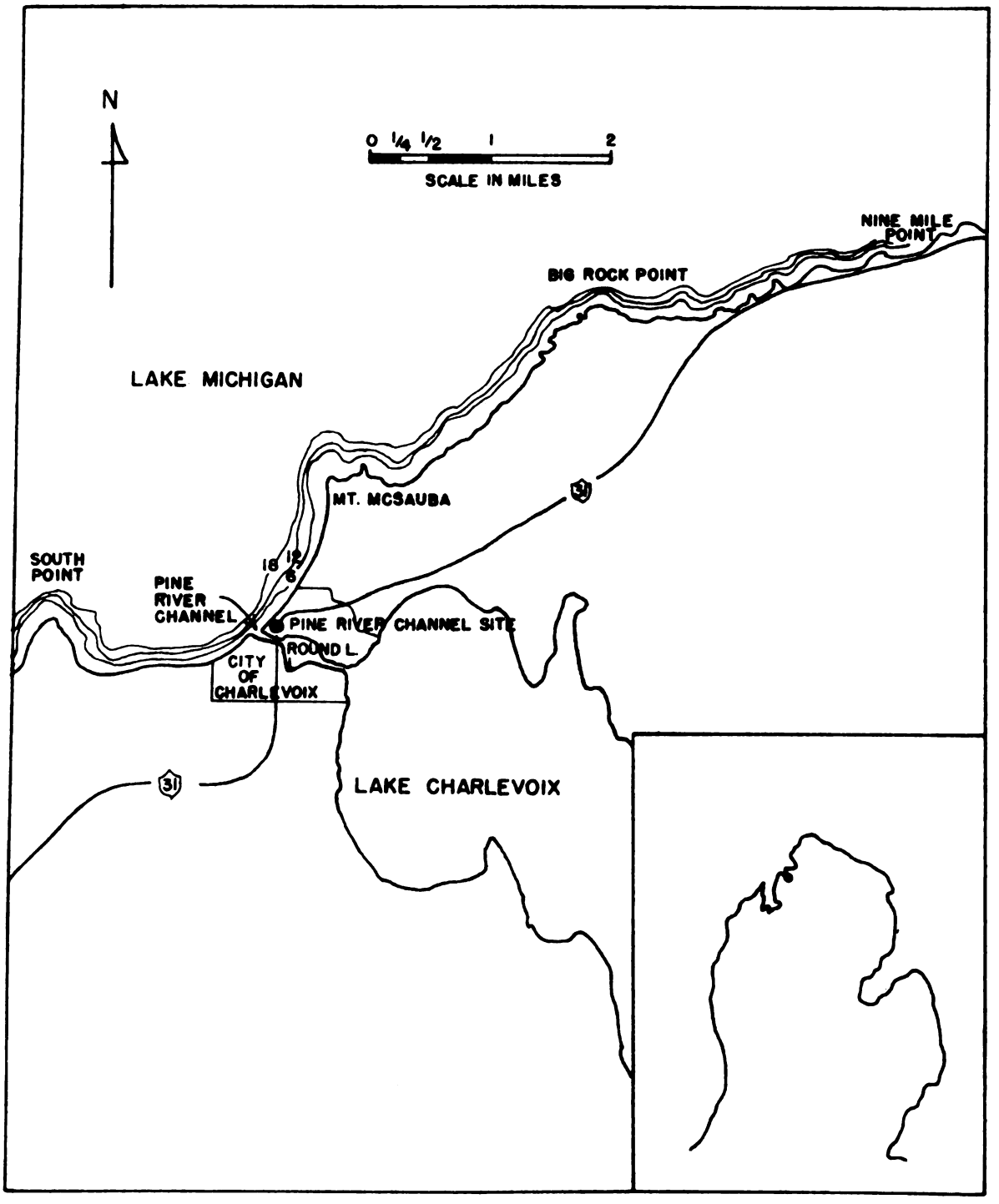
Introduction to the Pine River Channel Site

The Pine River Channel site was discovered in the fall of 1970 by an MSU Museum field party. The group under the direction of Dr. Charles E. Cleland found the site during the course of a survey of Lake Charlevois. This project was undertaken as part of a continuing study by Dr. Cleland of the coastal area between the Mackinac Straits and Traverse City known as the Traverse Corridor (Cleland, 1967).

Location of Site

The Pine River Channel site, designated 20 CX 19 in the Michigan site registry, is located in the NE¼ of the NE¼ of Charlevoix Township in Charlevoix County, R8W T34N. The site is situated on bluffs 615 feet above sea level. The bluffs overlook Lake Michigan on the north side of the Pine River Channel which connects Round Lake with Lake Michigan (Fig. 31). The site is within the City of Charlevoix. It is bounded to the south by Dixon Street and to the east by U.S. 31.

Figure 31. Location of the Pine River Channel Site With Offshore Depths.


N
0 1/4 1/2 1 2
SCALE IN MILES
NINE MILE POINT
BIG ROCK POINT
LAKE MICHIGAN
MT. MCSAUBA
31
SOUTH POINT
PINE RIVER CHANNEL
18
12
6
PINE RIVER CHANNEL SITE
ROUND L.
CITY OF CHARLEVOIX
31
LAKE CHARLEVOIX

History of Site

In historic times the mouth of the Pine River was the scene of the "Battle of Pine River." This conflict took place in the middle of the ninteenth century between fishermen and Mormons on the south bluffs and resulted in only one injury. Later the same area served as a station for Great Lakes steamers to load wood cut from the interior interior forests and floated through the channel (Leach, 1883, 126).

The north side of the channel where the site occurs is mentioned by Leach (1883, 4) as being a place where Indians manufactured "arrow-heads." He offers as evidence numerous flint chips and unfinished "arrow-heads" that occurred to a depth of at least a foot. Hinsdale (1931) on Map 13 of his atlas notes a prehistoric site on the same spot (Fig. 31).

In 1889 the Beach Hotel owned by Martha Baker was built on the Pine River Channel site (Gilbert, 1973:29). In addition to the hotel itself, facilities included fourteen cottages and areas for golf, tennis and swimming. The hotel was extremely popular as a summer resort for wealthy people from the large cities like Detroit and Chicago, especially between the end of World War I and the depression of the 1930s. However, by 1967 it was no longer profitable and was condemned. It was in the process of being torn down when it burned on October 16. Then in 1970 the prehistoric Pine River Channel site was relocated

during the course of the MSU Museum survey directed by Dr. Cleland. Excavation of the site occurred in 1971 and 1972 after the hotel burned and just prior to the building of the condominium apartments that presently stand on the site.

Excavation of Site

Dr. Charles E. Cleland with a crew of seven conducted test excavations of the Pine River Channel site from August 5 to August 27, 1971. Testing was begun at the north margin of the erosion gully (Fig. 31) in ten by ten foot units so that it would be possible to determine the nature of the midden noticed at the edge of the gully. In addition, five of the units, NO/W80, NO/W70, S10/W60, S10/W70, and S20/W70 were located so as to form a black excavation in order to recover features. Two other ten by ten foot squares, N30/W100 and N60/W40 were dug to the northwest and north to see how far the midden extended in those directions. The midden was slightly thicker to the south and east and was located below a layer of modern sod and fill. The dark top .2' of the occupation zone was disturbed and underlain by a woody zone that was light white, brown and black in color. Beneath the woody zone was an occupation layer that was undisturbed except for occasional pits originating at the surface. Yellow sand occurred below the uneven bottom of the occupation zone. This sand was the source of hearth features and artifacts that were probably of the Archaic time period (Fig. 33).

Figure 32. Map of the Pine River Channel Site Showing Excavation Units.

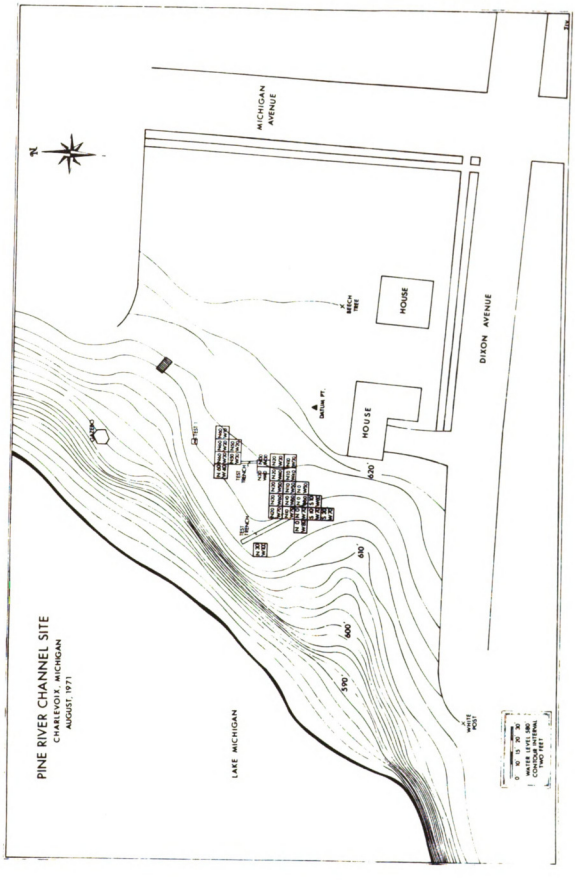
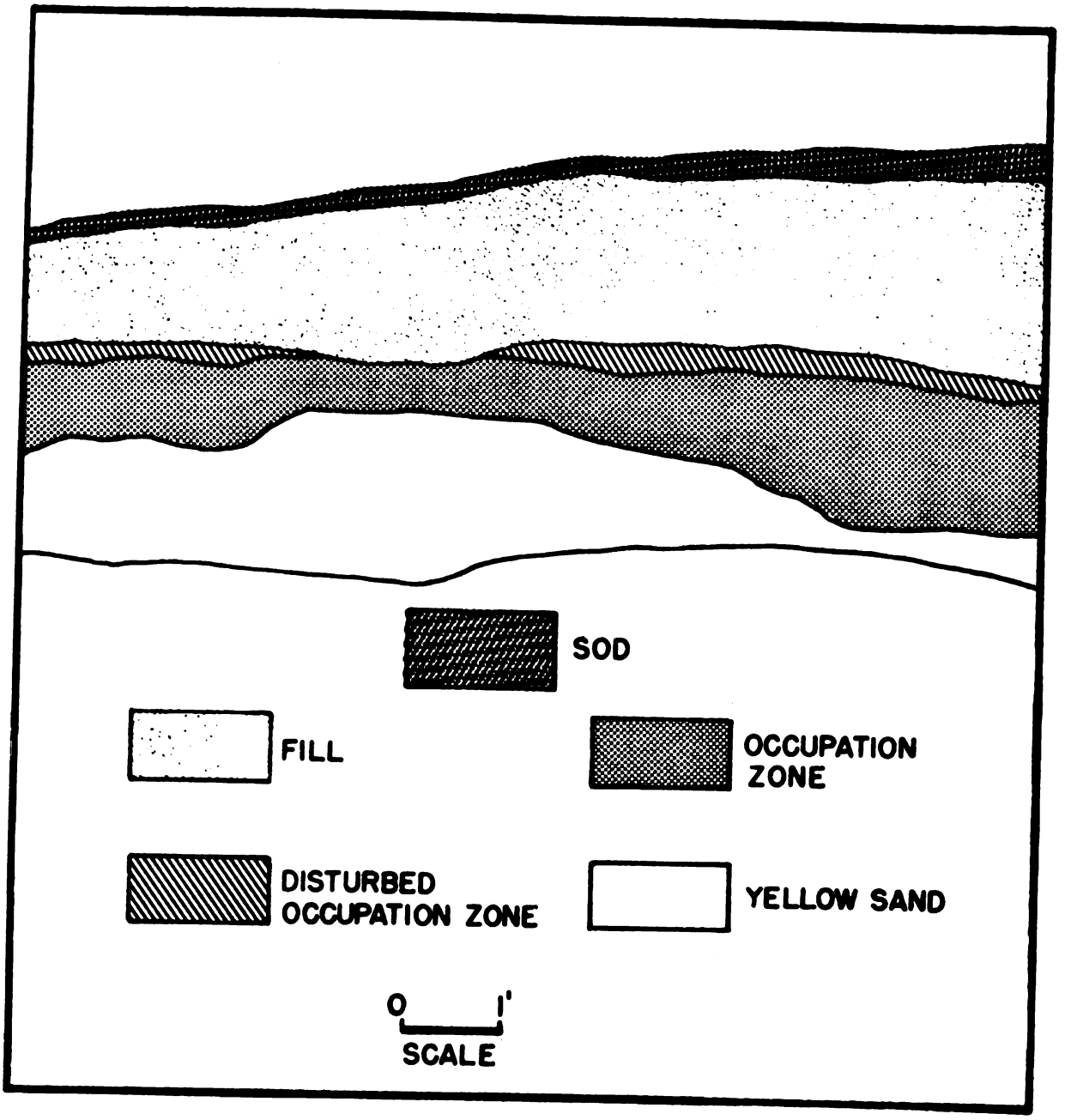

PINE RIVER CHANNEL SITE
CHARLEVOIX, MICHIGAN
AUGUST, 1971
LAKE MICHIGAN
MICHIGAN AVENUE
DIXON AVENUE
HOUSE
HOUSE
BENCH TEST
DATUM PT.
590'
600'
610'
620'
WATER LEVEL 580
CONTOUR INTERVAL
TWO FEET

Figure 33. Generalized Soil Profile of the Pine River Channel Site.


SOD
FILL
OCCUPATION ZONE
DISTURBED OCCUPATION ZONE
YELLOW SAND
0 1'
SCALE

During the 1971 season, a grid was laid out and a contour map of the site was made. Units were excavated in .2' levels which were drawn on square sheets showing depth below datum in all four corners. Profiles were drawn of all exposed walls of each square. In addition, 36mm. color slides were taken of square floors and profiles. Material was put through a ¼ inch screen, artifacts from each level were bagged together and feature material was bagged separately. Field notes included a feature record and photographs were made of feature profiles. By the end of the testing operation in 1971, 700 square feet of surface area had been excavated.

The results of the 1971 excavations showed clearly that the Pine River Channel site was important enough to require more extensive archaeological investigation. Furthermore, the site was in immediate danger of being destroyed by the LaCroft condominiums which were scheduled to be build on the spot. In view of the urgent need to excavate the site before building began, Dr. Cleland initiated a drive to obtain funds for this purpose. He was aided in this effort by Fran Martin of Charlevoix and Bob Clock of the Charlevoix Courier. Within six weeks nearly $4,000 was contributed by many of Charlevoix's citizens. It is certain that without their generosity it would have been impossible to save the Pine River Channel site. In addition to financial support, other aid was

given which, as will be seen, was essential to the success of the excavation.

As the result of community effort, further excavations took place in the spring of 1972, from May 1 to June 7. A crew of seven under the direction of Dr. William A. Lovis, then a graduate student at Michigan State University, was able to return to the Pine River Channel site. Lovis' objective was to excavate as much as possible before construction of the condominium began. The occupation zone was covered by modern building debris that was often two or three feet thick. It was necessary to remove this before starting to excavate the occupation layer where it would be more profitable to spend the limited time available. Much of this was done through the aid of earth-moving equipment and operating personnel generously provided by Thomas Hanna, Charlevoix City Administrator and Leonard Dubey, Director of the City Maintenance Department.

Nineteen ten by ten foot units were excavated using .2' levels to the north and east of the 1971 excavations (Fig. 32). All materials from above the occupation zone were kept together according to the ten by ten foot unit from which they came. However, for the purpose of gaining better horizontal control of the occupation zone, each ten by ten foot square was divided into quarters and material was bagged by quarter unit. The base of the occupation zone was trowelled and materials bagged in ten foot units

before beginning the levels below it. Square sheets were prepared for each level showing the depth below datum at each corner. Thirty-five mm. slides were taken of each floor. In addition profiles were drawn of exposed walls and photos were taken. All material was sifted through ¼ inch screens.

Feature recovery was given primary importance in site excavation. Procedures were established that involved cross-sectioning features, drawing the north profile including below datum depths at first appearance and photographing them. In addition, a ½ bushel sample was taken from each feature for flotation to recover small plant and animal remains. Flotation was done in the field using window screen. Possible postmolds were cross-sectioned immediately in order to determine if they really were postmolds. Charcoal from one feature proved suitable for carbon-14 dating and a sample was obtained for this purpose.

Because the Pine River Channel site is bounded by bluffs, public streets and private property, extensive testing to determine the limits of the site was not feasible. Thus it was possible to concentrate on feature recovery through block excavations. However, a trench was dug from the northwest corner of N10/W70 to the bluff in order to determine how far the site extended to the northwest (Fig. 32). It was found that the occupation zone continued, at least partially, almost to the edge of the bluff. Likewise subsoil features occurred in this area.

A five foot profile was cut along the N89 line between W10 and W15 and a five by five foot test pit (1) was placed adjacent to it. The profile showed that the occupation zone was still present nearly 20 feet to the north of the major excavation area. The test pit contained artifacts and revealed three features at the base of the occupation zone. Coring and trenching in the area adjacent to the bluff on the west side of the site showed that modern building activity had destroyed the occupation zone there. Likewise disturbance was evidenced by a profile on the north bluff. Though the remains of a firepit were discerned, it was apparent that the occupation zone had been seriously disturbed by modern grading activity (see Fig. 33 for generalized soil profiles).

During the 1972 season a total of 1850 square feet of surface area was excavated. When added to the 700 square feet dug in the 1971 season this amounted to 2550 square feet total area excavated. Taking into account an average depth of three feet, about 7650 cubic feet of earth was moved at the Pine River Channel site. In addition to the aid received from Charlevoix citizens and city officials this was made possible through the excavation help provided by Dr. Richard Flanders and twelve students from Grand Valley State College who spent a weekend at the site in 1972. Finally, of course the cooperation of property owner Ralph Hess was of great importance.

NATURAL HISTORY

Traverse Corridor

An aspect of particular importance in understanding the prehistoric occupation of the Pine River Channel site is its location within the Traverse Corridor, or coastal plain of Lake Michigan from Traverse City at the south to Mackinaw City at the north (Cleland, 1967). This plain, which is bounded by the terminal Valders morainic system to the east, is favored by milder climate conditions than the interior largely because of the modifying effect of the lake (Wagner, n.d.). It thus becomes an extension of the transition zone between the Carolinian and Canadian biotic provinces into a region which to the east and north is part of the Canadian Biotic Province. Thus the Traverse Corridor possesses the characteristics of an ecotone, or border, between two biotic provinces. It includes the presence of both northern and southern plant species that take the form of a mosaic pattern rather than a single intermediate plant community (Dice, 1952:422). This can be seen in Isleib's (n.d.) and Nowak's (n.d.) studies of presettlement forest communities in the Traverse Corridor. This floral investigation shows such a mosaic pattern of 13 kinds of floral associations that include species characteristic of both the Carolinian and Canadian biotic provinces.

The importance to prehistoric populations of settlement within an ecotone lies in the possibility of

exploiting a much greater variety of food resources than would be available in either of the larger communities which form it. In addition there was the possibility of raising domestic crops, though the soils at the Pine River Channel site are not suitable for this purpose, at least according to modern requirements.

Finally, because the Traverse Corridor is the only region that forms a continuous north-south ecological situation favoring prehistoric settlement, Cleland suggests that it also is an avenue for interaction between northern and southern cultural areas (1967:2). Lovis, with some modification, was able to demonstrate that such interaction did indeed occur during the Late Woodland (1973). Thus the Pine River Channel site is located so as to be accessible to people from varied regions.

Environmental Setting

Glacial Topography

The Pine River Channel site is situated on a beach terrace of Lake Nipissing which formed at about 2200 B.C. due to a gravel sill at Port Huron which dammed the waters in the present Huron and Michigan basins at 605 feet above sea level (Humphreys et al., 1958:Part III, 1). During the Nipissing stage the water level was considerably higher than the present level of 580 feet above sea level. Because of isostatic rebound, the Nipissing beach at the Pine River Channel site is at 615 feet above sea level, or

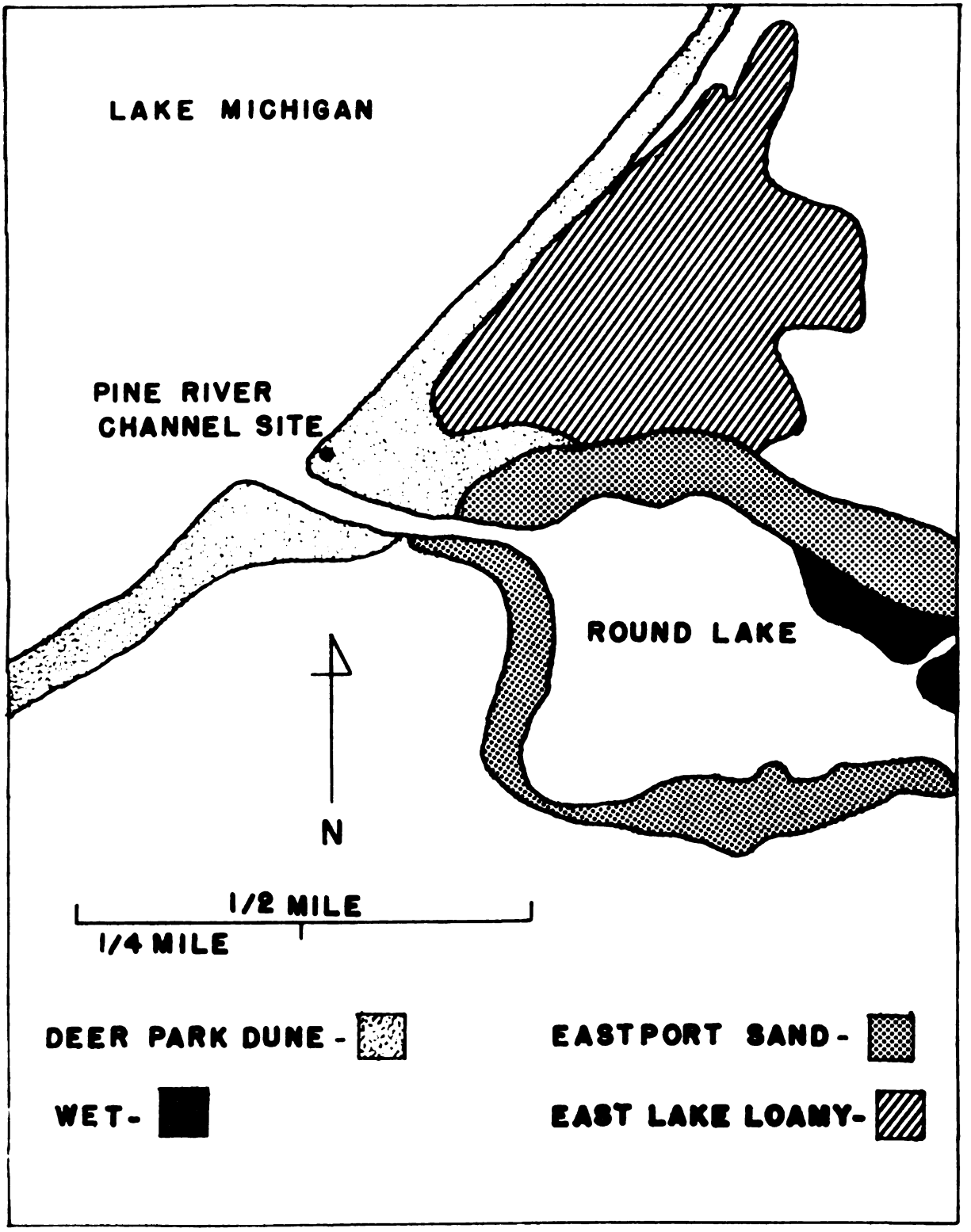
35 feet above the current water level of Lake Michigan. The site would have been available for human occupation anytime after the Nipissing stage about 2200 B.C. when the waters began to drop due to further downcutting of the Port Huron sill.

Soils

It is not surprising in view of the site's location on the Lake Nipissing terrace that the soils comprising both the site and the shore line on either side of the Pine River Channel are Deer Park Dune Land Association (USDA:1972). These soils have a very thin six to eight inch topsoil which is low in organic content. Beneath this topsoil is a layer of sand extending at least 60 inches to underlying gravel. This soil which is not suitable for domesticated food crops also occurs on both sides of the Pine River Channel where it joins Lake Michigan (Fig. 34).

The north shore of the Pine River Channel consists of wet alluvial sand adjacent to the water with gravelly sandy loam (Eastport Sand) on the slope. The south shore is of Eastport sand which occurs on slopes of 6 to 12 percent. To the northeast of the site, inland from both the lake and the channel soils are East Lake Loamy Sand which occurs on relatively flat land, or on slopes from 0 to 6 percent.

Figure 34. Soil Types in the Vicinity of the Pine River Channel Site.


LAKE MICHIGAN
PINE RIVER
CHANNEL SITE
ROUND LAKE
N
1/2 MILE
1/4 MILE
DEER PARK DUNE -
EASTPORT SAND -
WET -
EAST LAKE LOAMY -

Shoretype

The Lake Michigan shore at the site is Antrim Low Shoretype (Humphreys et al., 1958:Part II, 1). The wet beach is characterized to a water depth of six feet by medium sand and gravel up to four inches in diameter. The slope rises one foot in fifteen feet and the water is clear with no vegetation. The dry beach likewise lacks vegetation, is from 40 to 60 feet wide and has a slope of one foot in twenty feet. The strand consists of gravel and the berm, or "ridgelike deposit" along the water line is sand. The bluff consists of sand with some gravel and has a slope of 35° to 40°. At the top of the bluff, or upland, the land is level with sandy soil and vegetation consisting of oak, white birch, white cedar, maple and aspen.

The shoretype about one mile southwest of the Pine River Channel beginning at the present-day Boulder Park and about two miles to the northeast beginning at Mt. McSauba is South Point Cobble (Humphreys et al., 1958:Part II, 2). The wet beach here has a cobble bottom with algae and the bluff is minimal. Thus within a short distance of the site the shore changes making available perhaps different potential water resources.

Climate

The climate of Charlevoix County, particularly along the coast, is relatively moderate due to the modifying effect of Lake Michigan (Humphrys et al., 1958:Part III, 4). Thus during the winter the prevailing westerly winds

from the lake are warmed by the water which retains heat gained in warmer weather. Likewise in summer the winds are cooled by water chilled in the previous season. In January the mean temperature is 18°F. while in July it is 67°F. Though the mean annual precipitation is 29 inches, during June, July, and August the average precipitation is 2.5 inches per month. In September however, precipitation is greatest and average about 6 inches (Niedringhaus, 1966: 35, 36). An additional aspect of climate along the coast is that spring temperatures are relatively cool, about 48° in April, once again because the waters of the lake are cool. In the fall temperatures, which are about 55° in October, are warm because the lake waters are warm. Thus vegetation in the spring begins to develop somewhat late after the danger of frost is past, while in the fall vegetation is normally able to reach maturity before the first killing frost (Humphrys et al., 1958:Part III, 4). The number of frost free days in the area ranges between 120 and 140 (Niedringhaus, 1966:42) and the site is therefore within the limits of frost free days needed for prehistoric agriculture (Yarnell, 1964:128).

CERAMICS

Methods and Procedures

The initial processing of the pottery from the Pine River Channel site involved the division of a total of 24,594 sherds into smaller categories. These consisted of 1088 rims, 712 decorated body sherds, 4875 large undecorated body sherds, 85 neck sherds and 17,834 body sherds less than the size of a quarter. The rims were then separated into minimal vessels. On this basis at least 349 vessels were recovered from the Pine River Channel site of which 42 represent miniature pots. The larger body sherd categories were boxed by provenience unit and the small body sherds were counted and discarded. Those from the 1972 season were also weighed and had a total weight of 21,819.65 grams.

Attention was then given to rim sherds for the purpose of ordering the Pine River Channel vessels into types. The bulk of the ceramic materials from the site are from the early Late Woodland Mackinac Phase (McPherron, 1967), though some pottery is present from the Middle Woodland and other Late Woodland phases as well. Included in this latter group is pottery which had not been formally defined, but which during excavation appeared to have attributes of both earlier Middle Woodland Laurel Wares and the later Mackinac Ware. It therefore seemed to be intermediate in form and style between the two (Lovis,

personal communication, 1973). Because of the character of the assemblage and problems of this study, the examination of pottery from the Pine River Channel site had a twofold purpose directed toward the use of formal type definitions to answer questions concerning space-time relationships pertinent to the Mackinac Phase and the immediately preceeding period.

Since the central problem of this research is that of discerning the settlement system of the Mackinac Phase, a portion of the ceramic analysis focused upon the Mackinac Ware from the site. This was done with a view toward refining McPherron's classification (1967:86-97) in order to better establish a basis for dating and making spatial comparisons within the Mackinac Phase. It was hoped that this might be accomplished if types could be formulated that exhibited a stronger statistical clustering of attributes than pertained to the types of the original classification (McPherron, 1967:68, 72).

In addition, because the question of the origins of the Mackinac Phase was also of interest, the presence of ceramics apparently stylistically intermediate between the temporally distinct Laurel and Mackinac Wares was relevant because of the implication of cultural continuity between the earlier and later periods. Thus it was considered important to discern any patterning in the combination of earlier and later attributes that might be expressed in a formal type definition.

Because a type was considered to be recognizable as a ceramic class if constituent attributes clustered or occurred together in regular, patterned ways, the first step in discerning formal types present at the Pine River Channel site was to draw up an attribute list in order to note what attributes were present (see Appendix C). Not all attributes were appropriate for statistical examination however. For example, certain attributes, such as grit temper, were nearly universal in the sample and thus could not be used as a basis for discriminating classes or types within it. Additionally some attributes, such as cord-marked or plain surface treatments, were eliminated from statistical consideration because the way in which they occurred on types in the collection that were already formally described was known and predictable with a high degree of certainty. It was decided to concentrate statistical attention on decorative attributes of lip, rim exterior and rim interior, since these were most variable in ways that could not be readily predicted both in the case of Mackinac Ware types or in the case of previously unclassified ceramics. Thus it was hoped that statistical analysis might show a stronger clustering of these attributes along with others characteristic of Mackinac Ware than had been discerned when it was first defined. Further if an as yet undefined ceramic class was present, patterned regularity in the clustering of these attributes could be determined.

Since the problem of typing ceramics at the Pine River Channel site included discerning types other than those from the Mackinac Phase as well as refining those within Mackinac Ware, all vessels large enough to observe decorative attributes were included in chi square tests. A total of 230 vessels met this criteria and the chi square statistic was performed to test the null hypothesis that; (1) exterior decorated vessels were not decorated on the lip, (2) exterior decorated vessels were not decorated on the interior, and (3) vessels with lip decoration were not decorated on the interior. In all cases the null hypothesis was rejected at the .001 level (Table 19). Therefore, the probability was high that a vessel with exterior decoration would also be decorated on the lip and interior. Likewise a vessel with lip decoration would be decorated on the interior.

Given the information that vessels exhibiting any decoration at all could be expected to show this on all three areas where decoration occurred, it was decided to see if specific kinds of exterior decoration would be present with lip or interior decoration. The particular kinds of exterior decoration chosen were multiple motif, multiple row punctation, single row punctation, absence of decoration (plain), corded punctation, including all vessels where punctation was made with a cord-wrapped object or knot, and collared rims. The null hypotheses were; (1) that a paricular kind of exterior decoration

Table 19.--Presence of Decoration on Two Vessel Areas.

Test	N	X^2	df	P
Exterior/Interior	459	57.714	1	.001
Exterior/Lip	458	13.67	1	.001
Interior/Lip	457	114.23	1	.001

X^2 significant at .01 level.

would not have decoration on the lip and (2) that a particular kind of exterior decoration would not have decoration on the interior. The results of these chi square tests are shown in Table 20.

The importance of this second set of chi square tests lies in gaining an understanding of how changes in behavior with regard to lip and interior decoration might be relevant for further classification of Pine River Channel site ceramics. Because those categories which prior information suggested were later wares, exhibited the greatest likelihood of interior and lip decoration, whereas those categories that probably included more of the earlier pottery showed consideration variation in this regard, it became apparent that interior and lip decoration were crucial elements for the later types and that it was in this area that change was probably greatest. Thus the chi square tests for corded punctate vessels, multiple motif vessels and collared vessels are all pertinent for the later pottery and all show a tendency for interior and lip

Table 20.--Presence of Specific Exterior Decoration With Lip and Interior Decoration.

Kind of Exterior Decoration	N	X^2	df	P
Presence of Specific Exterior Decoration with Lip Decoration				
Multiple Motif	220	3.93	1	.05
Multiple Row Punctation	218	0.47	1	.80
Single Row Punctation	212	0.26	1	.90
Plain	218	0.41	1	.80
Corded Punctation	all decorated			
Collar	all decorated			
X^2 significant at .01 level.				
Presence of Specific Exterior Decoration With Interior Decoration				
Multiple Motif	221	3.46	1	.05
Multiple Row Punctation	220	1.01	1	.30
Single Row Punctation	224	0.72	1	.80
Plain	221	3.20	1	.10
Corded Punctation	222	13.21	1	.001
Collar	220	0.05	1	.98
X^2 significant at .01 level.				

decoration. In the case of vessels exhibiting punctation using some form of cord, there is a very high probability of 99.9 percent that the interiors of vessels of this kind will be decorated and all of them have decorated lips. Since decoration using cord is a common characteristic of Mackinac Wares as defined by McPherron (1967:86), it was thought that the test for this kind of decoration probably included mostly Mackinac Wares and few earlier classes. The multiple motif vessels show a tendency toward interior and lip decoration with a 95 percent probability that this is the case, even though it was not considered sufficient to reject the null hypothesis that such decoration would not occur. Since the use of multiple motifs is characteristic of the type Mackinac Banded and the later Bois Blanc and Juntunen wares in the area, it is likely that this test referred mainly to the later ceramics. The collared vessels present a somewhat anomalous case since all posses lip decoration, though the probability of interior decoration is very low at .02 percent. Since collaring is considered to be a horizon marker for the time period around A.D. 1000 in the study area (McPherron, 1967:277), it is probable that the collared sherds from the Pine River Channel site are within the later time segment of the ceramic assemblage. Thus it is not surprising that these exhibit lip decoration. Perhaps the noticable lack of interior decoration is related to a straight rim profile on collared vessels which would render interior decoration

less visible and therefore unnecessary. However, that possibility was reserved for later consideration, since it involved attributes not being considered at this point.

It is apparent that the occurrence of lip and interior decoration is most random on those vessels exhibiting multiple rows of punctation, a single row of punctation or no exterior decoration at all. These categories are the ones present on Mackinac Wares, the earlier Middle Woodland wares and the pottery which was observed to show characteristics of both. It is precisely here that the greatest randomness in decorative attribute combination should occur if the tests refer to three classes of pottery since they might cluster in different ways in each one.

Given the results of the preceeding tests which suggested that interior and lip decoration may have changed over time and that they were probably predominantly characteristic of the later ceramics at the Pine River Channel site, it was decided to focus on them to see if there were any consistent patterns that might be discerned. Accordingly, chi square tests were performed to see if the kind of tools used for interior and lip decoration were the same on vessels exhibiting both and to see if the direction in which the tools were applied were the same for both (Table 21).

As can be seen in Table 21, the null hypothesis was accepted in both cases. A tool used for decoration of the interior of a vessel is not necessarily the one which is

Table 21.--Co-occurrence of Attributes of Interior and Lip Decoration.

Test	N	X^2	df	P
Tools Used	241	6.10	4	.20
Direction of Application	150	3.43	2	.80

X^2 significant at .01 level.

used to decorate the lip. Likewise the direction of application of the tool need not be the same for both. These results indicate a considerable lack of patterning with regard to the attributes of interior and lip decoration on the pottery from the Pine River Channel site.

Further attempts to use chi square for the purpose of being more specific with regard to interior and lip decoration proved fruitless because the nature of the sample was such that criteria for the test could not be met. However, it was observed that cord-wrapped cord, cord-wrapped stick and cord-wrapped paddle edge never appear together on the interior and lip of the same vessel. This is not surprising since these are simply different ways of producing a similar motif.

In summarizing the use of chi square for formulating pottery types for the ceramics from the Pine River Channel site, two conslusions were reached. First interior and lip decoration probably increased over time and were characteristic of later types. Second, there appeared to be no

consistency or patterning in attributes pertaining to these areas of decoration when both occurred on the same vessel.

It was decided at this point to look at the collection again utilizing the information gained from statistical procedures. Unusual vessels were held aside and the rest were sorted into the categories of exterior decoration used in the tests. Within these groupings attributes of interior and lip decoration were given particular attention along with related attributes of lip shape and profile as well as rim profile. It became apparent that these were important because they were relevant to the problem of enhancing the visibility of interior and lip decoration. The eversion of lip and rim plus thickening the lip or bevelling it all can be used as devices to make interior or lip decoration more obvious. The resultant typological divisions were based largely on the ways in which this set of related attributes occurred.

Type Descriptions

The majority of the vessels from the Pine River Channel site were classified in terms of a sequence of changes in emphasis on particular aspects of pottery decoration. The initial direction of change is toward simplification. Those vessels recognized as late Middle Woodland Laurel exhibit decoration apparently confined to the exterior rim, whereas on earlier Laurel types decoration

covers more of the vessel exterior. Further simplification which involves the elimination of different parts of the decoration found on Laurel rims can be seen in a new class which will be defined here as Pine River Ware. Finally, the Mackinac Wares show greater variation in exterior decoration particularly in the kinds of tools used, and in the advent of interior and lip decoration with a concommittant change in lip shape, lip profile and rim profile.

Laurel Ware (6 vessels)

Laurel ceramics are associated with Middle Woodland occupations in northern Michigan (Janzen, 1968 and Brose, 1970). Janzen (1968) dates Laurel from about A.D. 0 to 450. Brose (1970:89) however, sees the Middle Woodland as having a somewhat shorter time span and dates Laurel between A.D. 110 and 420. In the Mackinac Straits area some Laurel sites have yielded later dates than those given by Janzen (1968) and Brose (1970). These include A.D. 450±120 (M-2489) and A.D. 650±130 (M-2490) from Fort Michilimackinac, A.D. 630±120 (M-2065) from Wycamp Creek and A.D. 610±110 (M-1625) from Goodwin-Gresham. Thus there is some evidence that Laurel in the region of the Pine River Channel site may last until A.D. 600.

The six vessels at the Pine River Channel site classified as Laurel were divided into two subgroups, Laurel Dentate and Laurel Linear Stamped on the basis of the kind of tool used in exterior decoration. Thus one

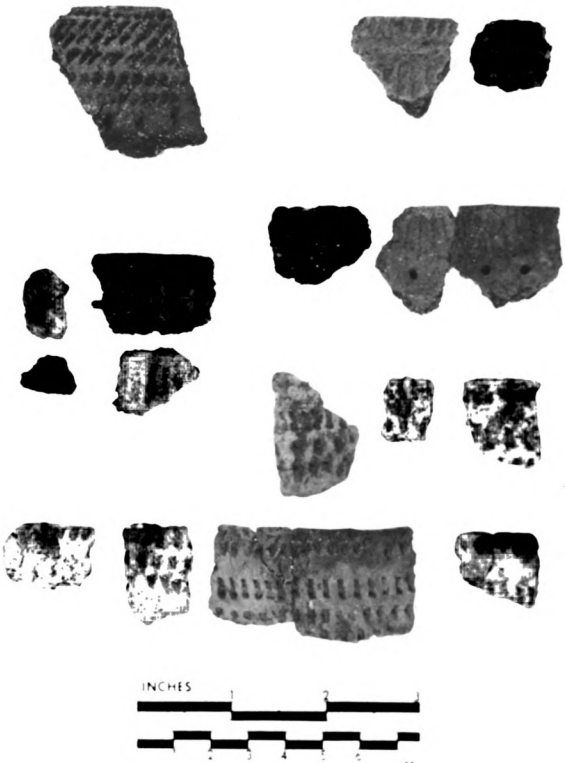
group of three exhibits dentate stamping while the other group of three has decoration with plain tool banked or linear stamping. Though vessels in the subdivisions share enough other attributes that separation might not be warranted with so small a sample, this has been a distinguishing factor for Laurel types at other Michigan sites with larger Laurel components, i.e., Summer Island (Brose, 1970) and Naomikong Point (Janzen, 1968), and it was considered worthwhile to follow that precedent here.

The major commonality between the two groups lies in the fact that exterior decoration begins at the lip and extends from 2 to 3 cm. below the lip. This band is always bounded either at the top, the bottom or both, though the ways in which the bordering effect is achieved vary. In addition all vessels have straight rim profiles, straight lip profiles and plain interiors. Both groups show evidence of breakage along coil lines.

Laurel Dentate (3 vessels, Fig. 35)

The three vessels exhibiting dentate stamping show decoration beginning at the lip that consists in the main of a band of parallel rows of vertical dentate stamped impressions which is bounded on two of the vessels at 1.5 cm. below the lip with one row of small circular punctations and on one vessel at .6 cm. below the lip with two parallel rows of horizontal impressions that are probably of twisted cord. This latter vessel has at least

Figure 35. Laurel Ware from the Pine River Channel Site.


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one row of dentate stamping executed with a larger tool below the horizontal band. In addition both of the other vessels have some horizontal decoration though this occurs in different places on each one. One rim exhibits at least two horizontal rows of what is probably single cord impressions below the punctations and one has a horizontal row of dentate stamping at the lip. All three vessels are broken so that it is impossible to tell whether the decoration continues and what the exterior surfaces were like. These vessels all have medium grit temper ranging from 1.1 to 2.0 cm. in size plus plain interiors, squared lips, straight lip profiles and stright rim profiles. One vessel exhibits lip decoration consisting of circular punctates. The other vessel lips are undecorated.

The term Laurel Dentate will be used for this class of vessels at the Pine River Channel site because given the small sample size with the resultant impossibility of adequate comparison with samples from other sites, this term is the most descriptive in that it assigns this class to northern Middle Woodland ceramics and at the same time avoids the introduction of a new name or inaccurate assignment to other named types. Thus though there are similarities between this ceramic material and that from Summer Island including decoration beginning at the lip and the use of horizontal as well as vertical decoration, it would probably be inaccurate to use the name Upper Peninsula Linear Stamped; Dentate Tool variety since there are

differences in terms of lip shape and frequency of interior decoration and both similarities and differences may well be due to sampling error (Bros, 1970:77-80). Unfortunately, there remains an implication of comparability with Laurel Dentate ceramics from Naomikong Point which is not the case since those materials are body sherds, whereas the Pine River Channel site sample is confined to rims. However, the more general term seems more appropriate to the situation.

Laurel Linear Stamped, Plain Tool (3 vessels, Fig. 35)

The three vessels from the Pine River Channel site designated Laurel Linear Stamped all have decoration beginning at the lip consisting of rows of plain tool vertical or oblique impressions. In two cases there is a bordering row of more widely spaced punctations that are deep, generally square and often show trail marks at the bottom indicating that the tool used was jabbed into the clay at an angle rather than straight on. The vessel lacking a row of punctations at the bottom of the rim decoration has a .6cm. space between the first row of linear stamping just beneath the lip and the three rows below it and has small fine line incising at the front of the lip which extends less than one-half way across the top. This has the effect of creating a border at the top of the decorative band.

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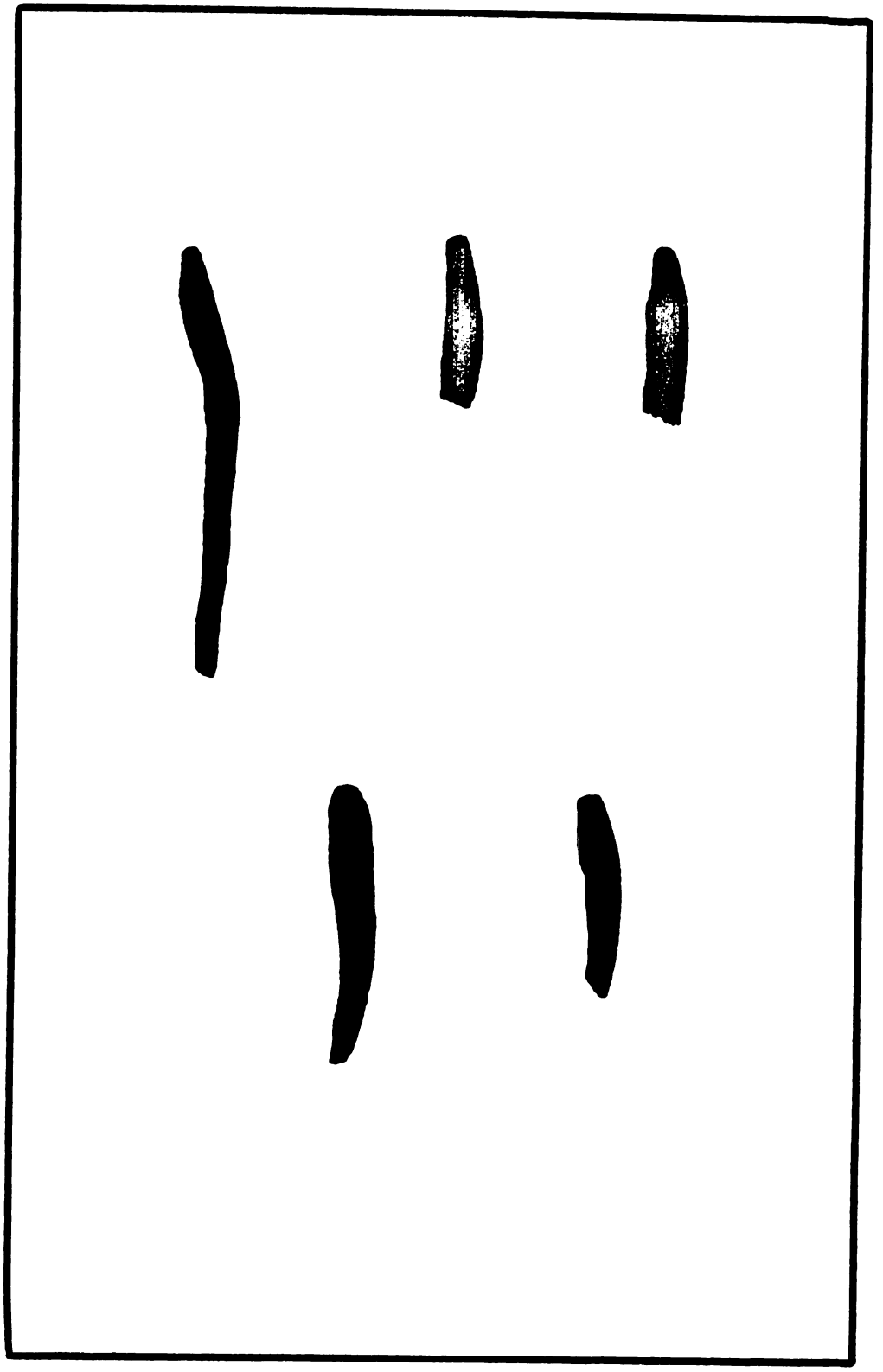
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All vessels have straight rim profiles, straight lip profiles and plain interiors (Fig. 36). Temper varies from medium (1.1-2.0cm.) to large (over 2.1cm.) grit. Surface treatment was observable on only two vessels. One exhibited fine brushing, the other was plain. These two had no decoration below the rim. As has been mentioned one lip was finely incised at the front. Both of the other vessels had plain lips. Greatest variation occurred in lip shapes. One lip was rounded, another was squared and the third was bevelled to the interior.

Similar ceramics have been reported from both the Summer Island (Brose, 1970) and Naomiking Point sites (Janzen, 1968). Brose refers to them as Summer Island Banked Stamp; Plain Tool variety and divides them into oblique and vertical groups (1970:59). A major point of similarity with the vessels from the Pine River Channel site lies in the fact that the vertical group contains vessels with a separation of lip front decoration and the remainder of the rim decoration. Vertical and oblique elements of decoration occur at the Naomikong Point site as well in the type Laurel Linear Stamped (Janzen, 1968:52). The most relevant comparisons here seem to be that 15 percent of the vessels have a row of circular punctation below the linear stamping and that on some vessels only the rim is decorated (Janzen, 1968:52). Coiling as the method of manufacture is apparent on some vessels from both sites (Brose, 1970:55) and Janzen, 1968:51). Once

Figure 36. Rim Profiles of Laurel Ware.



again close comparisons are difficult because of the small size of the sample from the Pine River Channel site. Therefore, this vessel class will be called Laurel Linear Stamped since this is the most descriptive and at the same time the most general term.

Pine River Ware (33 vessels)

Pine River Ware is a ceramic class named here which is considered to be intermediate in time and style between the late Middle Woodland Laurel types and the Late Woodland Mackinac Wares occurring in the study area (Appendix B). Thus Pine River Ware ranges in time from about A.D. 600 at the end of the Middle Woodland to about A.D. 800 when the Mackinac Phase begins. Transitional ceramics of the same kind have been observed by the author in the assemblages of other sites in northern lower Michigan. Because of its transitional nature, Pine River Ware exhibits characteristics of both Laurel and Mackinac Wares that take the form of the retention or elimination of some earlier attributes and the substitution of some later ones. The major Laurel attributes retained on some Pine River Ware vessels are coiled manufacture, plain surfaces and square, rounded or bevelled lip shapes which involve no thickening or eversion of the lip. In many cases the use of cord has been substituted for the plain tool as a decorative device. Thus there is the advent of the use of twisted cord, cord-wrapped object or knots instead of dentate tools or the

ends of plain circular or square sticks. Likewise cord-marked surfaces may appear on Pine River Ware vessels.

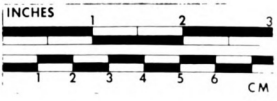
The process of elimination is evident in changes in exterior decoration that form the basis for the division of Pine River Ware into four types. Whereas the Laurel vessels from the Pine River Channel site have a band of decoration set off at the top and/or bottom in such a way as to create a border, some portion of this is used as decoration while the rest is discarded on Pine River Ware. Thus the type Pine River Multiple Punctate is characterized by the presence of a band of multiple row punctate impressions with no borders. Pine River Divided Punctate represents the elimination of the band and the retention of impressions at both the lip and the area below which the band would occur. Pine River Punctate is divided into two subgroups, one with punctate impressions at the lip and one with punctate impressions at the base of the rim. In this case only one border area is decorated and both the band and the other border have been removed. Finally, the type Pine River Plain has no exterior decoration at all.

Pine River Divided Punctate (9 vessels, Fig. 37)

The type Pine River Divided Punctate is characterized by exterior decoration consisting of one row of punctate impressions that extend onto the front of the lip and the rim just below it plus another row of punctate impressions from 1 to 2.5 cm. below the lip. The decoration

Figure 37. Pine River Divided Punctate from the Pine River Channel Site.




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is vertical in all but one case which exhibits square punctations. The tendency is for these impressions to be made with plain tools as is the case on six vessels. Variation occurs in the form of cord-wrapped stick impressions on two vessels and cord-wrapped paddle edge on one. Both sets of punctate impressions are made with the same tool, though there are two exceptions. Thus on one vessel the bottom row has plain tool impessions while those at the lip were made with a single cord pressed into the clay and another vessel has cord-wrapped stick impressions at the lip with a bottom row of stab-drag impressions.

Interior rims of Pine River Divided Punctate are likely to be plain, though one-third of them are decorated. In one case there are three rows of horizontal stab-drag impressions, in another there is a row of vertical plain tool impressions and on the third there are cord impressions on the interior. Lip shapes vary from flat and square to slightly bevelled to the interior and one squared lip has been thickened. Lips are plain with the exception of one which is finely cord-marked. One lip is aberrant in that it is notched. Rims are generally everted with only one being straight. One vessel surface is plain while the rest are smoothed-over cord-marked and grit temper size ranges from .01 cm. to over 2.1 cm. though the majority of eight vessels have temper less than .2 cm. in size.

Pine River Multiple Punctate (2 vessels, Fig. 38)

The type Pine River Multiple Punctate contains only two vessels, one represented only by a body sherd, which share attributes generally characteristic of Pine River Ware. However the exterior decorations is such that they do not conform to any of the other types and merit a class of their own. Thus the vessel reprsented by a rim was apparently made by coiling, has a smoothed-over cord-marked surface, a straight rim and lip profile, a square flat lip and a plain interior. The lip of the vessel has been treated with cord-wrapped paddle.

The characteristic that distinguishes Pine River Multiple Punctate as a type is its exterior rim decoration which represents a carry-over in simplified form of the Laurel multiple row band of rim decoration and the discarding of border decoration at the lip or bottom of the band. On the single available rim there are at least two rows of square plain tool punctations beginning 1.5 cm. from the lip. The rows are .3 cm. apart and the punctations are 1 cm. from each other. The punctations in the two rows are not directly above or below one another, but rather those in the bottom row are slightly to the right of those above them.

Pine River Punctate (11 vessels, Fig. 39)

Pine River Punctate, like other Pine River Ware types, is distinguished on the basis of exterior decoration

Figure 38. Pine River Plain and Pine River Multiple Punctate from the Pine River Channel Site.

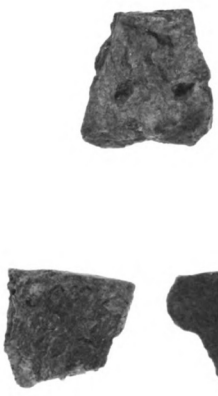
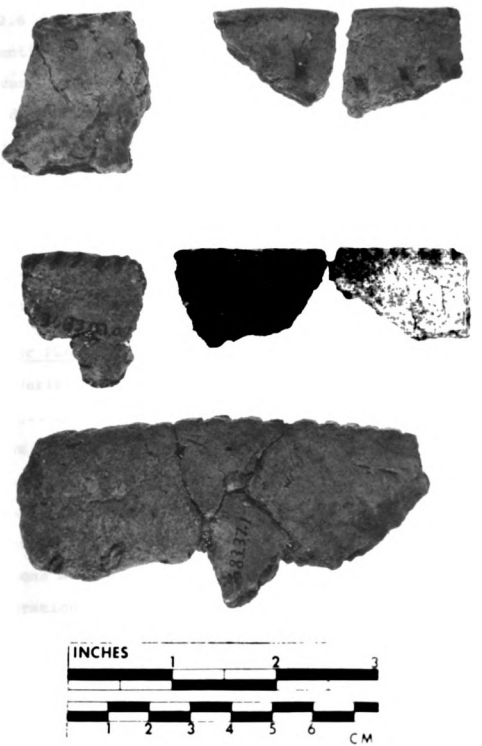

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Figure 39. Pine River Punctate from the Pine River Channel Site.


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which in this case consists of a single row of punctate impressions located either at the lip front or from about 1.5 to 2.6 cm. below the lip. In effect this represents the retention of one border found on the Laurel pottery at Pine River Channel and the elimination of the multiple row band of decoration on the rim. The type is divided into two varieties depending on which border area was chosen for decoration. Thus, variety one exhibits a single row of punctations on the rim at least 1.5 cm. below the lip and variety two consists of a single row of punctations at the lip. One body sherd probably is of this type, but cannot be assigned to a variety.

Pine River Punctate, Variety One (7 vessels, Fig. 39)

Variety one of Pine River Punctate is characterized by a single row of punctations from about 1.5 to 2.6 cm. below the lip. These are normally the result of plain tool impressions, either wedge shaped or rectangular, though one vessel had punctations made with a cord-wrapped stick, one had punctations made with a single cord and one had punctations made with a knotted cord. The orientation of the decoration is usually vertical. However, in two cases the orientation was oblique.

The interiors of vessels in this group are likely to be plain. One vessel interior showed cord impressions. Lips are somewhat more variable in shape and treatment. Four lips were square, one was bevelled, one was wedge

shaped and everted and another was wedge shaped and thickened. Treatment of the lip included one vessel with oblique fine cord impressions, one with olbique fine line incising, two with cord-wrapped paddle impressions and three left plain.

The greatest variability in this variety of Pine River Punctate was with regard to rim profile and vessel surface. Three rims were vertical, while four were everted. Two vessels exhibited plain surfaces, two had smoothed-over cord-marked surfaces and three were cord-marked. Temper size ranged from 0.1 to over 2 cm. with temper of four vessels being medium and ranging from 1.1 to 2.0 cm. temper of one vessel being fine from 0.1 to 1.0 cm. in size and temper from two vessels being coarse or over 2.1 cm. in size.

Pine River Punctate, Variety Two (4 vessels, Fig. 39)

Pine River Punctate, variety two is decorated by a single row of punctations at the top of the rim that extend onto the front of the lip. Unlike the later Mackinac Wares where lip decoration is a key decorative element, the effect achieved here is one of rim decoration. On three of the vessels this is produced by impressing a single cord vertically into the clay. In one case these impressions occur on the back of the lip as well, though the lip top is plain as it is on all the other vessels. The single row of punctations on one vessel was made using a cord-wrapped stick with an oblique orientation.

All interiors are undecorated in this variety of Pine River Punctate and all lips are square. The rim profile is inverted in one case, vertical in one case and everted in two cases. One vessel has a plain surface, two have smoothed-over cord-marked surfaces and one has a cord-marked surface. Temper is coarse, over .2 cm. in three vessels and fine, 0.1 to 1.0 cm. in one vessel.

Pine River Plain (6 vessels, Fig. 38)

The characteristic that sets Pine River Plain apart from other types in the Pine River Ware category is its lack of exterior decoration. In addition, it can be distinguished from undecorated types of other wares. Thus though three vessels lack cord-marked exterior surfaces, they do not have the smooth, finished appearance of Laurel ceramic surfaces. Of the three, one is rough and brushed and two are rough. The other three of the six vessels in this type have surfaces that are in one case cord-marked and in two cases smoothed-over cord-marked. Likewise, Pine River Plain is different from the later type Mackinac Undecorated. The lips of the vessels not only lack the decoration often found on Mackinac Ware, but they lack elaboration of lip form which in Mackinac Wares serves to make lip decoration more visible and prominent. For example, there are no thickened or everted lips. Four of the lips are square in shape and two are rounded. Five lips have been smoothed, while the one which is rough occurs

on a vessel with a rough exterior surface. Four of the six interiors have been brushed and in addition to brushing the vessel with a rough exterior surface and lip exhibitis a rough interior. Three rims have vertical profiles and three have everted profiles.

Mackinac Ware (209 vessels)

Mackinac Ware dates from about A.D. 800 to 1000 (McPherron, 1967). It is found in the northern lower peninsula of Michigan and along the shore of Lake Michigan in the upper peninsula.

It was stated in the introduction to this section on pottery type descriptions that the major problem was to refine the class Mackinac Ware as defined by McPherron (1967). The results of typological analysis however, led to the definition of Pine River Ware as an early Late Woodland antecedant of Mackinac Ware and to no change in the types proposed by McPherron (1967) within the Mackinac Ware category. Because these findings are relevant to the general problems posed by this study of the Mackinac Phase, it becomes necessary to consider the changes that occurred from Pine River Ware to Mackinac Ware and to discuss the reasons for leaving McPherron's (1967) types intact.

The change from Pine River Ware to Mackinac Ware involves a shift in emphasis to lip and interior decoration rather than the modification of exterior decoration that differentiated Pine River Ware from the earlier Laurel

Figure 40. Rim Profiles of Pine River Ware.

ceramics. Thus the exterior decoration of Mackinac pottery types retains much that was present earlier, i.e., a single row of punctations on the rim (M. Punctate), a double row of punctations on the rim (M. Punctate), banded decoration with bordering punctations (M. Banded) and of course a plain type (M. Undecorated). With regard to lips and interiors however, these are not only more likely to be decorated on Mackinac Ware vessels, but there are changes in lip and rim attributes that have the effect of increasing the visibility of and giving prominence to lip and interior decoration. These new attributes include lips that are splayed, outrolled or thickened and rims that are normally flared outward (McPherron, 1967:86-97). It is interesting to note that the type Mackinac Cord Impressed is the least likely of Mackinac Ware types to exhibit these attributes of lip and rim and is at the same time confined to the earliest Mackinac Phase occupation (Occupation A) at the Juntunen site (McPherron, 1967:90, 91). Indeed lips on Mackinac Cord Impressed vessels are often straight as is the case with Pine River Ware.

In turning to the question of formulating types within Mackinac Ware it was decided that these should remain as defined by McPherron (1967:86-97). No significant attribute clustering was noted by either intuitive or statistical means that would distinguish any new types in Mackinac Ware or that would modify those that were already established. Indeed the findings here conform to those of

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McPherron who found it difficult to discern "strong attribute clustering" in the earlier ceramics at Juntunen (1967: 72). Statistical tests suggested considerable randomness in the tools used and the direction of their application for both lip and interior decoration which are apparently key attributes in Mackinac Ware.

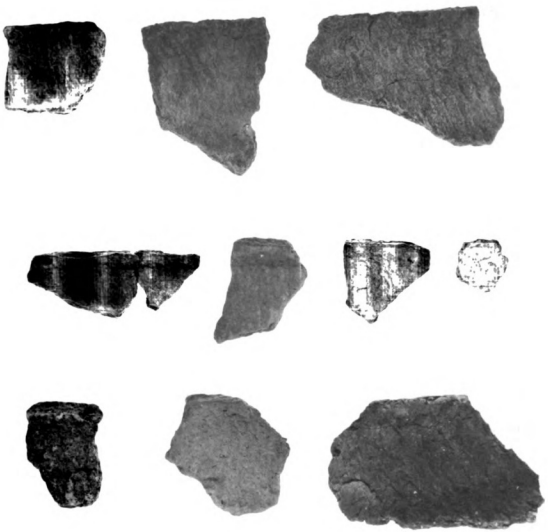
There were 118 vessels from the site that could be placed within McPherron's types. In addition there were 78 rims too small to type and 13 decorated body sherds probably of Mackinac Ware making a total of 209 Mackinac Ware vessels.

Mackinac Undecorated (48 vessels, Fig. 41)

The 48 Mackinac Undecorated vessels all exhibit the attributes of lip, interior and rim profile characteristic of Mackinac Ware and can thus be distinguished from other types at the Pine River Channel site which lack exterior decoration. Lips in all but one case exhibit the use of special treatment with a wide variety of tools applied in a number of directions and on all but three vessels they have been made prominent through manipulation of shape.

Cord-wrapped paddle constitutes the most common lip treatment and appears on sixteen of the vessels. These plus two vessels treated with fabric-wrapped paddle, one with smoothed-over cord-wrapped paddle, one with smoothed-over fabric-wrapped paddle and four that have smoothed lips add to twenty-four vessels with treatment that covered the

Figure 41. Mackinac Undecorated from the Pine River Channel Site.


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entire lip. Five of the Mackinac Undecorated vessels exhibit plain tool impressions and the remainder have various kinds of cord impressions including four using a cord-wrapped paddle edge, six using a cord-wrapped stick, six using a single cord, and two using a knot. Lip decoration was applied transverse to the lip on seven vessels, oblique to the left from the back of the lip on eight vessels, oblique to the right from the back of the lip on one vessel, horizontal around the lip on one vessel and cross-hatched on one vessel. In addition, five vessels exhibit combined directions of tool application. Four of these have vertical plain tool impressions at the front of the lip plus treatment of the entire lip top in two cases and impressions transverse to the lip in two cases. Finally, one vessel exhibits oblique impressions at the lip front, horizontal decoration on the top and vertical impressions at the back.

Mackinac Cord-Impressed (2 vessels, Fig. 42)

The type Mackinac Cord-Impressed is comprised of two vessels at the Pine River Channel site. Both exhibit horizontal rows of twisted cord decoration separated by smoothed plain bands on the exterior. On one vessel there are at least four rows of twisted cord impressions beginning about 1 cm. below the lip. The other vessel has three rows of twisted cord impressions beginning .04 cm. below the lip. In this case the bottom row has been obscured by

Figure 42. Mackinac Cord Impressed from the Pine River Channel Site.








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smoothing, thus indicating that the area between the rows of twisted cord was smoothed after the cord-impressions were made. In addition both vessels have straight, squared lips that have been impressed with twisted cord transverse to the lip and both have plain interiors plus smoothed-over cord-marked surfaces. One rim has an everted profile whereas the other is vertical. Likewise one vessel exhibits small grit temper (0.1-1 cm.) and the other has large grit temper (over 2.1 cm.).

Mackinac Banded (5 vessels, Fig. 43)

Five vessels are included in the type Mackinac Banded at the Pine River Channel site. Characteristically the exterior decoration is complex with an introductory border at the lip above the "major motif." The border varies from a vertical row of cord-wrapped object impressions on two vessels, a row of cord-wrapped stick impressions above a row of circular plain tool punctations on one vessel, two rows of oblique plain tool punctations on one vessel to a band of smoothed-over fabric impressions with superimposed knots on one vessel. The "major motif" consists of two or three rows of horizontal cord or twisted cord in three cases. One vessel exhibits a major motif of twisted cord chevrons over fabric impressions and one has a band of cross-hatching executed with twisted cord. All vessels have decoration below the "major motif" as well. Following the "major motif" on two of the vessels

Figure 43. Mackinac Banded from the Pine River Channel Site.


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there is a row of vertical cord-wrapped object impressions and one of these has cord-wrapped object chevrons below this. One vessel has a row of ovoid cord-wrapped stick impressions below the "major motif" and another has a lower border of three rows of horizontal cord impressions. Finally one vessel exhibits a secondary motif of chevrons of twisted cord that are filled in with horizontally oriented twisted cord and followed by at least one row of horizontal cord impressions.

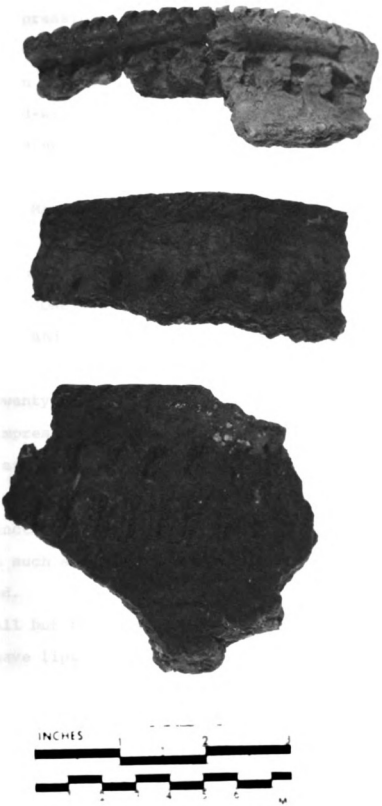
The Mackinac Banded vessels at the Pine River Channel site all have attributes of lip and rim that in effect give prominence to lip decoration. Thus all rims are everted and all lips are thickened. Four of the lips are also everted while one is slightly bevelled. Decoration of the lip has a transverse orientation on three of the vessels, is oblique on one and zig-zag on another. In two cases a plain tool was used and in two cases the lip was decorated with a cord-wrapped stick. One vessel has lip decoration of single cord impressions.

The interiors of four vessels are plain whereas one is decorated with vertical cord-wrapped stick impressions. Two vessel surfaces are cord-marked, two are smoothed-over cord-marked and one surface is unknown. Temper varies from .01 to over 2.0 cm. in size.

Mackinac Punctate (62 vessels, Fig. 44)

Mackinac Punctate with sixty-two vessels is the largest type represented at the Pine River Channel site.

Figure 44. Mackinac Punctate from the Pine River Channel Site.


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Exterior decoration consists of one or more rows of punctate impressions that on nearly one-half or twenty-seven of the vessels were executed with a corded tool. Variation in the use of cord included nineteen vessels showing cord-wrapped paddle edge impressions, one with cord-wrapped stick impressions, seven with knot impressions and one with a single cord impressed into the clay. Twenty-nine of the Mackinac Punctate vessels exhibit plain tool impressions. In one case the tool was notched or toothed and two vessels combined plain tool and cord-wrapped stick decoration. One vessel has fabric-wrapped paddle edge punctations and two were unidentifiable as to the tool used.

Punctations are normally vertical. This is the case on twenty-nine of the vessels. Thirteen vessels have oblique impressions and on twelve vessels they are circular. Vertical and oblique directions of tool application are combined on three vessels and one vessel has crescent shaped punctations oriented vertically. Three vessels were broken in such a manner that orientation could not be determined.

All but two of the sixty-two Mackinac Punctate vessels have lips decorated with a variety of tools. The tool used with greatest frequency was cord-wrapped stick. This occurred on fifteen vessels. Other kinds of corded tools used in lip decoration included knot on two vessels, cord-wrapped paddle edge on nine vessels, cord-wrapped paddle on eight vessels, a single cord on five vessels,

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and cord-wrapped cord on two vessels. A plain tool was used on eleven vessels and a toothed tool was used on one. One vessel lip was treated with a fabric-wrapped paddle and one was smoothed. In addition several vessels exhibited a combination of two tools applied to the lip. Cord-wrapped paddle superimposed by plain tool decoration occurred on three vessels with the cord being smoothed-over in one instance and cord-wrapped paddle superimposed with cord-wrapped paddle edge appeared on one vessel. Finally, the lip on one vessel was treated with a knot and cord-wrapped paddle edge.

The variety introducted into lip decoration by different kinds of tools was enhanced by decorating different portions of the lip and by applying the tool in different directions. Thus thirty-eight vessels were treated only at the lip surface. These included fifteen vessels with decoration transverse to the lip, nine vessels with oblique decoration, one vessel with punctations on the lip, twelve vessels on which treatment covered the entire lip, and one vessel where decoration was both transverse and horizontal. The remaining twenty-one vessels exhibiting treatment of the lip were decorated at the front only in twelve cases or at the front and lip top in six cases and at the front and back in four cases. Those vessels having decoration at the front exhibited vertical impressions on eight, oblique impressions on two and punctations on one. On three vessels where treatment of the lip top covered

the entire lip, the lip front was decorated with vertical impressions on two vessels and circular punctations on one. One vessel had oblique impressions on the front and oblique impressions on the top. Those vessels decorated at the front and back of the lip all showed the direction of tool application was the same on both. Thus there was one vessel with vertical decoration, one with oblique decoration and two with punctations.

As is characteristic of Mackinac Ware in general, the type Mackinac Punctate at the Pine River Channel site showed manipulations of lip shape and lip and rim orientation which served to give prominence to lip decoration. Thus the lips on thirteen vessels were everted and in addition eversion was combined with bevelling in five cases, thickening in seven cases, rolling in two cases and interior bevelling in two cases. Seventeen vessels had bevelled lips, three had rolled lips and one had a splayed lip. Finally, two vessels had lips that were rolled and bevelled and one had a lip that was rolled, bevelled and thickened. Fifty-two rims were everted, six were straight and four were unidentifiable as to profile.

Interiors of the Mackinac Punctate vessels are not decorated in twenty-seven cases and of those that are, variety is once again evident in both tools used and in the direction of tool orientation. Tools used included nine vessels with cord-wrapped paddle edge, six with cord-wrapped stick, five with plain object, one with a toothed

instrument, two with knots, three with single cord impressions, one with twisted cord and four with brushing. Cord-wrapped paddle edge is combined with cord-wrapped stick on one vessel and with cord-wrapped cord on another. On eleven vessels the decoration was oblique, on eight vessels it was vertical, on three vessels it was horizontal and on one it was circular. Finally, horizontal decoration occurred in combination with vertical impressions in one case and with oblique impressions in another.

Mackinac Zigzag Lip (1 vessel, Fig. 45)

One vessel from the Pine River Channel site was assigned to the type Mackinac Zigzag Lip. Though this vessel deviates from McPherron's definition of the type in that it does have exterior decoration in the form of plain tool punctations, it conforms to the definition because the zigzag design was applied to a very thick lip after it was prepared by smoothing, it was applied with a cord-wrapped object and the triangles formed by the zigzag line were filled in with cord-wrapped object impressions (1967:94-96). The interior is undecorated and a fine brushed appearance is probably the result of the potter's thumbprints. The surface of this vessel is brushed above the punctates and is smoothed-over cord-marked below them. The rim has as everted profile and the grit temper is coarse with an average temper size of .21 cm.

Figure 45. Mackinac Zigzag Lip from the Pine River Channel Site.

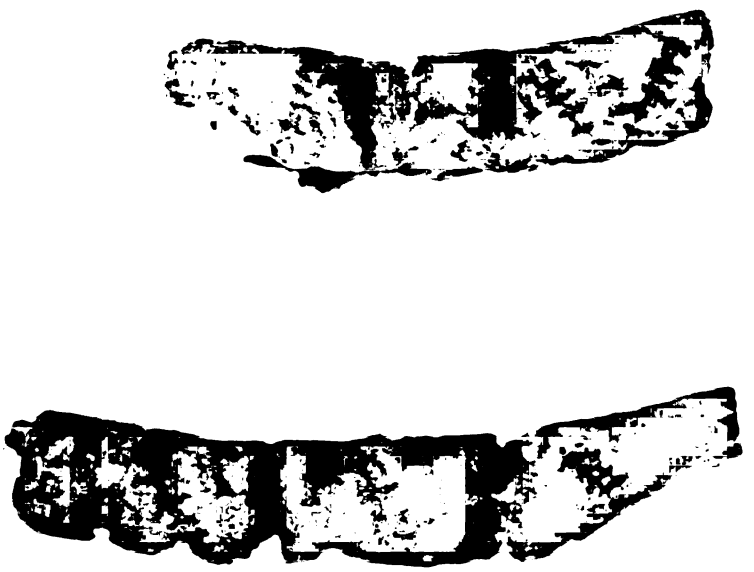
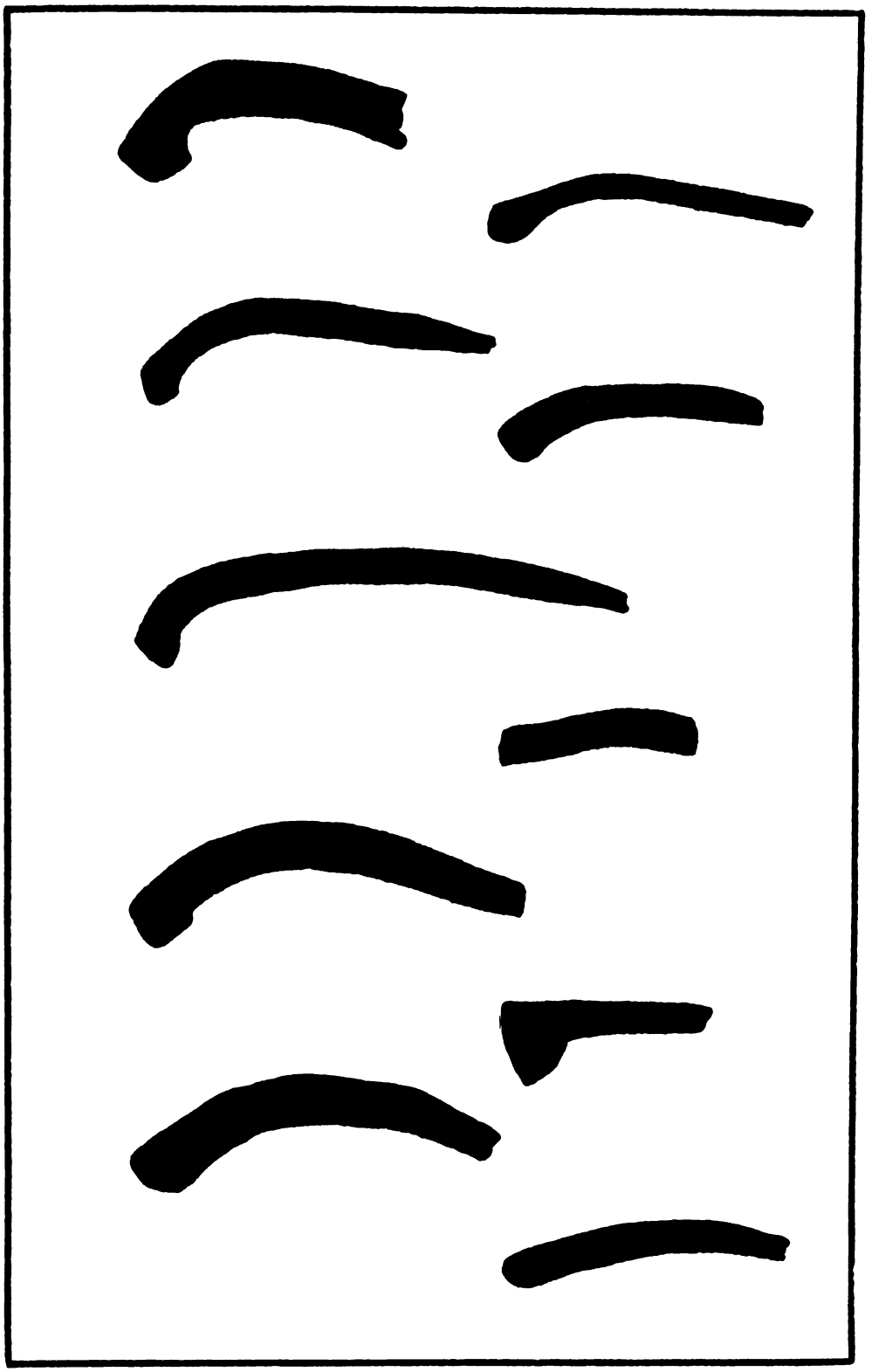

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Figure 46. Rim Profiles of Mackinac Ware.



Bois Blanc and Juntunen Wares

Bois Blanc Ware was found at the Juntunen site and is associated with the Bois Blanc Phase (McPherron, 1967: 265). The Bois Blanc Phase immediately postdates the Mackinac Phase and lasts from about A.D. 1100 to 1300. Juntunen Ware was found in the latest occupation levels at the Juntunen site and dates from A.D. 1300 to A.D. 1600.

Bois Blanc Ware (1 vessel, Fig. 47)

Only one Bois Blanc Ware vessel large enough to be certain of classification was found at the Pine River Channel site. In addition there is one small rim and three body sherds that are probably Bois Blanc Ware. This is in marked contrast to the large number of earlier ceramic wares and suggests less occupation of the site following the Mackinac Phase. The vessel lacks either a beaded or braced rim, but exterior decoration is with cord-wrapped cord as is characteristic of Bois Blanc ceramics (McPherron, 1967:104). This was applied around the vessels in five rows that follow the contours of the castellated rim. Beneath this is a bordering row of vertical cord-wrapped cord impressions. The steeply bevelled lip is covered with cord-wrapped object impressions as is the interior beginning at the lip. The rim profile is slightly everted. This vessel possesses several repair holes drilled after it was fired.

Figure 47. Bois Blanc Ware.


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Juntunen Drag-Jab (1 vessel, Fig. 48)

One rim from the Pine River Channel site represented the type Juntunen Drag-Jab (McPherron, 1967:113-116) and as is the situation with Bois Blanc Ware indicates the relatively diminished use of the site in later periods. The drag-jab decoration on this collared vessel was applied to a smoothed surface. The design begins .5 cm. below the lip with a horizontal drag-jab band. Beneath this are parallel rows of oblique drag-jab impressions spaced about 1 1/2 cm. apart which are in turn bounded below by two more rows of horizontal drag-jab impressions. Below the collar there is at least one row of horizontal cord-wrapped object impressions. There is apparently more decoration extending onto the vessel body, but the form it takes is unknown. The straight, square lip is decorated by a single cord applied transverse to the lip and the interior exhibits vertical single cord decoration. This vessel was probably castellated and the temper size ranges from about 1.1 to 2.0 cm. Juntunen Drag-Jab was most popular during Occupation F at the Juntunen site and dates around A.D. 1300 at that site (McPherron, 1967:115).

Exotic Types

Illinois-like Middle Woodland (Fig. 50)

One rim was found which is reminescent of Illinois Middle Woodland Havana ceramics. It is plain surfaced and tempered with grit and leached limestone. Exterior

Figure 48. Juntunen Ware.






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Figure 49. Rim Profiles of Juntunen Ware.

Figure 50. Central Illinois, Aztalan and Wisconsin Pottery.








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decoration begins 1 cm. below the lip and consists of three rows of parallel horizontal brushed or incised lines followed by closely spaced parallel vertical brushed or incised lines. The lip is rounded, everted and decorated by brushed or incised lines located transverse to the lip. The rim profile is vertical and the interior is undecorated. This vessel is similar to Victory Brushed described by Griffin (1952) for the central and lower Illinois Valley and it was suggested by Moreau Maxwell (1975, personal communication) that it may be imitative of Illinois Central Basin Middle Woodland ceramics.

Havanna Ware (1 vessel)

The same ten by ten foot unit which yielded the rim which seems to have a relationship to the Illinois Valley also contained a Havanna Ware body sherd. This sherd had raised nodes on the exterior smoothed-over cord-marked surface and punctates on the interior formed in the process of making the exterior nodes.

The Pine River Channel site is one of the few northern locales where Illinois-related Middle Woodland pottery has been found. One Havanna sherd was uncovered at the Portage site on Little Traverse Bay. Likewise southern Middle Woodland pottery has been found and reported from the Holtz site in the region of Grand Traverse Bay (Lovis, 1971).

Aztalan Collared (1 vessel, Fig. 50)

One vessel of the type Aztalan Collared was found at the Pine River Channel site. It is made of a fine paste with little visible temper in the form of small sand grains and the surface consists of fine cord-marking oriented vertically. The large double folded collar is triangular in profile and is decorated with four rows of horizontal cord. The bottom of the collar has what appears to be twisted cord impressions placed at intervals around it. Below the collar is a row of corded punctates. The space between these is filled with two parallel rows of horizontal cord impressions which are about one-half the size of the punctates. The lip top is decorated in the center with a horizontal cord impression while the exterior and interior edges exhibit corded punctate impressions.

Interior decoration is complex. Beginning just below the lip are four rows of horizontal cord impressions followed by a row of vertical cord impressions and below that another row of horizontal cord. The rim profile is everted.

It is not known whether the vessel at the Pine River Channel site had an angular orifice. However, in terms of decorative attributes it certainly fits the description of Aztalan Collared put forth by Baerreis and Freeman in 1958. Thus the lip and entire collar are decorated, parallel horizontal lines are present and interior decoration is elaborate (Baerreis and Freeman,

1958:44, 48, 61). It is suggested here that this vessel is an import from Wisconsin because the decorative attributes conform to those described by Baerreis and Freeman (1958:44, 48, 61), the paste is macroscopically different from other vessels at the Pine River Channel site and the collar is certainly a "true Collar." This latter attribute is characteristic of only the Point Sauble and Aztalan sites according to McPherron (1967:111). In addition, Dr. Moreau Maxwell of Michigan State University who is familiar with Wisconsin ceramics agrees that this vessel was probably imported (Maxwell, 1975, personal communication). It is not surprising that an Aztalan Collared vessel occurs here, since Wisconsin pottery types were present at the Juntunen site during the earlier occupations.

Wisconsin-like (1 vessel, Fig. 50)

One other vessel indicates relationships to Wisconsin in the Late Woodland. It exhibits complex exterior decoration executed with a cord-wrapped stick. Beginning at the lip there is a band of cross-hatched impressions. Below this are four horizontal rows which are in turn followed by oblique impressions. The lip and interior are likewise decorated with a cord-wrapped stick and on both the decoration is oblique. The rim on this grit tempered vessel is everted.

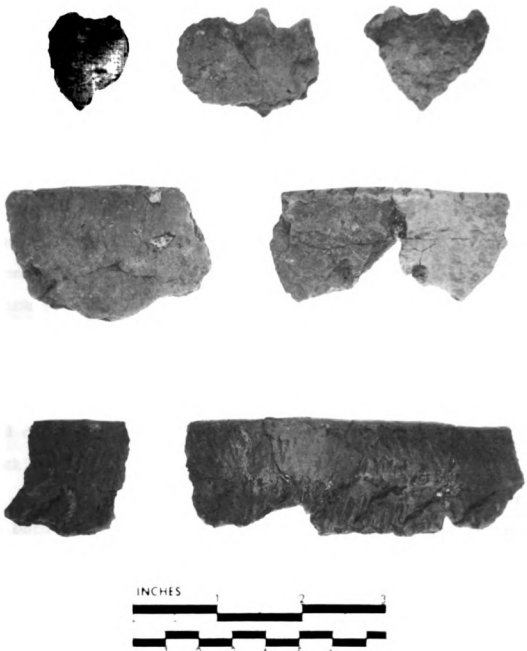
Southern Traverse Corridor Ware (11 vessels)

Eleven vessels at the Pine River Channel site possess attributes found on pottery from the Skegemog Point site in the southern portion of the Traverse Corridor. They represent types defined by Cleland (n.d.) including Skegemog Collared and Traverse Scalloped.

Type: Skegemog Collared (10 vessels, Fig. 51)

The type Skegemog Collared which dates between about A.D. 900 and A.D. 1300 (Cleland, n.d.) is present in the form of ten vessels at the Pine River Channel site. Two have smoothed-over cord-marked surfaces and grit temper size ranging from 1.0 to 2.0 cm. The rim profile on both vessels is everted with the lip being straight and rounded on one vessel and straight and squared on the other. Major decoration begins below the ca. 1.5 cm. collar which is not prominent and which is somewhat blended with the vessel body by smoothing. One vessel is decorated on the exterior with a row of circular plain tool punctates some of which form the apex of chevrons below formed by circular punctation with a cord-wrapped object. This vessel also has fine oblique cord-wrapped stick impressions at the lip which have been smoothed-over. The lip itself is smoothed-over cord-marked and the interior is plain. The other vessel is decorated below the collar with at least one row of cord-wrapped object punctations that in some instances were formed by multiple impressions of the tool. More

Figure 51. Skegemog and Traverse Wares.


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decoration was probably present, but the vessel is broken below this point. The lip of this vessel is smoothed and the interior has a row of vertical cord-wrapped object impressions beginning at the lip.

Eight of the Skegemog Collared vessels found at the Pine River Channel site possess cambered or beaded collars. Three of these have exterior decoration over a cord-marked or smoothed-over cord-marked surface consisting of one row of oblique plain tool punctations on the collar, one row of plain tool punctations with differing orientations below the collar and a similar row at the lip exterior which extends onto the lip top. The lip top was smoothed after the punctations were made. The interiors of these vessels were decorated with two or three rows of horizontal twisted cord. Another vessel exhibits all these attributes and differs only in that punctation on the collar is lacking.

The other four vessels in this group are undecorated on both the exterior and interior. On these vessels the lips were first treated with cord-wrapped paddle and were subsequently smoothed-over while the other vessel has transverse lip decoration. The exterior surfaces of two of these vessels is smoothed-over cord-marked, one is cord-marked and one has a plain surface. The lips on all eight vessels are straight and all but two with exterior levels are squared. Six rim profiles are everted and two are straight.

Traverse Scalloped (1 vessel, Fig. 51)

The single Traverse Scalloped vessel has a slightly thickened lip which is decorated with deep cord-wrapped dowel impressions. This kind of lip decoration produces a scalloped effect which is characteristic of the type. The extant surface of this vessel is smooth. However, not enough of the surface is present to observe the patterning of surface treatment that is diagnostic of all Traverse Ware. Normally Traverse Ware has surfaces exhibiting bands of different surface treatment such as smoothing alternated with cord impressions.

Other Collared Vessels

There were two vessels found that were virtually identical in terms of shared attributes. Both are very thin and have cambered or beaded applique collars. The vessels have fine cord surface impressions that are oblique on the collar and vertical below it. There is at least one row of plain tool punctations located below the collar. Both interiors are plain and one lip is smoothed-over cord-marked while the other has been treated with cord-wrapped paddle and is not smoothed.

Juvenile Wares

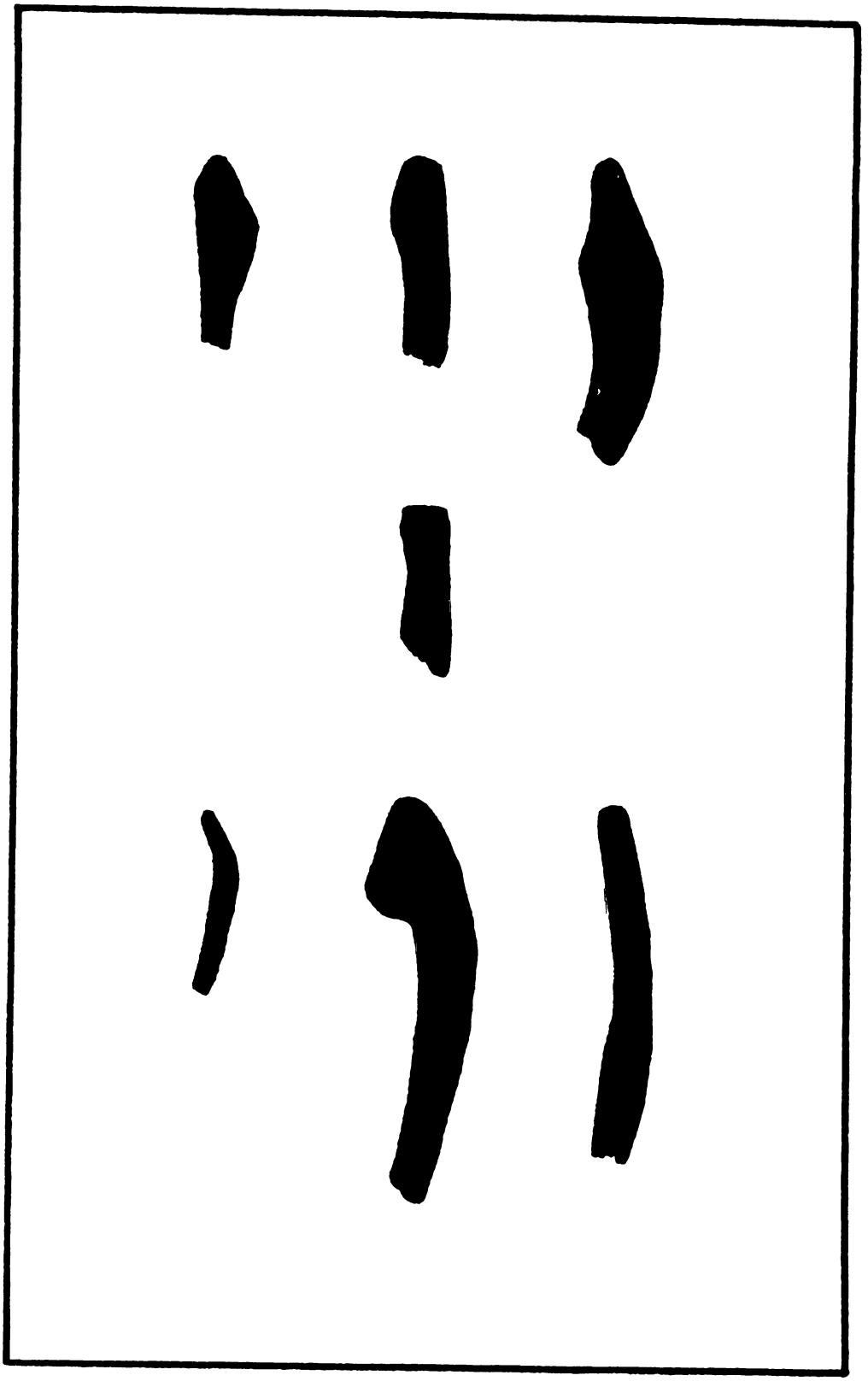
A large group of forty-two minature vessels exhibits clumsy execution of shaping and decorative techniques. These are assumed to have been made and used by children because in addition to attributes reflecting inexperience

Figure 52. Rim Profiles.

Row 1--Skegemog Collared

Row 2--Traverse Scalloped

Row 3--Illinois Middle Woodland, Aztalan Collared, Wisconsin Late Woodland



in pottery making, all but nine of them can be assigned to defined types present at the site and in effect constitute an imitation of practicing potters.

Pine River Children's Ware (4 vessels)

There were four children's vessels at the Pine River Channel site that are clearly imitative of three Pine River Ware types. These are Pine River Plain, Pine River Punctate, variety 2 and Pine River Multiple Punctate.

The vessel that is Pine River Children's Plain lacks exterior, interior and lip decoration, has a very smoothed-over cord-marked surface and some brushing on the interior. The lip is square and straight and the rim profile is everted.

Pine River Children's Punctate is represented by one vessel similar to variety 2 of the Pine River Ware type. It has cord impressions at the front of the straight, flat lip that extend about half-way across the top of the lip. The surface of this vessel is smoothed-over cord-marked and the interior is undecorated. The rim profile is straight.

Two vessels are reflective of Pine River Multiple Punctate. Both have straight, flat lips, straight rims and undecorated interiors. One has exterior decoration on a smoothed-over cord-marked surface that consists of three rows of punctation made with a cord-wrapped object. In addition the lip has faint cord-wrapped object impressions.

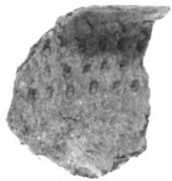
The other Pine River Children's Punctate vessel has a smooth surface and exterior decoration of the vessel body that appears to be a futile attempt at cross-hatch incising.

Mackinac Children's Ware (29 vessels, Fig. 53)

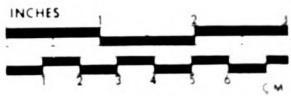
This class of vessels, like Mackinac Ware, constitutes the largest set of children's vessels at the site and likewise emphasizes the lip in terms of decorative variety and devices used to increase exposure of lip decoration. Sixteen of these vessels are assigned to Mackinac Children's Punctate. Exterior decoration consists of one or more rows of corded or plain tool punctates as is the case with the type Mackinac Punctate. Lips are bevelled, thickened, everted or splayed and are normally decorated with a corded or plain tool. This decoration may be horizontal, transverse or oblique at the lip top and may also occur at the lip front, back or both. Interiors are normally undecorated, all but three of the rim profiles are straight and surfaces are cord-marked or smoothed-over cord marked.

Three children's vessels are in the category Mackinac Children's Undecorated. All have everted rim profiles and cord-marked or smoothed-over cord-marked surfaces. Lips in this group do not exhibit such attributes as splaying or thickening and only one vessel has a decorated lip. Likewise this is the only vessel with interior decoration.

Figure 53. Juvenile Mackinac Ware.






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Four miniature Mackinac Ware vessels exhibit somewhat complex design patterns on the exterior, but do not clearly reflect a particular Mackinac Ware type. All have punctate decoration occurring in combination with oblique, horizontal or vertical and horizontal impressions formed by the application of a cord-wrapped object, brush and plain tool. All lips are decorated and thickened or bevelled. In addition all rim profiles are everted and one interior exhibits oblique corded decoration.

There are six children's vessels that are so fragmentary as to be unidentifiable in terms of exterior decoration. However, all possess the bevelled or thickened lips characteristic of Mackinac Ware and all but one of the lips are decorated.

Miscellaneous Children's Ware

Nine of the miniature vessels assumed to have been made by children are not assignable to a specific adult ceramic class. Two of these are particularly interesting though because it is possible that they are imitative of Juntunen Phase ceramics. One has oblique drag-jab exterior decoration and one is castellated with the direction of the oblique decoration forming a rough triangle below the castellation. Both vessels have smoothed surfaces and both are from the same ten by ten foot provenience unit, though they occur at different levels.

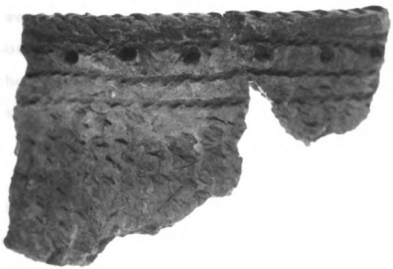
Unusual Small Vessels (Fig. 54)
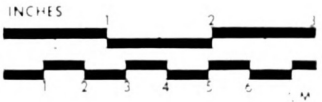
Four vessels from the Pine River Channel site were included in a separate category because of their uniformity in size which ranges between 9 and 10 cm. in diameter coupled with an appearance of somewhat finer quality than other vessels at the site largely because of regularity in surface treatment. Though this varies in kind with two surfaces probably of fabric, one of twisted cord and one of cord-wrapped paddle, all reflect an evenness of application. In the case of the two vessels with corded surfaces, the direction of application is consistent with one being horizontal and one vertical. The three vessels where the lip is present have decorated lips and the decoration is exposed to view with a slight bevelling on two straight rims and a slight thickening on an everted rim. All exteriors are decorated though this varies from one row of punctations on two vessels to two rows of oblique punctation in opposing directions on one vessel to a row of circular punctation superimposed over three rows of horizontal twisted cord impressions on one vessel. Only one vessel exhibits interior decoration. These vessels appear to be similar to the miniature pots found in bural context at the Juntunen site (McPherron, 1967:Pl. XXIV), though that is not the case here.

Miscellaneous

There were fourteen rims and eighteen decorated body sherds from the site that were not classifiable,

Figure 54. Fine Small Vessel.




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usually because of small size. Ten of the decorated body sherds are of interest however, because they exhibit either cross-hatched design or fine-line incising. Cross-hatching is of course characteristic of Middle Woodland or early Late Woodland pottery. The surfaces of the five cross-hatched vessels are smoothed-over cord-marked in two cases, very smoothed-over cord-marked in two cases and smoothed and brushed in one case, thus reinforcing the suggestion that this pottery may be early in the ceramic sequence at the Pine River Channel site. The five incised vessels likewise have very smoothed-over cord-marked, roughened and brushed surfaces. Incising consists of parallel lines sometimes arranged in bands at angles with one another. On one vessel this occurs below a row of circular punctates at the neck and on another it occurs in combination with brushing. These vessels like the cross-hatched ones seem to be either Middle Woodland or early Late Woodland because of the nature of their surfaces and because of the frequent use of brushing.

Summary

In summarizing what has been learned from analysis of the ceramic materials from the Pine River Channel site, it will be recalled that the initial problem was to re-examine Mackinac Phase ceramics in order to establish a chronology and a basis for spatial comparisons within that phase as well as to discern the presence of a possible

Table 22.--Pottery Types at the Pine River Channel Site.

Middle Woodland	
Laurel	6
Illinois	2
Total	8
Transition	
Pine River	33
Late Woodland	
Mackinac	209
Bois Blanc	1
Juntunen	1
Wisconsin	2
Skegemog	11
Traverse	1
Total	225

class of ceramics which was intermediate in form and style between Mackinac Ware and earlier Laurel Ware. The establishment of a continuous sequence of change in ceramic style from the late Middle Woodland to the Mackinac Phase sheds some light on the chronology of the Mackinac Phase and the character of the sequence lends some support to the idea that the Mackinac Phase is a local development. It will be useful here to briefly restate the salient points of the ceramic sequence and then to discuss it in terms of the questions raised as to the Mackinac Phase and as to

how it relates to the problem of culture change in the area during the late Middle Woodland and the early Late Woodland.

The ceramic sequence which is diagrammed in Figure 55 begins at the Pine River Channel site with a late Middle Woodland Laurel Ware that is characterized by dentate or linear stamped rim decoration occurring in a band extending from the lip to 2-3 cm. below and bounded at the top and/or bottom in various ways. There appears to be no further decoration of the vessel. If this is the case, the late Laurel Ware at the Pine River Channel site is a simplified version of earlier Laurel ceramics which are more highly decorated. The next stage of the sequence which is represented by Pine River Ware sees the retention of Laurel coiled manufacture, plain surface treatment and squared, rounded or bevelled lips on some vessels with the substitution of cord-marked surfaces on some vessels and further simplification in rim decoration. Thus the type Pine River Multiple Punctate exhibits a retention of the late Laurel decorative band and the elimination of the borders, whereas the type Pine River Divided Punctate is characterized by a retention of the borders and the elimination of the decorative band. Further, in the type Pine River Punctate both the decorative band and one border are absent and only one border remains. Pine River Plain exhibits the elimination of all decoration. Finally, Mackinac Ware retains the cord-marked surfaces and motifs

Figure 55. Changes in Ceramic Form and Style at the Pine River Channel Site.

Ware	Surface Finish	Manufacture	Lip	Interior	Decorative Band	Borders	
Late Laurel	plain	coil	square, round, bevelled, undec.	undecorated	present	upper and/or lower	Laurel Dentate Laurel Linear Stamped
Pine River	smoothed, Smoothed-over cord	coil slab	square, round, bevelled, undec.	undecorated	eliminated	both retained-Pine River Divided Punctate	
						lower retained-Pine River Punctate, variety 1	
						upper retained-Pine River Plain	
					retained	both eliminated-Pine River Multiple Punctate	
Mackinac	smoothed-over cord, cord-marked	slab	bevelled, thickened, everted, rolled, decorated	decorated	eliminated	lower retained-Mackinac Punctate (1 row)	
						lower retained-Mackinac Zigzag Lip	
						both retained-Mackinac Banded both eliminated-Mackinac Undecorated	
					retained	both eliminated-Mackinac Cord Impressed	
							Mackinac Punctate (2 rows)

of rim decoration found on Pine River Ware, but new emphasis on lip and interior decoration is seen coupled with changes in lip shape, lip profile and rim profile that serve to make both lip and interior highly visible. In addition, Mackinac Ware is characterized by such variety in attributes of lip, interior and exterior decoration that it is difficult to arrive at clearly defined types either through statistical means or personal observation. Thus the possibility of making more precise spatial comparisons between Mackinac Phase sites on the basis of ceramic types remains remote.

On the basis of trends occurring in ceramic style at the Pine River Channel site it is possible to make only limited jugements as to chronology of ceramics within the Mackinac Phase. Thus vessels of the type Mackinac Cord Impressed often exhibit straight lips and rims with less flare than other Mackinac Ware types (McPherron, 1967:90) and it is likely that this type is early in the Mackinac Phase, since these are attributes of lip and rim that are characteristic of the preceeding Pine River Ware. As has been noted, some support for an early date for Mackinac Cord Impressed is derived from the fact that this type is confined at the Juntunen site to the earliest Mackinac Phase occupation (Occupation A) (McPherron, 1967:61). Mackinac Cord Impressed is the only type of Mackinac Ware that can be given chronological placement within the Mackinac Phase on the basis of shared attributes with Pine

River Ware because this involves attributes which are subject to later change, whereas in the case of the other types attributes shared with earlier wares remain more constant.

The nature of the ceramic sequence at the Pine River Channel site is important for the question of whether or not the Mackinac Phase originated in situ in the area. It appears that Mackinac Ware developed from earlier local ceramic forms because not only do attributes continue through time, but there is an order to changes seen. The makers of Pine River Ware simplified already existing patterns of rim decoration and many of these were retained by Mackinac Phase potters who at the same time were turning their attention to lip and interior decoration. Concern for lip decoration in the Mackinac Phase can be seen to follow from patterned change in that the upper border found on late Laurel ceramics later extends onto the lip in Pine River Ware, especially Pine River Punctate, variety 2, and then moves entirely to the lip on Mackinac Ware. Certainly, the fact that Mackinac Ware is more or less similar to Late Woodland wares from the same time period in Wisconsin, Minnesota, Manitoba and New York (McPherron, 1967:86) argues for a good deal of between group interaction as contributing to its development. However, it is just as clearly the product of local changes in ceramic form and style through time and perhaps it is this local "ingrediant" that allows it to be distinguished as a separate class.

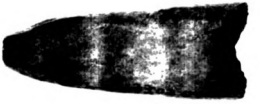
CLAY PIPES

The Pine River Channel Site yielded portions of eight clay elbow pipes. Seven of these are parts of stems and one is a bowl fragment. Four of the stems are rectangular in cross-section and one is ovoid. The cross-section of the remaining two could not be determined, however, the extant portion of one of them is rounded. The fact that the greater number of cross-sections are rectangular is compatible with ceramic indications that the site was occupied mainly in the early Late Woodland since at the Juntunen site rectangular cross-sections tended to be earlier.

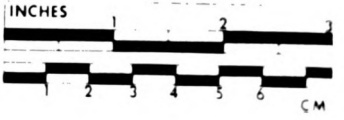
All but two of the pipe stems are decorated. Two exhibited closely spaced rows of closely spaced punctations which in one case were executed with a cord-wrapped object and in one case with a plain tool (Fig. 56). Two others have widely spaced rows of punctations that are also widely spaced and both pipe stems have smoothed surfaces. On one of these the tool used was a cord-wrapped object and on the other it was plain. On the remaining decorated pipe stem there is a longitudinal single cord impression on opposing sides of the pipe which has a smoothed surface. The bit is present on three of the pipe stems and is relatively flattened on two of them while the other appears to have received no special attention in finishing.

The small pipe bowl fragment from the Pine River Channel site has a flat and slightly thickened lip. The

Figure 56. Pipestems.






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surface is decorated with closely spaced horizontal rows of cord-wrapped cord.

CHIPPED STONE

Cores

There are 263 cores from the Pine River Channel site of which 217 or 83 percent are of Norwood Chert. These were divided into six major categories included 97 block cores, 22 biconvex cores, 36 plano-conves cores, 4 blade cores, 40 bipolar cores and 57 amorphous cores. In addition there were six specimens that were unclassifiable. The frequencies with which these categories occur at the site are compatible with those found at the O'Neill site located about four miles south of the Pine River Channel site and even closer to the source of Norwood Chert (Lovis, 1973). The variety in kind and size of the cores at the O'Neill site suggested to Lovis (1973:157-162) that once broken, cores were not wasted, but continued to be worked using different techniques. The techniques chosen depended largely on the kind of breakage that occurred.

Because block cores were most frequent at the O'Neill site, Lovis suggested that the block core technique was normally the first option chosen for working tabular Norwood Chert (1973:199). Such cores exhibit cortex on both ends which serves as a striking platform for flakes removed from one or both ends. Only thirteen of the block cores at the Pine River Channel site exhibited platform

preparation on areas other than the cortical ends as was the case at O'Neill where thirteen specimens showed the same phenomenon. All but one of the block cores at the Pine River Channel site are of Norwood Chert and their frequency at the site is strikingly similar to that at O'Neill. Thus block cores constituted 38 percent of the total sample at the O'Neill site (Lovis, 1973:159) and 37 percent at the Pine River Channel site. Further. the subcategories of block cores occur in about the same proportions at both sites. The O'Neill site sample included 14 unexpended block cores, 14 block core nucleii and 40 block core fragments (Lovis, 1973:110). The Pine River Channel site yielded 25 unexpended block cores, 22 block core nucleii and 50 block core fragments.

According to Lovis, if a block core breaks there are opportunities to make continued use of the core through various techniques which are dependent upon the kind of break that occurs (1973:159). Thus if hinge through occurs, there is the possibility of using either a bipolar or plano-convex technique, whereas if the break is longitudinal either a plano-convex or biconvex technique may be chosen. The frequences with which these techniques occur at the Pine River Channel site again parallels the situation at O'Neill. Thus at O'Neill there were 48 bipolar cores representing 6 categories, 24 plano-convex cores and 7 biconvex cores (Lovis, 1973:115, 122) whereas at the Pine River Channel site there are 40 bipolar cores, including

the same 6 categories, 37 plano-convex cores and 22 bi-convex cores. On the basis of frequency of occurrence of kinds of cores at sites spatially close together, with a comparable sample size and the same raw material present it seems apparent that prehistoric populations were making a patterned use of raw chert materials and Lovis's proposed series of options regarding core utilization is supported.

The forty bipolar cores from the Pine River Channel site exhibit the characteristic opposed zones of percussion resulting from use of the hammer and anvil technique. In addition all six varieties of bipolar cores described by Binford and Quimby (1963:289-296) are present. Thus there are 13 opposing ridge bipolar cores, 10 area-ridge bipolar cores, 6 area-point bipolar cores, 3 right angle ridge bipolar cores, 2 ridge point bipolar cores and 5 bipolar core fragments. As was the case at the Summer Island (Brose, 1970:104) and O'Neill sites (Lovis, 1973:120), the area ridge variety are largest in size (Table 23).

As has been noted, the bipolar technique is considered by Lovis (1973:159) to be one means of making continued use of a block core if a hinge through or hinge out break occurs. In addition, he suggests this technique is a primary option in working small pebble cores. Thirty percent of the bipolar cores from the Pine River Channel site are of other than Norwood chert and imply the exercising of this option.

Table 23.--Metric Attributes of Block Cores.

Core	Total	Mean Length	Mean Diameter	Range Length	Range Diameter
Whole	25	6.2cm.	4.2cm.	4.3-8.0cm.	2.8-6.8cm.
Fragment	50	4.6	3.3	2.1-8.5	1.8-6.4
Nucleii	22	5.4	2.7	3.4-10.3	1.3-3.2
Total	97	5.4	3.4	2.1-10.3	1.3-6.8

There are 37 plano-convex cores characterized by one flat face and one convex or ridged face formed by the convergence of flakes driven from the flat face and 22 biconvex cores exhibiting flakes driven from both faces. As these were considered by Lovis to be options for continued use of a block core in the base of a longitudinal break (1973:159) it is of interest that 2 block core fragments exhibited platform preparation of the lateral axis and a few flakes removed from 1 face apparently as initial steps in beginning the plano-convex option. In both cases the cortex was absent from one end. Finally, 78 percent of the plano-convex cores and 91 percent of the biconvex cores were of Norwood chert.

There were four blade core fragments from the Pine River Channel site. Two of these were of Norwood chert and two were of unidentified chert. All were extremely fragmentary and little can be said about them other than a blade industry is not indicated for the site.

The Pine River Channel site yielded fifty-seven amorphous cores which exhibit flaking from virtually every direction with no apparent pattern. It is noteworthy that amorphous cores are second in frequency of the kinds of cores at the site. As can be seen in Table 24 they vary considerably in size though they tend to be large. This manner of core utilization may not offer so many options for using different techniques if breakage occurs and thus perhaps a more limited number of flakes can be removed using this technique. However, breakage may not be so likely to happen as in the block core technique where consistent removal of flakes along the longitudinal axis places greater stress on the material. Perhaps under circumstances where flaws occur in the raw material that would prohibit the use of the block core technique, the nearly random removal of flakes exhibited on amorphous cores might be more efficient. Lovis suggested that the fourteen amorphous cores from the O'Neill site may have had such flaws (1973 125) and thirty-one amorphous cores from the Pine River Channel site were frost cracked and/or possessed inclusions such as chrystals. In addition only 72 percent of all amorphous cores were of Norwood chert. Perhaps the larger chert pebbles are best worked in this way.

In summary, the frequencies of kinds of cores at the Pine River Channel site parallels the situation at the nearby O'Neill site and indicates that the series of options available to the knapper for maximizing the number

Table 24.--Metric Attributes of Cores Other Than Block Cores.

Core	Total	Length	Width	Mean Thickness	Range Length	Range Width	Range Thickness
Biconvex	22	5.2cm.	3.3cm.	1.7cm.	3.4-8.6cm.	2.5-6.8cm.	1.5-3.6cm.
Plano-convex	36	5.2	3.6	2.2	2.7-8.6	1.1-6.1	1.1-4.9
Plano-convex fragment	1	4.5	3.9	1.6	. .	. .	. .
Amorphous	49	5.7	4.2	2.8	1.6-8.7	3.0-6.0	1.2-5.0
Amorphous fragments	8	5.2	3.9	2.4	3.9-6.4	2.8-5.0	1.8-3.1
Blade	4	3.7	2.2	1.3	3.1-4.5	1.6-2.6	0.9-1.6
Ridge-point	2	3.8	2.9	1.8	2.9-4.7	1.9-3.8	1.6-2.0
Area-point	6	3.0	2.2	1.4	2.2-4.2	1.9-2.7	1.5-2.0
Area-ridge	10	4.3	3.2	2.1	2.5-5.6	2.1-4.0	1.0-2.8
Opposing ridge	13	3.4	2.6	1.2	1.7-5.4	1.2-4.5	0.6-1.9
Right angle-ridge	3	3.5	2.2	0.9	2.3-5.0	1.8-3.0	0.6-1.1
No class	6	4.8	3.7	2.0	4.0-6.1	3.2-4.6	1.0-2.8

of useable flakes from a core as proposed by Lovis (1973: 159-160) were exercised here. The frequency of amorphous cores is considerably higher at the Pine River Channel site than at the O'Neill site and suggests an even greater desire to avoid wasting raw material, since the site is at a greater distance from the source of Norwood chert. Thus perhaps the amorphous technique may be a more efficient way of utilizing flawed Norwood chert and the larger non-Norwood beach pebbles. The greatest incidence of chert other than Norwood for the core sample from the Pine River Channel site occurs in the amorphous and bipolar categories reflecting the possibility that these techniques are most useful for working chert in pebble form. In addition all other kinds of cores include some of non-Norwood chert which is again perhaps the reflective of the greater distance from the source.

Unfinished Bifaces

The Pine River Channel site yielded 258 bifacially worked artifacts that apparently represent items being manufactured into preforms or finished tools. Only sixty-six of them were complete enough to measure, but as can be seen in Table 26 they are quite variable in terms of size.

Variability however, does not appear to be so evident in the manufacturing process itself. It seems clear that thinning was begun on the longitudinal axis from the proximal and distal ends and then work proceeded from

Table 25.--Percent of Cores Made From Norwood Chert.

Core	Total	Total Norwood	Percent Norwood
Block	97	93	96%
Biconvex	22	20	91
Plano-convex	37	29	78
Amorphous	57	41	72
Blade	4	2	50
Bipolar	40	28	70
No class	6	4	66 2/3
Total	262	216	82

Table 26.--Metric Attributes of Unfinished Bifaces.

	Length	Width	Thickness
Mean	7.3cm.	3.1cm.	1.3cm.
Range	2.1-9.8cm.	1.9-5.5cm.	0.6-3.0cm.

Total of sample = 66

the lateral edges toward the center. The nature of the incomplete portions of the artifacts supports this because the central areas remain to be thinned by primary flaking on 194 or about three-fourths of the artifacts. Thinning was necessary on the center only in 143 cases and in addition to the center in 29 cases, on the base in 17 cases, on the tip in 2 cases and on both base and lateral edges in 4 cases. Of the remaining 63 artifacts, 33 were judged to be completely thinned, 12 required edge thinning only, 9 required proximal thinning only, 8 required distal thinning only and one required thinning only of the distal end and one lateral edge. It is necessary to note that these figures must be viewed with some caution as most specimens are fragmentary and the judgment as to what constitutes completion is a subjective one. However, because the central portion of the artifact remains to be thinned by primary flaking on the majority of these items, it is apparent that this was the last step during initial thinning and that the proximal and distal ends were the first to receive primary flaking.

It has been suggested (William Lovis, personal communication, 1976) that this order in the primary flaking process is a logical one since the greatest stress to the artifact would come from blows along the longitudinal axis. Energy is saved by working here first, because the likelihood of breakage is greater and effort spent on chipping the rest of the artifact would not be wasted should a

break occur. Breaks from longitudinal stress were dominant in the assemblage, thus bearing this out. These were evidenced on 181 of the 191 broken specimens.

Another aspect of these unfinished artifacts worthy of note is the fact that 56 or 22 percent of them exhibited some flaw such as the presence of crystals or cortex which in many cases may have caused them to be discarded. Norwood was the chert used for 182 or 71 percent of the specimens. The remaining 76 or 29 percent were of unidentified chert.

Utilized Flakes

They were 1051 flakes from the Pine River Channel site that were judged to have been used because of the presence of irregularity of retouch on the edges. These were divided into decortication flakes, flakes with parallel sides from the bulb of percussion, flakes with expanding sides from the bulb of percussion and flakes with contracting sides from the bulb of percussion. Next each flake was examined to determine which of its edges exhibited use retouch. When the results were tabulated, it was apparent that there is a pattern in the kinds of flakes selected for use that reflects the number of edges available. Thus expanding edge flakes consisted of 43 percent of the total and were probably chosen most often because both lateral edges and the distal end would serve equally well for purposes, such as cutting, and more work could be performed with a single flake than is the case with the other kinds.

As can be seen in Table 27, expanding edge flakes consist of 73 percent of those flakes exhibiting use retouch on the distal end and over 50 percent of those used at the distal end plus one or both of the lateral edges. To the contrary, contracting edge flakes rarely exhibit use retouch of the distal end. The percentages of the kinds of flakes chosen are more nearly equal when lateral edges only have been used. This is not surprising since both of these are available for use on most flakes. Finally, decortication flakes are least likely to exhibit use retouch at all probably because the presence of cortex would be a limiting factor.

Retouched Flakes

The Pine River Channel site yielded 239 flakes that were considered to have been intentionally retouched, since retouch exhibited regularity of flake removal. These were categorized the same way as were the utilized flakes and the kinds of flakes present occur with nearly the same frequency. Thus of the retouched flakes, 49 percent are expanding edge flakes, 22 percent are parallel edge flakes, 17 percent are converging edge flakes and 12 percent are decortication flakes, whereas, of the utilized flakes 43 percent are expanding edge flakes, 28 percent are parallel edge flakes, 18 percent are converging edge flakes and 10 percent are decortication flakes (Table 27).

Table 27.--Comparison of Edges Modified on Utilized and Retouched Flakes.

Edges Modified	Decortication		Parallel		Expanding		Converging	
	Ut.	Ret.	Ut.	Ret.	Ut.	Ret.	Ut.	Ret.
1 lateral	16%	14%	32%	25%	27%	33%	25%	27%
2 lateral	5	10	28	37	26	33	41	20
distal	8	10	18	14	73	74	006	02
distal+ 1 lateral	17	23	24	10	58	54	006	13
distal+ 2 lateral	6	0	37	24	54	56	03	20
proximal	0	0	0	100	0	0	100	0
proximal+ 1 lateral	0	0	0	20	0	60	0	20
proximal+ 2 lateral	0	0	0	50	0	0	0	0
proximal+ 1 lateral+ distal	0	50	100	0	0	0	0	0
proximal+ 2 lateral+ distal	0	0	0	0	0	50	0	50

In comparing the data for both retouched and utilized flakes it immediately becomes clear that though the proximal or bulbar end of the flake rarely exhibits retouch of any kind, this occurs more frequently when the retouch is intentional. Thus 11 of 239 retouched flakes exhibited proximal retouch whereas use was made of the proximal end only once on the 1051 utilized flakes. This seems quite reasonable since the bulb of percussion would require some thinning of the end to be of use.

With regard to the lateral and distal edges, comparative observations are again of value. First, in nearly three-fourths of the cases the edges retouched on the different kinds of flakes occur with less than 10 percentage points difference from the same occurrence on the utilized flakes and in nearly one-half of the cases this difference is less than 5 percentage points. Thus it appears that normally the kind of flake chosen and the edges retouched, either intentionally or through use, is almost the same. It is noteworthy that there is considerably greater likelihood that a converging edge flake will exhibit intentional retouch on the distal end perhaps because this is small and subject to breakage without some modification before use.

It is of some importance dispite a disparity in sample size that retouched and utilized flakes exhibit similar patterning and that most of the differences can be explained, because with the utilized category in particular

one cannot always be confident that a flake has indeed been used as opposed to a natural occurrence of what appears to be irregular retouch through use. Though it is possible that natural "retouch" could occur on the same edges and the same kinds of flakes as those intentionally retouched, similar patterning in the two major categories implies similar choices on the part of site occupants. The finding corroborates that of Lovis (1979:157) for the O'Neill site where he maintains that the distinction between utilized and retouched flakes is formal, but not necessarily functional.

Debitage

There were 181,005 flint chips found at the Pine River Channel site. Those from the second season of excavation were weighed as well as counted. The debitage weighed totalled 133,014.4 grams. Though the flint chips were not measured or categorized, it was observed that size ranged from large decortication flakes to flakes resulting from primary retouch to flakes of secondary retouch recovered through flotation.

PROJECTILE POINTS

The eighty-three projectile points from the Pine River Channel site have been divided into three classes. There are forty-one unhafted points in Class I, seven stemmed points in Class II and thirty-five notched points in Class III.

Class I--Unhafted Projectile Points

The forty-one projectile points in Class I exhibit considerable variation in size, shape and workmanship. Four types have been distinguished that reflect this variation.

Type A

The twenty-one projectile points in Type A can be distinguished from other unhafted points on the basis of length which ranges from 4.3cm. to 7.0cm. (Table 28). In addition, they consistently share attributes which may occur within other categories with less regularity. Bases are most likely to be straight (Table 28). Of the twenty points where it was possible to determine the line of the base sixteen were straight, three were slightly concave and one was slightly convex. The points exhibit a uniformity in thinning of the blade in comparison to those in other categories. Thus medial ridges are not present. This is reflected in both longitudinal and transverse cross-sections. Of the longitudinal cross-sections 62 percent were biplano, 29 percent were plano-convex and only 9 percent were biconvex. Likewise 52 percent of the transverse sections were biplano, 33 percent were plano-convex and 14 percent were biconvex. The high percentages of biplano cross sections reinforces the impression of uniform thickness. Regularity occurs also with regard to shape with 90 percent of the points being excurvate and 10 percent ovate.

Table 28.--Class I--Triangular Projectile Points.

Specimen	Type A--Variety 1								Type A--Varieties 2 and 3															Variety 3				
	23	6	32	47	16	52	Mean	Range	28	49	51	45	22.2.1	50	43	48	42	35	06.04	39.2.1	Mean	Range	1	44	32.2	Mean	Range
Max. Length	5.4	4.9	6.0	5.7	6.5	6.6	5.9	4.9-6.6	4.8	5.9	4.3	5.2	4.8	4.7	5.2	5.6	5.7	4.9	4.3	4.6	5.0	4.3-5.9	7.0	6.0	6.0	6.3	6.0-7.0
Max. Width	3.2	3.6	3.8	3.4	3.2	3.8	3.5	3.2-3.8	3.1	2.8	2.4	2.5	2.3	2.2	2.7	2.5	2.4	2.5	2.3	2.9	2.6	2.2-3.1	1.8	2.2	2.0	2.0	1.8-2.2
Max. Thickness	0.8	2.8	0.9	0.6	0.5	0.7	0.7	0.5-0.9	0.7	0.6	0.6	0.6	0.6	0.5	0.6	0.7	0.6	0.5	0.7	0.6	0.6	0.5-0.7	0.6	0.8	0.9	0.8	0.6-0.9
Basal Width	2.5	2.8	3.1	3.4	2.4	3.6	3.0	2.4-3.6	2.8	2.4	2.3	2.5	2.0	1.8	2.7	2.1	1.7	2.3	2.0	2.8	2.3	1.7-2.8	1.5	2.0	1.9	1.8	1.5-2.0
Cross Section	bi-plano	bi-convex	plano convex	bi-plano	bi-plano	bi-plano			plano-convex	bi-plano	bi-plano	plano-convex	bi-plano	plano-convex	plano-convex	bi-convex	plano-convex	bi-plano	bi-plano	bi-plano			bi-plano	bi-convex	plano-convex		
Leng. Section	bi-plano	bi-convex	plano convex	bi-plano	bi-plano	bi-plano			bi-plano	bi-plano	bi-plano	plano-convex	bi-plano	plano-convex	bi-plano	bi-convex	plano-convex	bi-plano	bi-plano	bi-plano			bi-plano	bi-convex	plano-convex		
Outline	ex.	ex.	ex.	ex.	ex.	ex.			ex.	ex.	ex.	cvate	ex.	ex.	cvate	ex.	ex.	ex.	ex.	ex.			ex.	ex.	ex.		
Base	st.	con-vex	st.	st.	st.	. .			st.	st.	con-vex	st.	st.	st.	con-cave	st.	st.	st.	st.	con-cave			st.	st.	st.		
Grinding Base									-	+	-	-	-	+	-	+	+	-	-	-			-	+	-		
Grinding Edges									-	+	-	-	-	+	+	+	+	-	-	-			-	+	-		

Within the Type A grouping there are three varieties arranged in order of an increasing ratio of length to width. This ratio for Typa A, variety 1 is 1.7, for Type A, variety 2 it is 1.9 and for Type A, variety 3 it is 3.2.

Type A, variety 1 (Fig. 57)

The six points in this category are broader than the other points in Type A (Table 28). All of the points exhibit basal thinning with the exception of one where this was impossible to discern. In three cases thinning of the base was accomplished by removing small parallel flakes from one face and in one case finishing by continuous secondary retouch of the basal edge. Two of the points exhibit thinning of both basal faces though this was unsuccessful on one because the flakes removed terminated in hinge fractures. All of the points in Type A, variety 1 are made of Norwood chert with the exception of one which is made of Bayport chert. In addition, one of these points was part of a cache that included most of the points in Type A, variety 2.

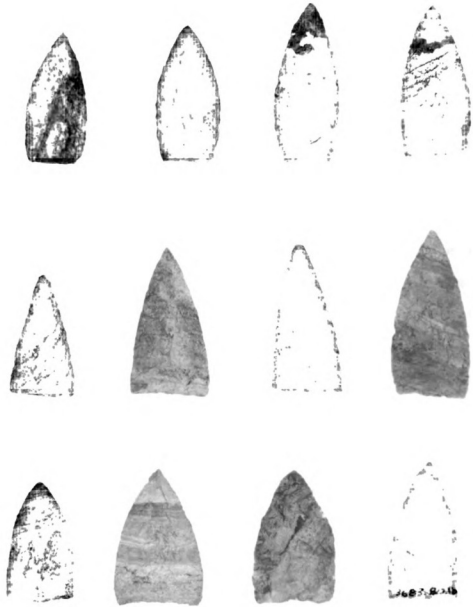
Type A, variety 2 (Fig. 58)

This variant of Type A includes thirteen points that tend to be narrower than those in the preceeding variety with a mean blade width of nearly 1 cm. less (Table 28). They are further distinguished by the fact that six of the ten points showed evidence of grinding on the lateral edges and five of these were ground on the

Figure 57. Class I Type A variety 1 Projectile Points.


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Figure 58. Class I Type A variety 2 Projectile Points.


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base as well. All those points exhibiting grinding and three others in Type A, variety 2 were included in a cache found in a hearth (Feature 51) located in the northwest quarter of N10/W40 at the bottom of the occupation zone and extending below it. It is perhaps significant that grinding of projectile points in Type A is confined only to those in variety 2 which are found in the cache. In addition to grinding, all points in this grouping are characterized by basal thinning which was accomplished by removing lamellar and conchoidal flakes from one face in eleven cases and two faces in two cases. Three of the points exhibit subsequent continuous retouch of the basal edge. All of the points in Type A, variety 2 are made of Norwood chert except three which are made of unidentified chert.

Type A, variety 3 (Fig. 59)

The three points in this category have a greater mean length than any other varieties in Type A and likewise have a smaller mean width. Thus they are long and narrow by comparison (Table 28). Both faces of the base show thinning by removal of lamellar and conchoidal flakes and one exhibits grinding of the base and basal edges. This last point is made of quartz and was part of the cache found in Feature 51. The others are made of unidentified chert.

Figure 59. Class I Type A variety 3 Projectile Points.



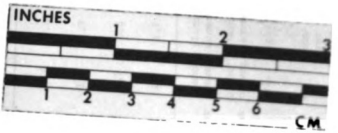

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Table 29.--Class I--Triangular Projectile Points.

Speciman	Type B--Variety 1						Type B--Variety 2									
	4	31	34	39	Mean	Range	21	27	11	2	56	55	57	37	Mean	Range
Max. Length	2.6	3.4	3.0	2.7	2.9	2.6-3.4	3.3	3.5	3.0	2.6	2.6	- -	2.4	2.7	2.9	2.5-3.5
Max. Width	1.0	1.8	1.7	1.6	1.6	1.0-1.8	1.6	1.7	1.5	1.1	1.4	1.4	1.3	1.5	1.4	1.1-1.7
Max. Thickness	0.5	0.7	0.5	0.3	0.5	0.3-0.7	0.6	0.5	0.5	0.3	0.3	0.5	0.3	0.3	0.4	0.3-0.5
Basal Width	1.0	1.8	1.7	1.6	1.5	1.0-1.8	1.2	0.7	1.0	0.6	0.8	1.4	- -	0.7	0.8	0.6-1.4
Cross Section	bi-convex	plano convex	plano convex	bi-plano			plano convex	plano convex	bi-plano	concave convex	bi-plano	plano convex	bi-plano	bi-plano		
Long Section	bi convex	plano convex	plano convex	bi-plano			concave convex	plano convex	bi-plano	concave convex	bi-plano	plano convex	bi-plano	bi-plano		
Outline	tri.	tri.	tri.	tri.			ex.	ex.	ex.	ex.	ex.	par. ovate	ovate	ex.		
Base	st.	st.	con-vex	con-cave			con-vex	con-vex	st.	con-cave	st.	st.	- -	st.		

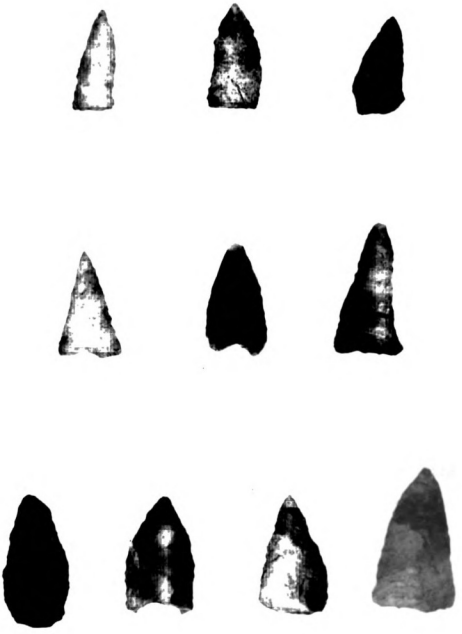
Type B (Fig. 60)

Type B can be seen as a separate category of eighteen unhafted points because it includes points that are smaller than those in the other types. Thus the longest point in this grouping is 3.5cm., whereas the shortest point in the other unhafted categories is 4.3cm. Likewise, the widest point in Type B is 1.8cm., while the narrowest of the other points is also 1.8cm. Metric and discrete attributes of Type B are shown in Tables 29 and 30.

Within Type B there is considerable variation creating the impression that little effort was expended in the manufacture of these points. This variation is evidenced mainly in the geometric outline which in eight cases is assymetric, in the lack of uniformity in the line of the base and in the frequency of different shapes of the longitudinal and transverse sections.

The kind of variation seen in Type B reflects the fact that these points generally conform to the shape of the flake used in manufacture and differences occur in the degree of modification of the original flakes on which the point was made. Thus five points exhibit primary flaking over both faces whereas primary flaking covers only one face of nine points with minimal retouch at the edges of the other face and four points show only minimal flaking around the edges of both faces. Of the latter four, one point exhibits no modification of the base and one-half of one edge of another point lacks modification of any kind.

Figure 60. Class I Projectile Points--Type B.


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Ten of the points in Type B are made of Norwood chert. The kinds of chert used in the manufacture of the remaining eight are unidentified.

Type C (Fig. 61)

The single projectile point in Type C is parallel-ovate in outline and plano-convex in both the longitudinal and transverse sections. Primary flaking exhibits little uniformity. Flakes extend less than one-half way across the point from the lateral edges and may be expanding, conchoidal or lamellar. There are some deep scars that end in hinge fractures about one-half way between the edges and the longitudinal axis of the point. Secondary retouch is continuous on one edge of one face only. The base is straight and exhibits continuous secondary retouch on one face and discontinuous secondary retouch on the other. Metric attributes for Type C are shown in Table 30.

Type D (Fig. 61)

This leaf-shaped point exhibits primary chipping that consists of lamellar and conchoidal flat flakes with no clear pattern on the faces of the point and small lamellar and conchoidal flakes at the edges. Secondary retouch is continuous. The base was probably straight and the point is plano-convex in both the longitudinal and transverse sections. Metric attributes are shown in Table 30.

Figure 61. Class I Projectile Points--Type C, D.



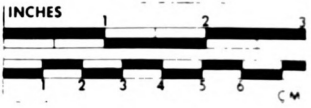

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Table 30.--Class I Triangular Projectile Points.

Speciman	Type B--Variety 3							Type C	Type D
	38	29	9	3	36	Mean	Range	17	8
Max. Length	2.9	2.7	2.7	2.9	2.9	2.8	2.7-2.9	10.2	7.4
Max. Width	1.6	1.4	1.3	1.7	1.6	1.5	1.3-1.7	3.2	2.7
Max. Thickness	0.5	0.5	0.4	0.5	0.5	0.5	0.4-0.5	1.2	0.6
Basal Width	1.3	1.2	1.1	1.7	1.6	1.4	1.1-1.7	2.6	. .
Cross Section	plano convex	bi-convex	plano convex	concave convex	plano convex			plano convex	bi-plano
Long. Section	plano convex	bi-convex	plano convex	plano concave	plano convex			plano convex	bi-plano
Outline	ex.	ex.	ex.	tri.	ex.			par. ovate	ex.
Base	st.	st.	st.	concave	concave			st.	st.

Class II--Stemmed Points

Class II is comprised of three types of stemmed projectile points which differ from each other in size and in attributes reflecting modes of manufacture. The larger ones have primary flaking over both faces whereas the smaller ones exhibit minimal primary flaking. Though the larger points in Types A and B are comparable in size, they differ in that Type B is of uniform thickness whereas the points in Type A exhibit variation in thickness. The total number of stemmed points is seven and this is clearly the smallest class of projectile points at the Pine River Channel site (Fig. 62).

Type A

The three stemmed projectile points in Class II, Type A are characterized by broad blades and relatively long stems which comprise nearly one-third of the total length of the points. They tend to be thick (Table 31), in part because some portion of the blade on each point is a raised area not completely removed by primary flaking and bounded by hinge fractures. The metric attributes of these points are strikingly uniform with the greatest variation occurring in the width of the haft element of one point which is .6 cm. larger than the others. Likewise, nonmetric attributes are relatively consistent (Table 31) with the one deviating speciman being different in each case. All the projectile points in this grouping are made of Norwood chert.

Figure 62. Class II Projectile Points.

Row 1--Type A

Row 2--Type B

Row 3--Type C


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Table 31.--Class II--Stemmed Projectile Points.

Speciman	Type A					Type B	Type C				
	4	5	29	Mean	Range	52	14	38	1	Mean	Range
Max. Length	5.0	4.7	4.6	4.8	4.6-5.0	5.0	. .	3.5	3.2	3.4	3.2-3.5
Max. Width	3.0	3.3	3.0	3.1	3.0-3.3	2.5	2.0	1.6	1.8	1.8	1.6-2.0
Max. Thickness	0.9	1.3	1.0	1.1	0.9-1.3	0.6	0.6	0.5	0.4	0.5	0.4-0.6
Blade Length	3.5	3.2	3.1	3.3	3.1-3.5	4.0	. .	2.7	2.1	2.4	2.1-2.7
Shoulder Width	3.0	3.3	3.0	3.1	3.0-3.3	2.5	1.8	1.6	1.8	1.7	1.6-1.8
Base Width	1.7	1.6	1.8	1.7	1.6-1.8	1.4	1.4	1.0	1.0	1.1	1.0-1.4
Base Length	1.5	1.5	1.5	1.5	1.5-1.5	0.7	0.6	0.4	1.1	0.7	0.4-1.1
Haft Width	1.7	2.3	1.7	1.9	1.7-2.3	1.3	1.3	0.9	1.0	1.1	1.0-1.3
Cross Section	plano convex	plano convex	bi-convex			bi-plano	bi-plano	bi-plano	concave convex		
Long Section	plano convex	plano convex	bi-convex			bi-plano	bi-plano	bi-plano	concave convex		
Outline	tri.	ex.	ex.			ovate	ex.	ovate	tri.		
Base	st.	convex	st.			convex	concave	st.	st.		

Type B

The single projectile point in Type B is ovate in shape with a straight stem and convex base. It is of uniform thickness as evidenced by the fact that it is biplano in both the longitudinal and transverse sections. Primary chipping consists of small flat flakes that occasionally end in hinge fractures. Secondary retouch is discontinuous on all edges. This projectile point is made of a poor variety of chert (Table 32).

Type C

Type C includes three small stemmed points with narrow blades (Table 32). Like the small unhafted points these exhibit varying degrees of primary flaking. One has primary flaking over the whole surface of one face and over two-thirds of the surface of the other face. Another shows flaking on about one-third of both faces and the remaining one has primary retouch on only one edge of each face. Stems are straight and two of the bases are slightly concave (Table 32). The other base is straight. Two of the points are biplano in cross-section. The third is concavo convex in cross-section reflecting the contours of the blade from which it was made. This last is also the point which shows the least modification from manufacture. Two of the points in Type B are of Norwood chert and one is of an unidentified kind of chert.

Table 32.--Class III--Notched Projectile Points.

Speciman	Type A							Type B
	15	35	25	26	11	Mean	Range	2
Max. Length	4.4	5.1	5.0	4.3	4.5	4.7	4.3-5.1	7.9
Max. Width	2.8	2.6	2.7	2.6	2.6	2.7	2.6-2.8	4.2
Max. Thickness	0.7	0.8	0.8	0.9	0.8	0.8	0.7-0.9	0.8
Blade Length	3.4	4.3	4.1	3.4	3.5	3.7	3.4-4.3	7.1
Shoulder Width	2.7	2.6	2.6	2.6	2.6	2.6	2.6-2.7	. .
Base Width	1.8	2.1	1.7	1.2	1.7	1.7	1.2-2.1	. .
Base Length	0.9	0.7	0.5	0.5	0.9	0.8	0.5-0.9	0.4
Haft Width	1.2	1.3	1.2	1.1	1.4	1.2	1.1-1.3	1.7
Cross Section	plano convex	bi-plano	plano convex	plano convex	bi-plano			bi-plano
Long Section	plano convex	bi-plano	plano convex	plano convex	bi-plano			bi-plano
Outline	ex.	ovate	ex.	ovate	ovate			ex.
Base	convex	concave	convex	convex	convex			convex

Class III--Notched Projectiles

The thirty-five notched projectile points in Class III have been divided into two types on the basis of whether they are corner notched or side notched forms. Within these larger groupings differences in the nature of the notch as well as other attributes occur which serve in the formulation of varieties within each type.

Type A, variety 1 (Fig. 63)

Type A, variety 1 consists of five corner notched projectile points. In addition to the kind of notch, consistency within this variety is evidenced by the geometric outline with three being ovate and two being excurvate in accordance with Binford's definition (1963: 200). However, in the case of the excurvate points the difference between maximum width and shoulder width, or the proximal defining points of the blade is only 1.0mm. and all of the points are actually very similar in outline (Table 32). Four of the five points have a convex base and there is minimal variation in the metric attributes with the exception of maximum length, blade length and basal width. Further, each point is made on a different variety of chert. One is clearly Norwood chert, one is made of chert such as that found in Michigan glacial till (Barbara Luedtke 1974: personal communication) and a third is made of a kind of chert definitely not found in Michigan and reminiscent of Burlington chert in the lower Illinois

Figure 63. Class III Type A Projectile Points.


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valley (Thomas Meier 1974: personal communication). Two of the types in Type A, variety 1 are of unidentified chert. One speciman shows evidence of having been heat treated since it exhibits an overall luster and red streaking resulting from modification to the iron content (Thomas Meier 1974: personal communication).

Type A, variety 2 (Fig. 63)

The single projectile point in this category is a large excurvate corner notched speciman with a blade which is long relative to the length of the base (Table 32). The end of the shoulder extends downward to a level just above the edge of the expanding base. Thus the angle of the notch in relation to the longitudinal axis of the point is acute. This point is of uniform thickness as evidenced by the fact that both the transverse and longitudinal cross-sections are biplano. The primary flaking consists generally of long, flat parallel flakes which tend to be diagonal from the edge toward the base and which frequently terminate in hinge fractures. The point is made of Norwood chert.

Type B, variety 1 (Fig. 64)

Type B, variety 1 consists of seven side notched projectile points with narrow blades and expanding bases which in all cases but one are convex (Table 33). They are distinguished from other side notched points at the Pine River Channel site by virtue of the fact that they are

Figure 64. Class III Type B, variety 1 Projectile Points.


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Table 33.--Class III--Notched Projectile Points.

Speciman	Type B Variety 1									Type B Variety 2a				Type B Variety 2b
	34	10	8	48	13	51	36	Mean	Range	5	1	Mean	Range	3
Max. Length	5.5	4.8	5.1	4.3	3.9	3.4	3.5	4.4	3.4-5.5	5.3	. .	5.3		4.4
Max. Width	2.5	2.3	2.1	2.1	1.9	1.9	2.1	2.1	1.9-2.5	2.1	2.3	2.2		2.3
Max. Thickness	0.7	1.1	1.1	0.9	0.8	0.9	0.6	0.9	0.6-1.1	0.6	0.7	0.7		0.5
Blade Length	4.3	3.9	4.2	3.1	3.1	2.4	2.5	3.4	2.4-4.3	4.4	. .	4.4		3.3
Shoulder Width	2.5	2.3	2.1	2.0	1.9	1.9	2.1	2.1	1.9-2.5	2.1	2.3	2.2		. .
Base Width	1.9	2.1	1.8	1.6	1.6	1.7	2.1	1.8	1.6-2.1	2.0	2.2	2.1		2.3
Base Length	0.8	0.3	0.6	0.6	0.5	0.5	0.7	0.6	0.3-0.8	0.8	0.4	0.6		0.9
Haft Width	1.4	1.4	1.2	1.0	1.3	1.4	1.3	1.3	1.0-1.4	1.5	1.7	1.6		1.6
Cross Section	bi-plano	bi-convex	bi-convex	plano convex	bi-plano	plano convex	plano convex			bi-plano	plano convex			bi-plano
Long Section	bi-plano	bi-convex	concave convex	bi-convex	plano convex	plano convex	bi-convex			bi-plano	. .			bi-plano
Outline	ovate	ovate	ovate	ex.	ovate	ovate	ovate			ovate	. .			. .
Base	convex	convex	st.	convex	convex	convex	st.			st.	st.			tri.

symmetrical in the geometric outline of the blade, in the depth of the notches and in the expansion of the base. Six of the seven are ovate in geometric outline and the seventh is slightly excurvate. Greatest variation occurs in the cross-sections (Table 33) with a fairly even distribution between biplano, plano-convex and biconvex in the transverse section and a slight tendency to biconvexity in the longitudinal section (Table 33). Two of the points in Type B, variety 1 are made of Norwood chert and one is probably of glacial chert (Barbara Luedtke 1974: personal communication). Three of the points are of unknown kinds of chert, one is made of argillite and one is probably oolitic chert, possibly from Wisconson (Barbara Luedtke 1974: personal communication).

Type B, variety 2 (Fig. 64)

Type B, variety 2 consists of three projectile points representing two subgroups. The variety as a whole is characterized by shallow side notching and close similarity in the metric attributes (Table 33).

variety 2a (Fig. 65)

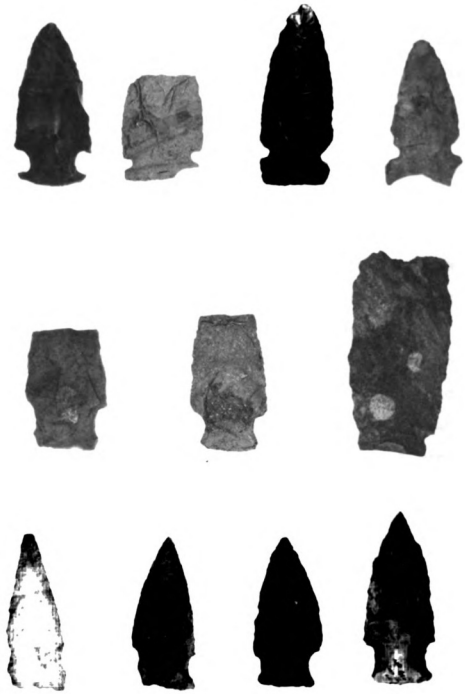
Type B, variety 2a includes two projectile points, one of which is broken one-half way up the blade. The haft element exhibits shallow side notching and the line of the base is straight. The lateral edges of the haft element are also straight and their juncture with the base is at a right angle, giving the base a

Figure 65. Class III Type B Projectile Points.

Row 1--variety 2a

Row 2--variety 2b

Row 3--variety 3


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rectangular appearance. As can be seen in Table 33. there is only a one or two millimeter difference in all metric attributes with the exception of basal length. The basal length of the broken point is one-half that of the other. The complete point is of uniform thickness and is biplano in both the transverse and longtitudinal sections. It is finely made with flat primary flake scars and an ovate blade which is one mm. wider than the base. The broken point likewise has a blade one mm. wider than the base and it was probably also ovate. However, it is not so well made. This is reflected in the plano-convex transverse section which results from the incomplete thinning of one face. The difference in quality of workmanship may be due to the kind of chert used. The complete point is possibly of Bayport chert and the broken one is of an unknown variety of chert.

variety 2b (Fig. 65)

The single unfinished speciman in variety 2b like the other points in Type B, variety 2 exhibits shallow side-notching. However, it differs because it is somewhat shorter and the base is wider than the triangular blade. In addition, the base was apparently going to be concave, because the concave basal edge exhibits some retouch though it was not completed probably because one lateral edge of the haft element is broken.

This point is biplano in both the longitudinal and transverse sections and is made of an unknown kind of chert (Table 33).

Type B, variety 3 (Fig. 65)

Type B, variety 3 includes six shallow notched points that have a narrow blade. The base is expanding though in two cases it expands on one side and contracts on the other (Table 34). There appears to be considerable difference in the line of the base with one being concave, one convex, two straight and two straight, but angled. However, this is somewhat misleading because the degree of variation is minimal and the line of the base could be considered generally straight. Consistency occurs in the geometric outline of the four points where this could be observed, since three of them were ovate and one was triangular. The triangular point is somewhat abberant in terms of cross-section also, because it is the only one that is biplano. The others have at least one convex surface. Four of the projectile points in Type B, variety 3 were made from Norwood, one was made from an unidentified kind of chert and one is possibly of Bayport chert.

Type B, variety 4 (Fig. 66)

The five projectile points in Type B, variety 4 are distinguished by small size, shallow side-notches and concave bases. As is the case with other small points from the Pine River Channel site, there is considerable

Table 34.--Class III--Notched Projectile Points.

Speciman	Type B, Variety 3						Type B, Variety 4						
	24	33	22	53	30	23	41	46	43	32	42	Mean	Range
Max. Length	. .	4.5	4.4	4.7	5.1	. .	3.7	. .	3.0	4.0	3.3	3.5	3.0-3.7
Max. Width	2.4	1.9	2.0	1.7	2.1	2.2	1.8	1.7	1.6	. .	1.4	1.6	1.4-1.8
Max. Thickness	1.0	0.9	0.9	0.6	0.9	0.8	0.6	0.6	0.5	0.6	0.6	0.6	0.5-0.6
Blade Length	. .	3.6	3.4	3.4	3.9	. .	2.8	. .	2.4	3.0	2.4	2.7	2.4-3.0
Shoulder Width	2.4	1.9	2.0	1.6	2.1	2.2	1.8	1.7	1.5	. .	1.4	1.6	1.4-1.8
Base Width	. .	1.6	1.6	1.7	1.8	1.6	. .	1.3	1.1	1.4	. .	1.3	1.1-1.4
Base Length	0.6	0.6	0.4	0.6	0.6	0.6	0.4	0.6	0.3	0.7	0.5	0.5	0.3-0.7
Haft Width	1.7	1.4	1.4	1.5	1.5	1.4	0.8	0.9	0.8	1.1	. .	0.9	0.8-1.1
Cross Section	bi-convex	bi-convex	bi-convex	bi-plano	plano convex	plano convex	bi-plano	bi-plano	bi-plano	bi-plano	bi-plano		
Long Section	. .	bi-convex	bi-convex	bi-plano	concave convex	. .	bi-plano	bi-plano	bi-plano	bi-plano	bi-plano		
Outline	. .	ovate	ovate	tri.	ovate	. .	ovate	ovate	ex.	tri.	ovate		
Base	st.	st.	st.	concave	convex	st.	convex	convex	convex	convex	convex		

within-class variation because the form of the points depends largely on the size and shape of the flake on which they were manufactured and modification by primary flaking on four of them is minimal. The relatively wide range in each of the metric attributes reflects this variation (Table 34). There is greater consistency in nonmetric attributes. All of the points are biplano in both the longitudinal and transverse sections. Three out of the five are ovate in geometric outline, one is excurvate and one is triangular. Three of these points are of Norwood chert and two of them are of an unidentified chert.

Type B, variety 5 (Fig. 66)

The single point in this variety is very small with an asymmetrically expanding bifurcate base. The concavity of the base is formed in the same manner as the notches by the removal of small conchoidal flakes. Primary chipping consists of flat lamellar and conchoidal flakes extending to one-half way across the point face. Secondary chipping is continuous on one edge of each face so that opposing edges exhibit continuous secondary retouch. This point is asymmetrically triangular in outline and is broken at the tip. It is plano-convex in both the longitudinal and transverse sections. An unidentified variety of chert was used in making this point (Table 35).

Table 35.--Class III--Notched Projectile Points.

Speciman	Type B Variety 5	Type B Variety 6							Type B Variety 7	Type B Variety 8	Type B Variety 9
	12	16	31	45	24	7	Mean	Range	52	17	TT
Max. Length	. .	3.6	3.5	3.5	2.8	. .	3.5	2.8-3.6	5.0	7.4	. .
Max. Width	1.3	2.0	1.8	1.2	2.0	1.3	1.7	1.3-2.0	2.5	3.9	. .
Max. Thickness	0.5	0.4	0.7	0.4	0.4	0.3	0.4	0.3-0.7	0.6	0.8	0.7
Blade Length	. .	3.2	2.6	2.6	2.3	2.3	2.6	2.3-3.2	4.0	5.8	. .
Shoulder Width	1.3	2.0	1.8	1.2	1.5	1.3	1.6	1.2-2.0	2.5	3.9	3.0
Base Width	1.1	1.8	. .	1.4	2.0	. .	1.7	1.4-2.0	1.4	3.7	2.0
Base Length	0.4	0.4	0.5	0.7	0.5	. .	0.6	0.4-0.7	0.7	1.5	1.5
Haft Width	0.7	1.7	. .	1.0	1.4	0.9	1.3	0.9-1.7	1.3	2.9	1.8
Cross Section	plano convex	bi-plano	bi-plano	bi-plano	bi-plano	bi-plano			bi-plano	bi-plano	bi-plano
Long Section	plano convex	bi-plano	bi-plano	bi-plano	bi-plano	bi-plano			bi-plano	bi-plano	bi-plano
Outline	tri.	ex.	tri.	tri.	tri.	tri.			ovate	tri.	. .
Base	concave	concave	. .	concave	concave	concave			convex	convex	convex

Type B, variety 6 (Fig. 66)

Type B, variety 6 includes five small side notched projectile points that are characterized by relatively deep notching, convex bases, and asymmetry in some aspect of the haft element. Asymmetry in the haft element is exhibited in all observable cases by a truncation of one side of the expanding base. Four of the points are triangular in geometric outline and the fifth is slightly excurvate (Table 35). Cross-sections are consistent with all five being plano-convex in transverse and four plano-convex in the longitudinal section. The longitudinal section of the remaining point is asymmetrically biconvex. On one side convexity occurs at the tip and tapers down so that some portions of the blade are concave. On the other side convexity occurs at the juncture of the blade and haft element and tapers down toward the tip with some portions of the blade again being concave. As is the case for all of the small points at the Pine River Channel site these show variation in the amount of modification by primary flaking. Two show full primary flaking on both faces and three are unifacial with primary flaking covering one face only. One point is clearly of Norwood chert. The others are of unknown varieties of chert. Metric attributes for this grouping are shown in Table 35.

Type B, variety 7

The single projectile point in Type B, variety 7 is side notched with a slightly expanding convex base.

Figure 66. Class III Type B Projectile Points.

Row 1--variety 4

Row 2--variety 5

Row 3--variety 6

Row 4--varieties 8, 9


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It is ovate in outline and both the longitudinal and transverse cross-sections are biplano. Primary chipping consists of small flat flakes with no apparent pattern. Secondary chipping is discontinuous on all eges. This point is made of an unidentified variety of poor quality chert. Metric attributes are shown in Table 35.

Type B, variety 8 (Fig. 66)

This variety contains one side notched projectile point made of Norwood chert. The notches are shallow and combined with an extremely convex base produces a form like archaic "Dovetail" points. The blade however, has apparently been reworked so that it tapers in sharply from the shoulder to form an asymmetrical triangular outline which is concave on one side and convex on the other suggesting possible use as a knife. The pattern of primary chipping is obscure on the faces of the blade and thinning is somewhat irregular. Lamellar and conchoidal flakes occur at the edges of the blade and secondary retouch is discontinuous. Notching was the final step in manufacture, since the conchoidal scars seen at the notches obscure flakes taken off the faces of the haft element. Secondary retouch on the base is discontinuous (Table 35).

Type B, variety 9 (Fig. 66)

Type B, variety 9 consists of one broken turkey-tail point that shows evidence of having been burned. Thus "pot-lid" fractures are apparent on one face of the blade

and on the opposite face of the haft element. Primary flaking generally consists of flat parallel flakes extending diagonally from edge to base and at least one-half way across the face of the point. This point is biplano in both the longitudinal and transverse cross-sections. It is made of material other than Indiana hornstone (Thomas Meier 1974: personal communication) (Table 35).

Scrapers

A total of 83 scrapers were found at the Pine River Channel site that were divided into two general categories termed "formal" and "casual." The two categories can be distinguished from one another both on the level of the individual artifact and on the level of all artifacts in each class. For example an individual scraper showing evidence of some care taken in its manufacture such as patterned primary and/or secondary retouch is classed as "formal" whereas a scraper lacking these is considered to be "casual." Likewise, all artifacts in the "formal" category exhibit striking uniformity with regard to a number of attributes, while those in the "casual" category are diverse in comparison with one another. Interestingly, the two categories show little difference in metric attributes (Table 36).

Formal Scrapers (Fig. 67, 68)

The 33 formal scrapers consist of 28 or 85 percent made on expanding flakes, and 5 or 15 percent made on

Figure 67. Formal Scrapers.


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Figure 68. Formal Scrapers.


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parallel flakes. Of these, eight exhibit cortex. The scraping edge is normally on the distal end of the artifact. This is the case on 75 percent of all formal scrapers. The scraper portion includes the distal end and one lateral edge on 12 percent of the formal scrapers, one lateral edge only on 9 percent and the distal and plus both lateral edges on 3 percent. The scraping edge is usually in the form of a continuous curve. The formal scrapers are plano-convex and the convex ridge on one face is the focal point of primary retouch. Retouch is normally perpendicular to the ridge from both lateral edges and the proximal end. Eight of 24 percent of the formal scrapers did not exhibit this kind of patterning. Secondary retouch was present on 24 or 73 percent of these artifacts and minimal to absent on 9 or 27 percent of them. Only four were bifacial although many of the others showed some attempt at thinning the bulb on the unworked face. Norwood chert was the material used for 27 scrapers while the other 6 were made of unidentified chert. Finally, there is one unfinished scraper of other than Norwood chert. It is made on an expanding edge flake and the edge is on the distal end and one lateral edge. One portion of the scraping edge exhibits incomplete primary flaking and numerous small hinge fractures.

Casual Scrapers

This class of forty-nine scrapers from the Pine River Channel Site is characterized by minimal modification

of the normally flat or biplano flakes on which they are made. This consists mainly of steep retouch to form a scraping edge and it is the steep retouch that distinguishes this class as scrapers rather than as retouched flakes. There is a greater proportion of flakes other than expanding flakes used for these scrapers which contrasts with the situation for formal scrapers where expanding flakes were predominant. Thus 20 or 41 percent were made on expanding flakes, 21 or 43 percent were made on parallel flakes, 7 or 14 percent were made on contracting flakes and 1 or 2 percent was a decortication flake. Nine casual scrapers had some cortex present. The distal end was modified for use on 69 percent of the artifacts, it was modified in addition to all or part of one or both of the lateral edges in 12 percent of the artifacts, one lateral edge was modified for use on 14 percent of the artifacts and both lateral edges were modified on 2 percent of the artifacts. One unusual scraper was retouched on the distal and proximal ends as well as on one-third of both lateral edges. The shape of the scraping edge varied from a continuous curve on 67 percent of the scrapers, to relatively straight on 20 percent of the scrapers to angular on 12 percent of the scrapers.

Retouch of any portion of the casual scrapers other than the working edge was minimal and when it occurred was confined to thick portions such as the bulb or the flake

Figure 69. Small Scrapers.



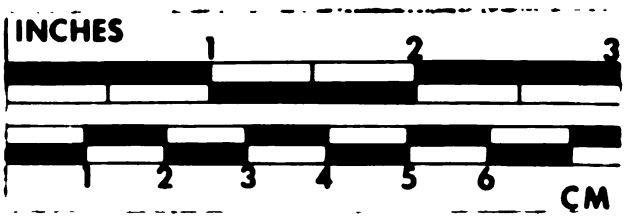

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Figure 70. Casual Scrapers.


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edges. Thirty of the casual scrapers were made of Norwood chert whereas nineteen were made on unidentified chert.

Twelve of the casual scrapers were extremely small. They range in length from 1.5 to 2.3 cm. and in width from 0.9 to 2.0 cm. Thickness of these casual scrapers ranges from 0.3 to 0.7 cm. (Table 36).

Knives

Seventy-three chipped stone artifacts at the Pine River Channel site were possibly used as knives. Because many of them closely resemble projectile points or unfinished bifaces, they are not so easily classified. However, they possess in common the quality of assymetry of shape and retouch that distinguishes them as a separate category. Their similarity to other artifacts is probably not accidental, since it is known from ethnographic reports that projectile points are used as knives (Turnbull 1961: 23, 62) and it is possible that the same steps were followed in manufacturing both kinds of artifact.

The presence or absence of modification for hafting serves as the basis for two broad classes of knives. The largest of these categories is that of unhafted knives. There are sixty-two unhafted knives and eleven hafted knives.

Unhafted knives (Figs. 71, 72, 73, 74, 75)

The sixty-two unhafted knives from the Pine River Channel site are nearly all made on bifacial blades or

Table 36.--Metric Attributes--Scrapers.

	Average Length	Range Length	Average Width	Range Width	Length/ Width Ratio	Average Thickness	Range Thickness
Formal	3.3cm.	2.3-5.3cm.	2.4cm.	1.9-3.3cm.	1.4	0.9cm.	0.4-1.8cm.
Large Casual	3.5	2.2-5.3	2.4	1.8-3.8	1.5	0.7	0.4-1.9
Small Casual	1.9	1.5-2.3	1.5	0.9-2.0	1.3	0.5	0.3-0.7
Total Casual	3.1	1.5-5.3	2.2	0.9-3.8	1.4	0.7	0.3-1.9

Figure 71. Triangular Knives.

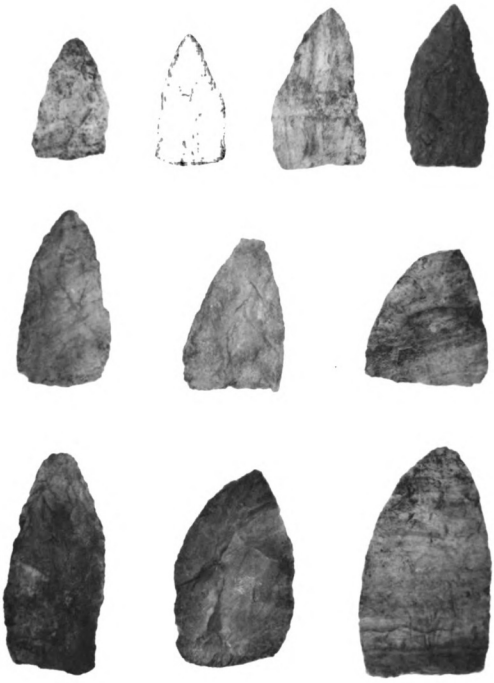

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Figure 72. Ovate Knives.


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Figure 73. Lanceolate Knives.

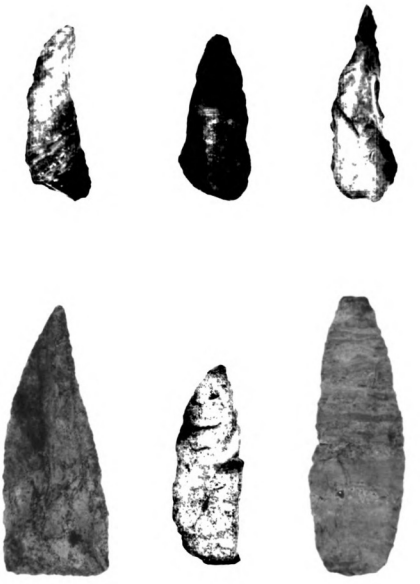

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Figure 74. Shouldered Knives.

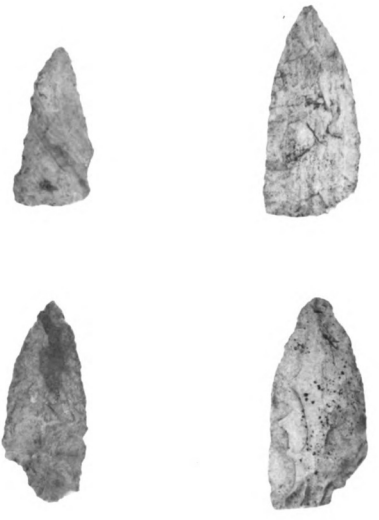

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Figure 75. "Humpbacked" Knives.


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preforms that have been modified so as to create a straight edge and a curved edge. Seven of them are unifacial and exhibit the same combination of a straight and a curved edge. In addition, one of these edges normally has greater continuity of primary retouch and/or the presence of secondary retouch, whereas the other edge lacks this and often exhibits hinge fractures or cortex. The curved edge possesses continuous retouch on 40 or 65 percent of these knives, the straight edge possesses continuous retouch on 21 or 34 percent and there is no differentiation of retouch on one knife.

The unhafted knives may be triangular, ovate or lanceolate in geometric outline. Four of them are shouldered and possess one short, curved edge. Thirty-nine knives are uniformly thinned on both faces. However, twenty-three exhibit one face with little thinning and can be considered "humpbacked" knives.

It is noteworthy that thirty-one knives were made of Norwood chert and thirty-one were made of other kinds of chert. In addition, the quality of material seems poorer than that used for other chipped stone artifacts. The metric attributes of unhafted knives are presented in Table 37.

Hafted knives

There were eleven hafted knives found at the Pine River Channel site. All are bifacial and exhibit the kinds

Table 37.--Metric Attributes of Unhafted Knives.

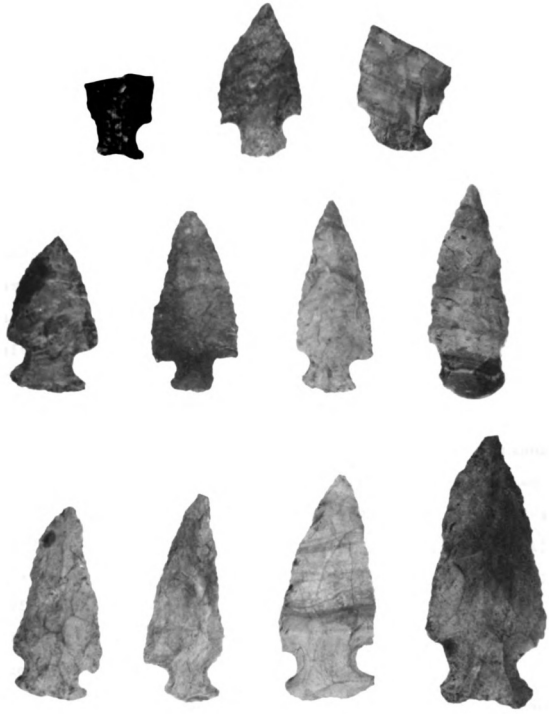
	Average	Range
Length	4.8 cm.	2.7-7.7cm.
Width	2.5	1.4-4.2
Thickness	0.9	0.3-1.7
Total - 62		

of asymmetry of blade and retouch present on the unhafted knives. The curved edge on six knives exhibits more secondary retouch and greater continuity of retouch than does the straight edge. Three knives show no differentiation in edge retouch and two are represented only by the basal portion so could not be examined for this characteristic. In addition, the bases of nine hafted knives are markedly asymmetrical because of differing lengths or depths of the two side-notches.

Seven of the hafted knives are similar to the unhafted "humpbacked" knives in that they are plano-convex in cross-section. However, there appears to be a greater amount of working of the convex face than is the case with the "humpbacked" knives. Three of the remaining artifacts are biplano in cross-section and one is biconvex.

As was the case with the unhafted knives only four, or less than half, of the hafted knives were made of Norwood chert. The other seven were of unidentified chert which once again gives an impression of poor quality. In

Figure 76. Hafted Knives.


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addition, four artifacts exhibit unremoved cortex. See Table 38 for metric attributes of hafted knives.

Table 38.--Metric Attributes of Hafted Knives.

	Average	Range
Length	6.2cm.	4.8-8.4cm.
Width	2.7	2.7-3.7
Thickness	0.9	0.7-1.3
Base Width	1.1	1.3-2.9
Haft Width	1.5	1.1-2.2
Haft Length	1.2	0.9-1.6

Drills

Sixteen drills were found at the Pine River Channel site. Seven of these are complete, six are bases and two are tips. One drill has an expanding base that suggests it was probably made in the Late Archaic. Another is a small, shouldered drill with minimal primary flaking of the basal half and no modification of the base itself. A single bifacial notched drill was found that is nearly the same size as the shouldered drill and evidently was hafted.

A group of five whole drills and six bases indicate artifacts roughly triangular in form that are likely to be of Woodland origin. Three of the complete Woodland drills are between 5.5 and 5.8 cm. in length and two are between 2.5 and 2.8 cm. in length (Table 39). Ten of the drills are of Norwood chert and six are of unidentified chert.

Figure 77. Drills and Drill Fragments.

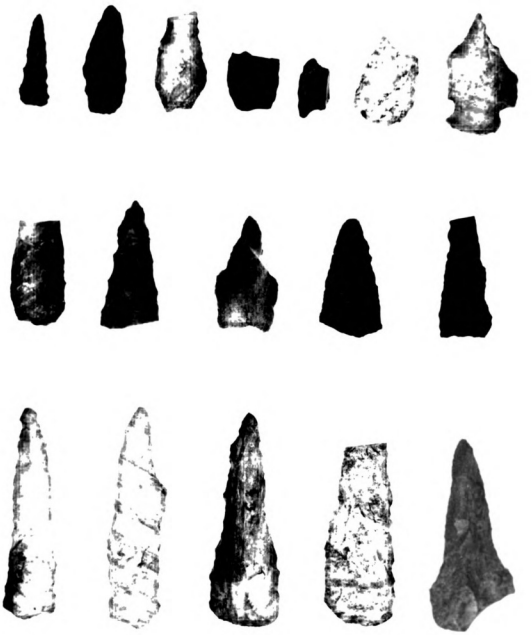

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Table 39.--Metric Attributes of Drills.

MSU #	Max Length	Max Width	Max Thickness	Blade Length	Haft Length	Blade Width	Haft Width
3683.25.2.4	2.8cm.	1.2cm.	0.5cm.	. .	. .	. .	. .
3683.06.05	2.5	0.8	0.4	. .	. .	. .	. .
3683.26.3.3	5.5	1.9	1.0	. .	. .	. .	. .
3683.04.05	5.6	1.4	0.6	. .	. .	. .	. .
3683.04.03	5.8	1.5	0.8	. .	. .	. .	. .
3683.85.1	2.9	1.1	0.9	. .	. .	. .	. .
3683.24.2.2	5.0	2.2	0.6	3.4cm.	1.5cm.	1.5cm.	2.2cm.
3683.36.1.4	3.2	1.9	0.9	2.2	1.0	1.9	1.2

Gravers

There were five gravers found at the Pine River Channel site. Four of them are made on flakes with minimal modification other than of the graving tip itself which exhibits some retouch. The other graver has the appearance of an unfinished triangular projectile point with some bifacial primary flaking. The tip is retouched. Three of these artifacts are made of Norwood chert.

Other Chipped Stone Artifacts

Two artifacts of Norwood chert from the Pine River Channel site are trapezoid shaped with nearly parallel lateral edges, nearly straight proximal ends and angular distal ends. The 45° angle distal end is apparently the working edge of these artifacts of unknown function. One is made on a blocky decortication flake with modification of the angular edge by both primary and secondary flaking. Other than this there are a few flakes removed on the bulb of percussion, but this is minimal. The other artifact is bifacial and the angular edge as well as the remainder of the artifact exhibits primary flaking. The angular edge has been thinned relative to the other parts of the artifact which has no secondary retouch.

There were two denticulate flake tools of Norwood chert from the Pine River Channel site. Both have deep irregular flaking which occurs in one case on a curved lateral edge and in the other at one end extending onto a

Figure 78. Gravers.

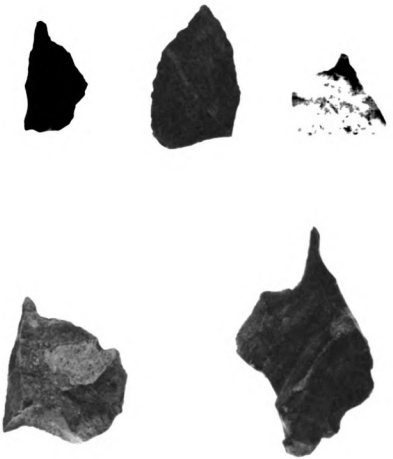

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Figure 79. Miscellaneous Chipped Stone Artifacts.


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portion of a curved lateral edge. The other edge on both artifacts is straight and lacks the denticulate flaking.

One artifact appears like the longitudinal one-half of a notched projectile point broken by hinge fracture, though the fact that the base is almost as long as the blade makes the proportions seem unusual. Nonetheless, the extant lateral edge of the blade has been worked by both primary and secondary flaking to form an edge that could possibly be used as a knife.

GROUND AND PECKED STONE

There were forty-seven artifacts of ground and pecked stone from the Pine River Channel site. Fourteen of these were of laminar material such as slate and, in addition, there were eighty-two laminar fragments recovered from the site. The dominant functional category consisted of sixteen flintworking tools including hammerstones and anvils. This is not surprising, since the manufacture of chipped stone tools was clearly one activity carried on at the site.

Hammerstones

The fourteen hammerstones found had at least one flat face with the exception of one cylindrical hammer and in varying combinations evidenced battering on the ends, on the edges or one from near the ends. Four have cracks in the stone often radiating from battered places and four exhibit smudging from fire. All appear to be made on

waterworn cobbles which in four cases could be identified as weathered granite. One hammerstone was of coarse sandstone and one was of a porus pumice-like material. Five of them showed indications of having served for multiple purposes. Thus the flat face on one exhibited concavities suggesting use as an anvil and one was smoothed on the thickest edge and end suggesting use as an abrader. The central portion of the flat face of three hammerstones from the same unit was smoothed in a circular pattern reflecting apparent use for some purpose other than hammering. The metric attributes of the hammerstones are shown in Table 40.

Table 40.--Metric Attributes of Hammerstones.

	Length	Width	Thickness
Mean	8.0cm.	5.8cm.	3.8cm.
Range	5.1-10.2	4.0-7.9	2.3-5.8
Total = 14			

Anvils

In addition to the hammerstones also used as an anvil, there were two artifacts that seem to have been used solely for this purpose. Both are oval waterworn pebbles with concavities in the central portion of one flat face. One measures 6.4cm. by 5.1cm. by 2.6cm. and the other is 13.2cm. by 10.9cm. by 6.3cm.

Celts

Three of the four celts from the Pine River Channel site appear to be unfinished. Two of these are made of dense hard material and show chipping and/or pecking, but no evidence of grinding. In both cases modification apparently begins at the edges and then proceeds toward the center. Both artifacts exhibit pecking or chipping of the edges and one has this at the ends as well. Large portions of the faces of each artifact are unmodified and where facial modification occurs it is located at one end. The third unfinished celt exhibits some grinding on both faces with the bit of one face bevelled and ground and the poll end shaped. The bit on the other face is chipped but not ground as is the case with one edge. A piece is broken out of this artifact near the poll end.

The fourth celt is made of weathered slate and bears evidence of use. The bit is broken and one facet at the bit end is gone. The extant bit face exhibits diagonal striations oriented roughly longitudinal to the bit. The poll and edges were shaped by chipping and then ground smooth. Both faces bear evidence of grinding. Metric attributes of celts are shown in Table 41.

Adzes

Two artifacts that were probably adzes were recovered from the Pine River Channel site. Both are plano-convex and on both the bit is bevelled at the convex face.

Table 41.--Metric Attributes of Celts.

MSU Catalog #	Length	Bit Width	Poll Width	Thickness
3683.06.05	13.7cm.	5.7cm.	3.5cm.	2.5cm.
3683.33.1.2	12.6	6.1	4.1	1.8
3683.58.1a	10.6	5.1	2.9	2.2
3683.04.02	12.6	5.7	2.8	2.6

One is of weathered granite and exhibits pecking on both faces with the bevelled bit smoothed by grinding particularly to one side and some grinding of the slightly bevelled bit on the other face as well. The other adze of dense waterworn stone has been smoothed by grinding over the entire artifact with the exception of the poll edge which has been pecked and only partially ground. This artifact was apparently used since the slightly concave bit has an irregular edge, the flat surface has horizontal striations from edge to edge and a small portion of the bevelled face at the bit has been removed. Metric attributes of the adzes can be seen in Table 42.

Abraders

Three artifacts with the whole or part of one flat face smoothed by grinding were possibly used as abrading tools. Two of them had edges with smooth surfaces as well and one of these had a smooth end. Grinding was confined to these areas and was the only modification apparent.

Figure 80. Celts.

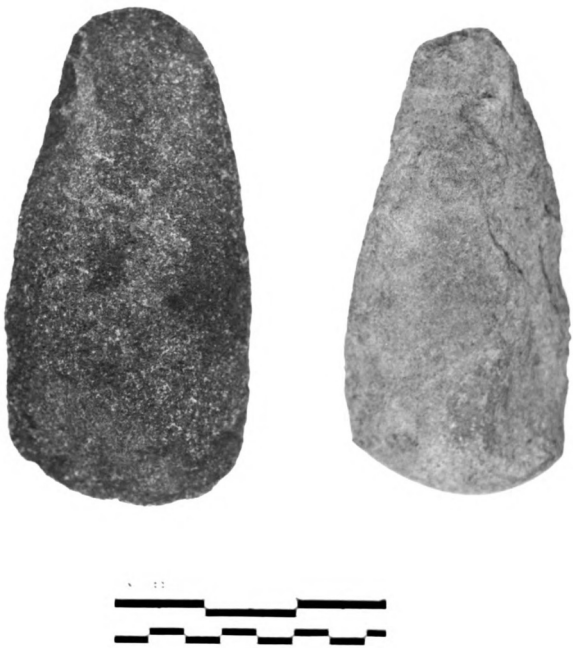


Figure 81. Celts.



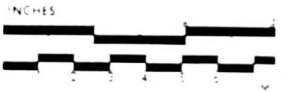

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Table 42.--Metric Attributes of Adzes.

MSU Catalog #	Length	Bit Width	Poll Width	Thickness
3683.26.3.4	13.5cm.	6.7cm.	3.8cm.	2.5cm.
3683.11.06	8.8	4.7		1.8

Pestles

The Pine River Channel site yielded two ground stone tools that are classified as pestles. Both have ground, flat bases though they differ in shape and material used. One is of very hard waterworn stone that is nearly circular except for the flat base which has a smooth circular dark gray concavity in the center. This artifact is firecracked and measures 4.9cm. in diameter and is 3.4cm. across at the base. The other is of coarse sandstone-like material and is pyramidal in shape. About two-thirds of the base is ground smooth and the remaining one-third which is not level with the ground portion plus occasional other places on the artifact has concavities suggestive of battering, though this could just as easily result from natural causes. This pestle is 6.0cm. in length and is 4.6cm. in thickness. The maximum width is 4.7cm. and the minimum width is .05cm.

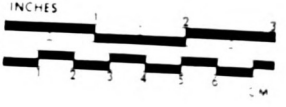
Figure 82. Adze, Netskinker, Hammerstone, Ground Slate.








3683.06.05


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Netsinker

One artifact from the site appears to have been a notched netsinker. It's side-notches indicate that it is a Late Woodland artifact (Cleland, personal communication: 1977). It is roughly rectangular in shape and is of a dense material which has been waterworn. The maximum width of 5.5 cm. occurs in the center of the artifact just below the chipped notches which measure .03 cm. and .02 cm. in depth. The width of the artifact at the notches is .5 cm. This netsinker is 6.7 cm. in length and is 3.0 cm. thick. The metric attributes are within the range of the fourteen netsinkers from Summer Island with the exception that the Pine River Channel site specimen is thicker.

Chopper

A flat, oval piece of stone was chipped so as to form a semicircular working edge possibly used for chopping. In addition there is some evidence of pecking around a circular inclusion of other stone material on one face. This artifact measures 9.7cm. by 8.1cm. by 2.2cm.

Unclassified Groundstone Artifacts

Five groundstone artifacts were uncovered at the Pine River Channel site that were not placed in a formal category. One of these that is apparently unfinished is oval in shape and made of a dense gray stone. Both faces and both ends exhibit packing and/or gouging. The lateral edges are more slightly modified. The gouged areas are

Figure 83. Chopper, Gorget and Grooved Slate Artifact.


INCHES

circular in shape and one of them contains a longitudinal groove. This artifact measures 10.6cm. by 6.5cm. by 3.9cm. and discoloration of one end suggested that it may have been in a fire.

Another unclassified groundstone artifact is of rather porous material, is oblong in shape and biplano in cross-section. One edge and end are rounded, while the other edge and end are flat. The outer surface of one end has been removed by packing which extends from 1.5cm. to 2.5cm. over each face. In addition the rounded end has a 1.5cm. groove along the longitudinal axis that measures less than 1mm. in depth. This artifact shows evidence of having been in fire and measures 13.8cm. by 2.9cm. by 2.0cm.

One artifact of weathered granite has been modified to form a roughly rectangular outline with a pointed end that has three facets terminating in a ridge. Additionally one edge has two facets that are clearly defined. The flattened base exhibits possible pecking. This artifact measures 11.6cm. by 6.5cm. by 4.4cm.

Finally, there were two broken oblong groundstone artifacts that were unclassifiable. One has a rounded end and the other has a round end and edges. In both cases one end and one face are broken.

Gorget Fragments

Three broken gorgets of laminar material were found at the Pine River Channel site. All three have one hole

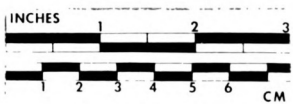
present which in two cases shows evidence of drilling from both sides and in one case drilling seems to have been from one side. The overall shape of each gorget is impossible to determine. However, on one the edges are not parallel and angle into a narrow end. Another has parallel edges that angle sharply into a point at the end. The third has both ends broken off, but its parallel sides exhibit decoration in the form of groups of three or four notches at the edge which are staggered so that those on the edge of one face occur between those on the edge of the other. The notch groups on this gorget are located at about 1.7-1.8 cm. intervals.

Grooved Slate

One piece of slate recovered is unworked except for two longitudinal grooves and additional diagonal grooves which form a cross-hatch pattern. The haphazard nature of these suggests that they were not decorative. A second piece of grooved slate exhibited bevelled edges, one rounded edge and one squared edge. This object has a longitudinal groove in each face that is about 2cm. in depth and on one face there are a few shallower grooves that are also longitudinal. The length of this artifact is 15.3cm., the maximum width, at one end, is 5.1cm. and the minimum width, at the other end, is 2.5cm. This artifact is 0.6cm. thick.

Figure 84. Incised Groundstone Artifact.




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Other Ground and Cut Slate Artifacts

Eight artifacts of ground and/or cut slate were found that were not specifically classified. Most are broken and each will be described individually.

One bar-shaped object was recovered that was broken at both ends. The remaining portion measures 6.1cm. by 3.1cm. by 0.5cm. There are no holes in this artifact and one edge is straight while the other is bevelled. The bevelled edge is irregular either because it is unfinished or has been used.

The Pine River Channel site yielded an oblong slate artifact that is broken at both ends, but is unusual in that it has a raised 1.1cm. by 0.9cm. by 0.2cm. rectangle on one flat face. The long edges of this high area have been cut out and ground. The whole artifact fragment measures 6.9cm. by 2.0cm. by 1.5cm. The cut edges are not parallel and one of these has been ground.

Another oblong ground slate artifact was found which is complete. It is thicker at one end and the thin end is rounded. This artifact is 7.6cm. long and 1.1cm. wide. The maximum thickness is 1.3cm. and the minimum thickness is 0.6cm.

Two similar slate artifacts, one broken and one complete had one end that formed an acute angle. The other end was squared on the complete artifact. Neither of these exhibited drill holes. The complete specimen measures 9.7cm. by 3.7cm. by 1.3cm. with the maximum width occurring

at the angled end. The maximum width of the incomplete artifact was 2.1cm. and this was located toward the center. This artifact was 0.8cm. thick and the length which is incomplete is 5.4cm.

A slate artifact was recovered which is rectangular with one rounded end. The other end is broken off and the artifact is fragmented in layers as well. The extant portion is 7.8cm. long and 3.9cm. wide.

An unusual piece of cut slate is nearly square with a wide v-shaped notch at one end which is 0.8cm. deep. All edges but one are cut and ground smooth and one end is rounded. This artifact is 4.7cm. long, 4.0cm. wide and 0.5cm. thick.

Finally, there were two broken slate pieces with only one worked edge present. There were eighty-two other slate fragments found at the Pine River Channel site.

Summary--Stone Artifacts

It is clear from the large amount of debitage, cores and unfinished bifaces plus the presence of hammer-stones and anvils, that the manufacture of chipped stone tools was performed at the Pine River Channel site. Apparently an effort was made to avoid wasting raw material and energy. Thus, the fact that the different kinds of cores were present in nearly the same frequency as they were at the O'Neill site supports Lovis's argument that the variety and kinds of cores from that site reflect choices

on the part of flint knappers that maximized the number of useable flakes from a single core (1973:159-160). In addition the high percentage of amorphous cores that were of flawed Norwood chert or beach pebbles indicates a desire to make maximal use of raw materials. The method of manufacturing bifaces suggests that energy was saved by working the artifact in areas of greatest stress first, so that if it broke at this point effort in chipping the rest of the artifact would not be wasted.

It seems appropriate here to add a cautionary note on the subject of so-called bipolar cores. There are two problems concerning these artifacts which certainly are cores that do occur at sites in northern Michigan. The first question has to do with whether or not they may have also served as tools and the second as to whether they were really produced by a hammer and anvil technique.

Both McPherron (1967:137-142) and Brose (1970: 102-106) express the belief that bipolar cores could have been used as tools. Thus McPherron sees the possibility that the opposed ridge variety could have been used as a wood-gouge (1967:141). Using microscopic analysis, Brose found wear patterns on some point-ridge, opposed point and opposed ridge bipolar cores at the Summer Island site and for the opposed point specimens suggests use an as awl while for the opposed ridge bipolar cores indicates use as a wedge or scraper (1970:104-106). He points out however, that his findings are not conclusive. The bipolar cores from the

Pine River Channel site have not been analyzed with a view toward determining whether or not they were used as tools. However, if they were utilized, there would be an additional case of energy conservation in the manufacture of chipped stone items, since they would be the source of both useable flakes and a finished tool.

Recently, there has been some question as to whether bipolar cores are in fact the result of a hammer and anvil technique (Neusius:n.d.). Crabtree (1972:42) suggests that a single blow to a core resting on an anvil produces shatter of the single bulb and further two bulbs are not produced. McPherron (1967:136) experimented with the bipolar technique with the result that his cores shattered or broke into several pieces. Perhaps, as Neusius suggests (n.d.), the presence of more than one striking platform results from blows from multiple directions. Since the argument seems to raise valid questions, it would be a mistake to assume a priori that artifacts termed bipolar cores were produced by a hammer and anvil technique. Nonetheless, they do exist as a class of artifacts in northern Michigan and they are cores. If the argument is correct that they are produced by blow from more than one direction, there is still the possibility that this instead of the bipolar technique was used to work broken tabular chert, especially if they were intended to be used as tools.

The projectile points from the Pine River Channel site include types representative of a long time span from

the Late Archaic through the Late Woodland and the frequency with which the types occur is expectable in view of the ceramic types present. The unhafted points, Class I, Type C and Class I, Type D are large, essentially lanceolate and clearly Archaic. Likewise the Turkey-tail and reworked Dovetail points in Class III, Type B, varieties 8 and 9 are of Archaic origin.

The Middle Woodland is indicated by a number of points from the site. The three stemmed points in Class II, Type A are very like the Middle Woodland Garden Stemmed Points, Type 4, variety 3, from Spider Cave on the Garden Peninsula of Michigan's Upper Peninsula (Cleland and Peske 1968:32-34) and have the same characteristic "Christmas tree" outline. The corner-notched points in Class III, Type A, variety 1 seems to be of Middle Woodland origin. Corner-notched points were found at the Middle Woodland Summer Island site (Brose 1970:Plate XIX) whereas the Late Woodland Juntunen site was lacking in such points. The corner-notched point in Type A, variety 2 is a Norton Corner-notched point (Griffen et al. 1970:Plate 170). The presence of this latter point is compatible with the presence of the Havana and Central Basin-like sherds and is further indicative of some southern connections during the Middle Woodland. Likewise the point in Type A, variety 1 which is made of exotic chert <u>possibly</u> from Illinois is suggestive of this.

The notched and stemmed pointed in Class II, Type B and Class III, Type B, varieties 2, 3, 6, and 7 are similar to points from the Juntunen site (McPherron 1967:Plate XXXIII) and may well be from the early Late Woodland.

The largest group of projectiles is comprised of twenty-six Juntunen Points in Class I, Type B, Class II, Type C and Class III, Type B, variety 4. These are the points which show varied degrees of modification of the flakes on which they were made and their occurrence in high numbers reflects the fact that the Late Woodland component at this site is the largest.

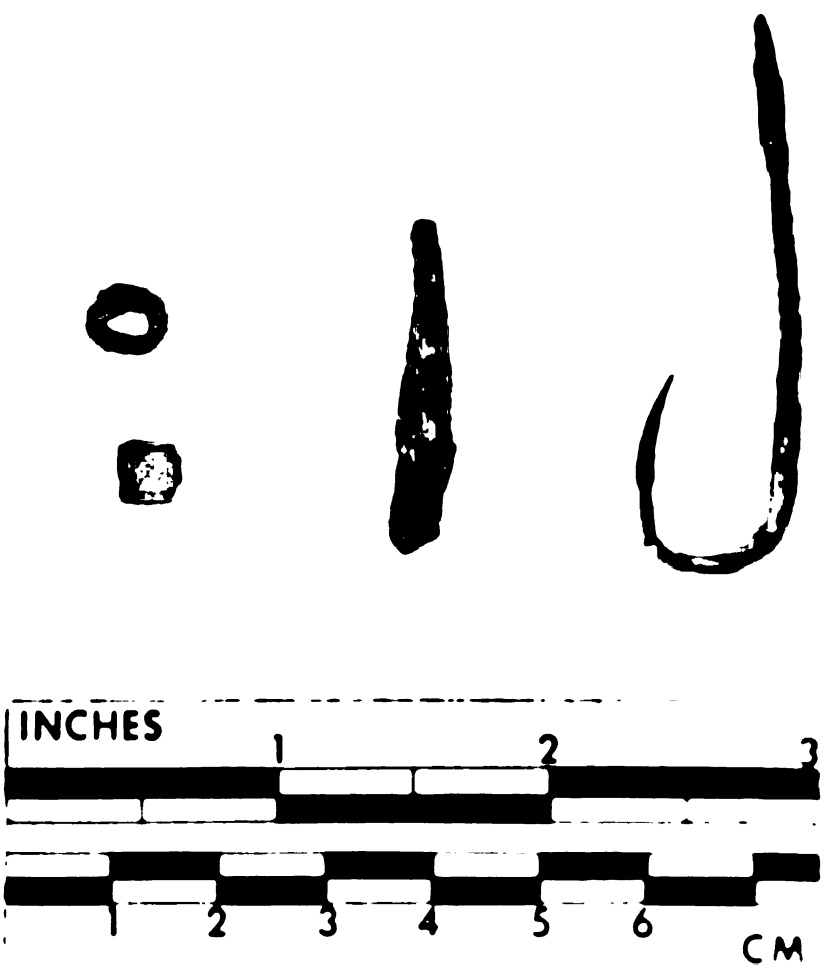
Finally, the cache blades in Class I, Type A might normally be considered to be Archaic because of their similarity to artifacts found in the Late Archaic Hodges and Pomranky burials (Binford 1963). However, since ten of them occurred in clear Late Woodland context at the Pine River Channel site (Feature 51), at least some are Late Woodland points.

COPPER

Copper was not abundant at the Pine River Channel site. However, six copper artifacts and four fragments were recovered.

Two of the artifacts are hammered and rolled beads that are nearly equi-dimensional (Fig. 85). One measures .6cm. in length and .75 in diameter, while the other was .6cm. in both of these dimensions. The hole in each bead is .3cm. in diameter.

Figure 85. Copper Beads and Fishhook.


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A copper fishhook was found which is flattened at both ends and has a square cross-section (Fig. 86). There are no barbs and there is no specific place for attachment of a line. The length of the fishhook is 5.2cm. from the tip to the beginning of the hook. The width of the curve of the hook is 2.0cm. and the length of the hook where it bends back up from the curve is 1.7cm.

A laminated fragment of a possible awl was found that is rectangular in cross-section and narrower at one of the extant ends (Fig. 86). This artifact is 3.1cm. long and 0.3cm. thick. The maximum width is 0.6cm. and the minimum width is 0.3cm. A whole copper awl measures 3.9cm. long and 0.3cm. thick. The width varies from 0.1cm. at the maximum to .03cm. at the minimum.

An additional artifact fragment was found which is shaped similar to a fishhook, but appears to be too small. The straight portion is 1.5cm. There is a small hook which is straight at the bottom for .05cm. and curves up again for .03cm.

HISTORIC PERIOD ARTIFACTS

The most startling aspect of historic period occupation of the Pine River Channel site is the paucity of artifacts dating from before the Civil War. Only four seed beads and one possible crinoid stem bead attest to use of the site before 1860. Apparently habitatation during earlier historic periods was minimal.

With the foregoing exceptions, all historic period artifacts date after 1860 (Patrick E. Martin, personal communication:1977). No doubt most are associated with the Beach Hotel. Thus glass, ceramics and building materials comprise the bulk of the historic period artifacts. Not surprisingly, "Hotel China" is found in the ceramic sample.

Mr. Patrick E. Martin, a doctoral candidate specializing in historic archaeology at Michigan State University, identified significant portions of the historic artifacts. In addition, he supplied descriptions and dates where possible.

Pre-1860 Historic Period Artifacts

Four seed beads were found at the Pine River Channel site. One measures 3mm. in diameter. It is opaque and dull brick red in color. This bead is of simple construction. It is doughnut shaped. The bead is similar to those, commonly found on eighteenth century sites such as the Guebert site in Randolph County, Illinois. A second seed bead is dark blue in color. This bead measures 2mm. in diameter. It possesses three flat facets. A colorless sead bead also measuring 2mm. in diameter was found at the Pine River Channel site. The fourth seed bead is light green in color and is transparent. It is doughnut shaped and measures 2.5mm. in diameter.

In addition to the seed beads, a possible crinoid stem bead was found. It measures 3mm. in diameter.

Post 1860 Historic Period Artifacts

Glass

The Pine River Channel site yielded six colorless glass medicine bottles. Three of these are cylindrical in shape. Two of the bottles are shouldered. One was possibly a perfume bottle. At least four of the bottles are machine molded. Bottom marks are present on two bottles. One is AGW 1-E and the other is LYRIC.

There were 191 fragments of glass vessels found at the Pine River Channel site. These included two snuff bottle fragments, one tumbler rim, one jar or pitcher fragment, plus portions of at least seven bottles. Colors represented include, dark brown, aqua, green and blue. In addition there were colorless glass vessel sherds including one of pressed glass with a diamond pattern.

There were forty-eight fragments of window glass among the historic period artifacts from the site. One of these was burned. Additionally, there were eleven fragments of glass too small to identify as to function. One of these was a fragment of milk glass and one was colorless with blue paint. Finally, two glass beads were found. One is light blue and measures 6mm. in diameter. It is somewhat deformed, but is doughtnut shaped and of simple construction. The other possible bead is fragmentary. It is dark blue with white opaque glass overlay covering part of the fragment.

Metal

The Pine River Channel site yielded ninety-one artifacts that can be categorized as building supplies. Eighty-four of these are nails. Both cut nails and wire nails are present. One nail was inserted through an iron washer and another through a concave disc. Two spikes, two screws, one screwhead, one washer and one nut were also found. In addition, there are 114 wire fragments including 11 pieces of twisted wire and 1 piece of copper wire.

Ammunition found at the Pine River Channel site included a 22 caliber rimbire catridge and a 32 caliber rimfire cartridge case. There was also a shotgun shell casing and a gun shell marked P on the bottom.

Three coins were found at the Pine River Channel site. One was an 1862 "Indian Head" penny, one was a 1918 penny and one was a 1920 "Buffalo" nickel.

A wide variety of domestic, or household, items was found. These included a thimble, a safety pin, a plated fiddle-back spoon, a small iron key, a circular shoe polish can, a bicycle spoke base and a fuse fragment. Three artifacts are associated with clothing. One of these is a 1.9 cm. iron overall button and one is a clothing rivet marked PIONEER. In addition there is a two piece brass button with a pressed "basket weave" front and an iron back. Other household items found include an aluminum razor blade box marked GEM DAMSKEEN BLADES, a Colgate toothpaste tube marked June 39, 1906 and a single blade pocket knife

marked SCHOOL KNIFE. Finally a 13cm. embossed brass band was found which was possibly a bracelet. It is marked LOWNEY in the central element and is decorated with two round domed buildings and a floral motif.

Seventy-seven miscellaneous and unidentifiable pieces of metal are from the Pine River Channel site. Two are concave sheet iron discs with a central perforation and one is a bar 3.8cm. long. The remainder consists of metal fragments.

Ceramics

Ceramics from the Pine River Channel site served a variety of needs. There are portions of plates and cups, a button, flowerpots, drain tile and pipe fragments. Plate and cup fragments were made of porcelain and ironstone. The two pieces of "Hotel China" in the sample included the basal sherd of a porcelain cup with a single painted red line around the base and on the handle. The rim sherd of a "Hotel China" plate likewise has a simple painted red rim decoration. Another cup rim has a blue transfer print floral motif and portions of an ironstone china plate have a transfer printed floral design with a brown overglaze. There is one blue and white porcelain sherd which had been burned. Other procelain and ironstone sherds are plain. The single ceramic button is of porcelain, is 1.2cm. in diameter and has four holes. Five clay pipestem fragments were found including one with a knob shaped heel. Finally there is one clay pipe bowl.

Shell

Two shell buttons were found at the Pine River Channel site. One button is 1.3cm. in diameter and has two holes. The other button is 1.9cm. in diameter and has one hole with a wire eye.

Miscellaneous

A wide variety of miscellaneous artifacts were found including fragments of bricks, concrete or mortar, coal, clinkers, paper and newspaper. In addition there is the carbon rod from a battery, some shoe fragments and a plastic tube cap marked .

FAUNAL AND FLORAL REMAINS

Faunal Remains

A total of 746 bones and teeth were recovered from the Pine River Channel site. All were identified by Melanie Gumerman, a Michigan State University graduate student in anthropology with the exception of the fish which were identified by Thomas Kramer while he was a graduate student in vertebrate paleontology at Michigan State University. The bones and teeth were sorted into categories of mammal, fish, bird and reptile in 526 cases and of these 148 could be further assigned at the generic level. A determination of the number of individuals represented in each group was not made largely because of the small size of the sample.

Table 43 indicates that mammals tend generally to dominate the assemblage, but perhaps the most striking thing is the variety of identifiable forms present (Table 43). It is clear that people occupying the Pine River Channel site were diversifying their efforts to obtain faunal resources and that they were exploiting the various aquatic and terrestrial habitats available to them.

Table 43.--Kinds of Fauna at the Pine River Channel Site.

	Number of Bones	% of Known Bones	% of Total Bone
Mammal	279	53%	37%
Fish	141	27	19
Bird	103	20	14
Turtle	3	006	004
Unknown	220	. .	29
Total	746	100	100

Mammals

Eleven species of mammals were identified including two domestic species from the first level that were no doubt present due to modern disturbance. These were cow (Bos taurus) and pig (Sus scrofa). Large game mammals identified were moose (Alces alces), white-tailed deer (Odocoileus virginansus), and a possible woodland caribou (Rangifer sp.). Smaller mammals found were coyote or dog (Canis sp.), beaver (Castor canadensis), rabbit (Lepus sp.),

Table 44--Identified Faunal Genra at the Pine River Channel Site.

Scientific Name	Common Name	Number of Bones
Alces alces	Moose	4
Bos taurus	Cow	2
Canis sp.	?	1
Castor canadensis	Beaver	6
Lepus sp.	Rabbit	1
Odocoileus virginansus	White-tailed Deer	8
Procyon lotor	Raccoon	3
Ranaifer sp.	Caribou	1
Sus scrofa	Pig	8
Tamiascurius hudsonicus	Red Squirrel	3
?	Rodent	2
Anas platyrhychos	Mallard	66
Anseriforme	Duck, Goose	1
Brantis canadensis	Canada Goose	2
Caprimulgiformes	Hawk, Vulture	1
Meleagris gallopavo	Turkey	12
Catostomus commersoni	Common White Sucker	1
C. commersoni or Moxostoma sp.	Common White Sucker or Redhorse	24
Stezostedion vitreum	Walleye	1
Chrysemys picta	Painted Turtle	1

raccoon (Procyon lotor), red squirrel (Tamiascuirus hudsonicus) and an unidentified rodent.

The mammalian fauna at the Pine River Channel site comprise a group that might be expected in an ecotone. Two of the species are found throughout Michigan, four have a northern distribution and one is generally western in occurrence (Burt 1957). Both moose (Alces alces) and caribou (Rangifer sp.) though formerly present, do not occur in the region today.

All of the identified species can be found in habitats that are present within two or three miles of the site. Thus both moose (Alces, alces) and woodland caribou (Rangifer sp.) occupy swampy coniferous forest areas such as are found to the south of the site (Burt 1957). Likewise the red squirrel (Tamiascuirus hudsonicus) prefers coniferous forest though it can also occur in hardwoods which are characteristic of the immediate vicinity of the site. Both the beaver (Castor canadensis) and the raccoon (Procyon lotor) occur along the wooded shores of lakes and streams like those found at and near the site. White-tailed deer feed on the leaves of deciduous trees and low growing vegetation including berries and water plants and often can be found at the edges of streams and ponds (Cahalane 1961: 26).

Though the mammalian fauna give few clues as to the season the site was occupied, there is some indication that people were present during warm periods. There is a right

third premolar of a very young white-tailed deer (Odocoileus virginanus). Since the white-tailed deer (Odocoileus virginanus) are born in June, the site must have been occupied at least once after this month (Burt 1957:152).

Fish

The most numerous bones at the Pine River Channel site, next to mammal, are those of fish (Table 43). Only two or possibly three species could be identified however. These were common white sucker (Catostomus commersoni), common white sucker and/or redhorse (C. commersoni or Moxostoma sp.) and walleye (Stizostedion vitreum).

As was the case with the mammals, the fish could have been caught in the vicinity of the Pine River Channel site. Suckers and redhorse (Catostomus commersoni and Moxostoma sp.) run upstream during the spring spawn and at this time could have probably been taken from the Pine River (Jordan and Evermann 1969:37). Walleye (Stizostedion vitreum) prefer the clear water of lakes with a rock, gravel, sand or hard clay bottom such as is found offshore from the site in Lake Michigan (Jordan and Evermann 1969: 361). They are found at moderate depths and are early spring spawners.

It is clear from the identified fish from the site that all give some indications of seasonality. Not only are sucker (Catostomus commersoni) and redhorse (Moxstoma sp.) abundantly available in late May or early June, but

they are more likely to be caught and eaten then, since they are poorer nutritionally and bonier than other fish which are more abundant later (Cleland:n.d.). Walleye (Stizostedion vitreum) spawn after the ice breaks in the spring in shoal water and are most abundantly available in the early part of the warm season (Cleland 1966:174). Whether or not they were caught through the ice in spring is not known. It is apparent however, from the fish remains that the site was occupied at least in the spring and perhaps on into the summer.

Bird

Five different kinds of birds were identified from the Pine River Channel site. These include mallard (Anas platyrhynchos), Canada goose (Brantis canadensis), turkey (Meleagris gallopavo), duck/goose (Anseriforme) and hawk/vulture (Caprimulgiformes). The latter was found at the surface and cannot be assumed to be associated with the prehistoric occupation of the site, though such birds were found at the Juntunen site (Cleland 1966:168).

Once again, like the mammals and fish, all birds present could have found a suitable habitat near the site. Both the mallard (Anas platyrhynchos) and the Canada goose (Brantis canadensis) utilize aquatic resources in their diet and the goose (Brantis canadensis) feeds on shore or on shoal bottoms (Pearson 1936:Part I, 115,160). In addition it often takes in sand apparently to aid in

digestion. The turkey (Meleagris gallopavo), currently at least, prefers a deep woods or swamp border habitat such as could be found in the vicinity of the site (Pearson 1936:Part II, 31).

With regard to the question of seasonality, the mallard (Anas platyrhynchos) and Canada goose (Brantis canadensis) are indicators of a warm season occupation since both are summer residents in the area (Cleland 1966: 167). Though the first migrants of Canada geese (Brantis canadensis) may arrive as early as March twentieth, the majority come later when spring is more advanced (Pearson 1936:xliv). Thus the bird remains are suggestive of a spring, summer habitation.

Turtles

The single identifiable carapace fragment was that of a painted turtle (Chrysemys picta). It too would have been collected during the warm season, since painted turtles (Chrysemys picta) are only available after the spring ice breaks up and are active when the temperature rises to about 60° or 65° (J. A. Holman:personal communication 1977).

Mussels and Snails

Two fragments of freshwater mussel shell were found that could not be identified. In addition there were five shells of land snail found. These were found in a unit

(NOW70) that had abundant bone and may well have been attracted by the presence of animal carcases.

Floral Remains

Floral remains recovered mainly by flotation from features at the Pine River Channel site were identified by Nancy Nowak, a graduate student at Michigan State University specializing in paleoethnobotany. Twenty species were found. Two of these including peach (Prunus persica) and corn (Zea sp.) plus one of the two beech seeds (Fagus grandiflora) were considered to be the results of historic occupation. A tabular summary of the eighteen species probably used aboriginally is presented in Table 45. Information as to species identified and season of availability was provided by Ms. Nowak and additional information as to seasonality, habitat and aboriginal use is taken from Yarnell (1964).

As can be seen in the table, all but one of the plants recovered prefer habitats that can be found in the vicinity of the site. These include sandy soil, moist areas such as stream banks or swamps, slopes, dry areas, thickets, open woods and wood borders. Thus it is likely that most or all of these plants were collected when the site was occupied. The one exception is wild pumpkin (Curcubita foetidissima) which is thought by Nowak to be more likely to occur naturally farther south.

With regard to the question of seasonality, dock (Rumex sp.) could have been available in May, depending on the species, so the site might have been occupied at this time. The majority of plants would have been collected during the period of July through October. Four of these are species which historically were preserved for winter use (Yarnell 1964). These include pin cherry (Prunus pennsylvanica), chokecherry (Prunus virginica), blackberry or rasberry (Rubus sp.) and hawthorn (Crataegus sp.). Bearberry (Arctostaphylos uva-ursi) can be obtained in winter, but is ready for harvest as early as July (Yarnell 1964:61). The one species available as late as November is beech (Fagus grandiflora) which is abundant every two or three years during the period from October to November (Yarnell 1964:67). Thus the site could have been occupied as late as November.

Summary of Fauna and Flora

The most striking aspect of both the fauna and flora identified is that the occupants of the site were apparently exploiting a variety of resources in the vicinity of the site as they became seasonally available. Advantage was taken of abundant fish resources in the spring, particularly the suckers (Catostomus commersoni, and/or Moxostoma sp.), and plants were likewise collected from mid-summer through early fall during the period of greatest availability. This evidence coupled with the presence of summer

Table 45.--Prehistorically Used Plants from the Pine River Channel Site.

Species	Number	Habitat	Season Available	Uses
Amphora canescens leadplant	1	river bank, thickets	Aug., Sept.	?
Arctostaphylos uva-ursi bearberry	48	dry, sandy rocky soil	July-winter	food, medicine, smoking, charm, technology
Chenopodium album goosefoot	1	waste ground	early summer to early fall	food
Cornus canadensis bunchberry	1	woods, thickets	Aug.-Oct.	food, medicine
Crataegus sp. hawthorn	4	open woods thickets banks	Sept., Oct.	food, charm technology
Cucurbita foetidissima wild pumpkin	1		summer, fall	
Fagus grandiflora beech	1	loam	Oct., Nov.	food, medicine, technology
Gaylussacia baccata huckleberry	2	rock soil woods, bogs	July, Aug.	food
Juniperus virginiana juniper	1	slopes, swamps, lakes	Fall	medicine
Prunus pennsylvanica pin cherry	9	woods, hills, openings	July, Aug.	food
Prunus pumila sand cherry	8	shores, sand	July, Aug.	food
Prunus virginica chokecherry	1	thickets, shores	July, Aug.	food, medicine
Pyrus coronaria? sw. crap apple	1	thickets, wooded slopes, bottoms	Oct.	food
Rhus sp. sumac	1	dry soil	late summer	food, dye, beverage, smoking, medicine
Ribes sp. gooseberry, currant	1		summer	food
Rumex sp. dock	4	moist areas	summer	
Rubus sp. blackberry-raspberry	4	thickets, wood borders	summer	food, medicine
Sambucus canadensis Am. elder	4	moist areas	Sept., Oct.	food, medicine

resident birds including mallard (Anas platyrhynchos) and Canada goose (Brantis canadensis) plus immature deer (Odocoileus virginansus) along with turtle (Chrysemys picta) suggests occupation of the site occurred during the warmer months from as early as May thorugh early fall and perhaps occasionally as late as November.

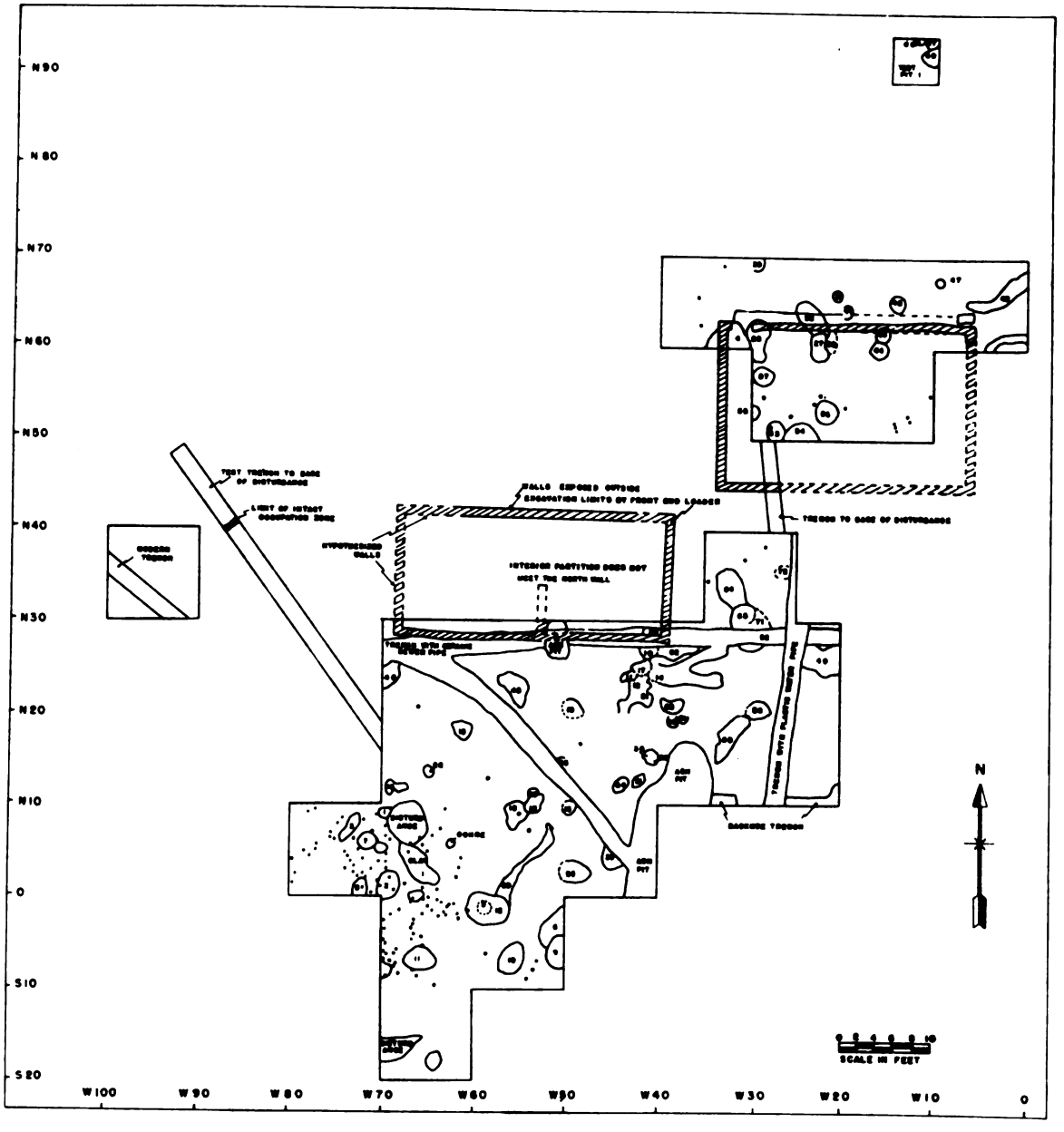
FEATURES AND DISTRIBUTION

The analysis of features and their distribution along with artifact distribution focused on the problems of delineating the several components at the site and of discerning activity areas. There was little natural stratigraphic division within the site. Mainly the site consisted of an undifferentiated midden layer except in the southwest portion where features were found originating in the sands below the midden. Therefore it was necessary to rely on the vertical and spatial distribution of diagnostic artifacts in attempting to locate component boundaries. Activity areas were defined on the basis of feature function and the nonrandom distribution of certain kinds of artifacts.

Features

There were seventy-five features at the Pine River Channel site other than postmolds (Fig. 86). Each feature is described individually in tables which include the number assigned during excavation, a functional definition where possible, the location at the site, the maximum

Figure 86. Feature Map of the Pine River Channel Site.


N90
N80
N70
N60
N50
N40
N30
N20
N10
0
S10
S20
W100
W90
W80
W70
W60
W50
W40
W30
W20
W10
0
N
SCALE IN FEET

dimensions, a description of shape and the contents. In addition to the tabular presentation certain groups of features require discussion in textual form so that the criteria for definition might be better understood or because they are noteworthy in terms of their distribution at the site.

Class I

There were eight features uncovered during the 1971 field season in the southwestern portion of the site that appear to be Archaic hearths even though many contain artifacts from later periods. This part of the site yielded most of the Archaic artifacts, these hearths occur below the occupation midden and they share characteristics not possessed by other hearths at the site. Thus they are described in the field records as being tear shaped in plane section and basin shaped in cross section. They were normally lined with beach stone and the centers were filled with yellow sand. The bottom of these hearths was usually a light gray or white sand containing cores and flat flakes. At least five of the hearths had cores and all contained flint chips.

All but one Archaic hearth produced evidence of later occupation in the form of ceramic materials. However, in all cases the amount of pottery is minimal and seems to represent the latter intrusion of artifacts, since all hearths occur below the midden.

Class II

Two large deposits of clay were found in the southeast quarter and northeast quarter of adjacent squares N0/W70 and NO/W80. Both are of an irregular elongated shape. The larger of the two, Feature 1, in N0/W70 measures 5.9' x2' x.6-.9' and may at one time have extended farther, since there was clay at the northwest balk of the unit with modern disturbance in between. The smaller clay deposit, Feature 3, is 3' x 1.4' x ca. .3'. Both of these features contained relatively high numbers of artifacts including flint chips, pottery and fire cracked rock. The larger feature also yielded 1 biface, 1 utilized flake, 3 retouched flakes, 1 core and 1 slate fragment in addition to coal which certainly resulted from modern disturbance. Since sandy loam is the characteristic soil at the site, it seems clear that the clay was brought to the site. Further, the irregularity of the clay deposits suggests a repository and in the absence of clay lining of the pit features was very possibly intended for use in the manufacture of pottery. The presence of artifacts in the clay is probably due to the deposits being open and uncovered. The smaller deposit contained a Mackinac Undecorated rim and thus this feature was probably present during the Mackinac Phase.

Class III

Class III features consists of six fire pits that may well have served as domestic or household hearths

during the Late Woodland. All but one of them are over one foot deep, are generally circular in plan view and basin shaped in cross-section, although the shapes may be irregular. The contents of these hearths suggests multiple activities performed in the vicinity by both men and women and in one case, at least, by children. Thus all of the six hearths have evidence of flint working in the form of cores and flint chips and in five cases of bifaces as well. All contain pottery and four yielded bone suggesting food related activity. One hearth, Feature 48, had the remains of two children's vessels one of which was from the Mackinac Phase. In addition, four of the hearths had chipped stone artifacts including a scraper in Feature 24, a scraper and projectile points in Feature 48, a scraper and graver in Feature 65 and knives and projectile points in Feature 27. Five of the six hearths had utilized and retouched flakes and Feature 65 yielded a piece of notched slate, while Feature 27 contained a celt. Feature 27 and Feature 48 contained Mackinac Ware and probably date from the Mackinac Phase.

Class IV

The distinguishing characteristics of the eight small hearths that comprise Class IV are that they had a relatively low artifact content and with the exception of one with four small body sherds, pottery is absent. All had flint chips and in addition, one had a core, one had a

biface and three had utilized flakes. Two hearths yielded bone and one of these also yielded plant remains. It is interesting to note that these features with contents confined mainly to debitage are located on the two portions of the site where most stone chipping took place. The features in Class IV are all close to one foot in depth and the four that are complete vary from 2.2' to 3.6' in length.

Radiocarbon Date

A single radiocarbon date of A.D. 1110±80 (N-1266 Yamasaki, Hamada and Hamada 1974) was obtained from Feature 6. This feature contained a vessel of the type Mackinac Banded and is certainly compatable with the time of the Mackinac Phase which is estimated by McPherron to last from about A.D. 700 to A.D. 1000 (1967:276).

Postmolds

A number of postmolds were found indicating that structures were present at the Pine River Channel site (Fig. 87). However, the relationship of the postmolds to each other is unclear and the shape of the structures cannot be determined with confidence.

Artifact and Feature Distribution

The first problem to be considered in studying the distribution of artifacts and features at the Pine River Channel site is to determine whether this can be used to delineate the components within the site. With regard to

the vertical occurrence of artifacts, the assemblage is mixed. Thus projectile points, other than those in features, of the Middle Woodland and Late Woodland are found at all levels and the most diagnostic Archaic points, particularly the "dovetail" point and the "turkey-tail" were found above the Woodland midden. Likewise pottery occurs at all levels and the types are mixed. This situation is not surprising considering the long use of the site. However, some components can be generally separated on the basis of other evidence.

Clearly the occupation that yielded the deep hearths in the yellow sand below the midden was Archaic and was apparently confined to the southwest portion of the site. Similarly, the relative abundance of pottery in the midden points to this as the locus of Woodland occupation. Though there seems to be no vertical separation of Woodland components, the Middle Woodland occupation, on the basis of the location of pottery and projectile types, seems to have occurred at the south-central and extreme northern portions of the site. The Late Woodland components represented principally by Pine River Ware and Mackinac Ware are the largest and are distributed over the entire site.

In further looking at the distribution of artifacts and features, two kinds of statistical tests were performed by independent observers in order to determine if certain localities of the site were favored for particular

activities. The results showed that chipping stone tools was apparently performed near the bluff edge.

The first tests were done by the author and involved the use of chi square to see if kinds of chipped stone artifacts were associated nonrandomly. These tests utilized data from the Woodland occupation only because the Late Woodland is the focus of this study. Further, data from the 1972 excavations were used since the one-fourth or five foot unit size of the 1972 season are of comparable size and the sample is appropriate for chi square.

The results of the chi square tests are strongly indicative of the fact that stone tool making was a major activity at the Pine River Channel site, because of the patterning of the associations (Table 46). Thus cores were nonrandomly associated with both bifaces and retouched flakes. This finding is reasonable, since in the tool making process the manufacture of bifaces can be seen as the first step in creating other tools and of course debitage is readily available for retouch. Likewise, though the association of cores and scrapers at >.02 was considered to be random, there is clearly a tendency for these to occur together. This probably reflects the choice of suitable flakes for making scrapers at the time the flakes were produced. Following this line of reasoning, it is not surprising to find a nonrandom association of bifaces with finished projectile points and scrapers, since these are the final product. Additionally, though the

Table 46.--Association Values of Paired Chipped Stone Artifacts.

Test	N	X^2	df	P
Bifaces/cores	74	6.07	1	<.01
Bifaces/utilized flakes	74	1.33	1	<.70
Bifaces/retouched flakes	74	.90	1	<.70
Bifaces/projectiles	74	20.13	1	>.001
Bifaces/knives	74	4.77	1	<.02
Bifaces/scrapers	74	14.19	1	>.001
Cores/utilized flakes	74	1.33	1	<.70
Cores/retouched flakes	74	15.07	1	>.001
Cores/projectiles	74	3.00	1	>.30
Cores/knives	74	.30	1	<.50
Cores/scrapers	74	5.51	1	>.02
Utilized flakes/retouched flakes	74	14.60	1	>.001
Utilized flakes/projectiles	74	.42	1	<.80
Utilized flakes/knives	74	3.74	1	<.05
Utilized flakes/scrapers	74	.36	1	>.90
Retouched flakes/projectiles	74	2.77	1	>.10
Retouched flakes/knives	74	1.19	1	>.20
Retouched flakes/scrapers	74	2.50	1	<.10
Projectiles/knives	74	10.54	1	<.001
Projectiles/scrapers	74	10.44	1	<.001
Scrapers/knives	74	5.95	1	>.02

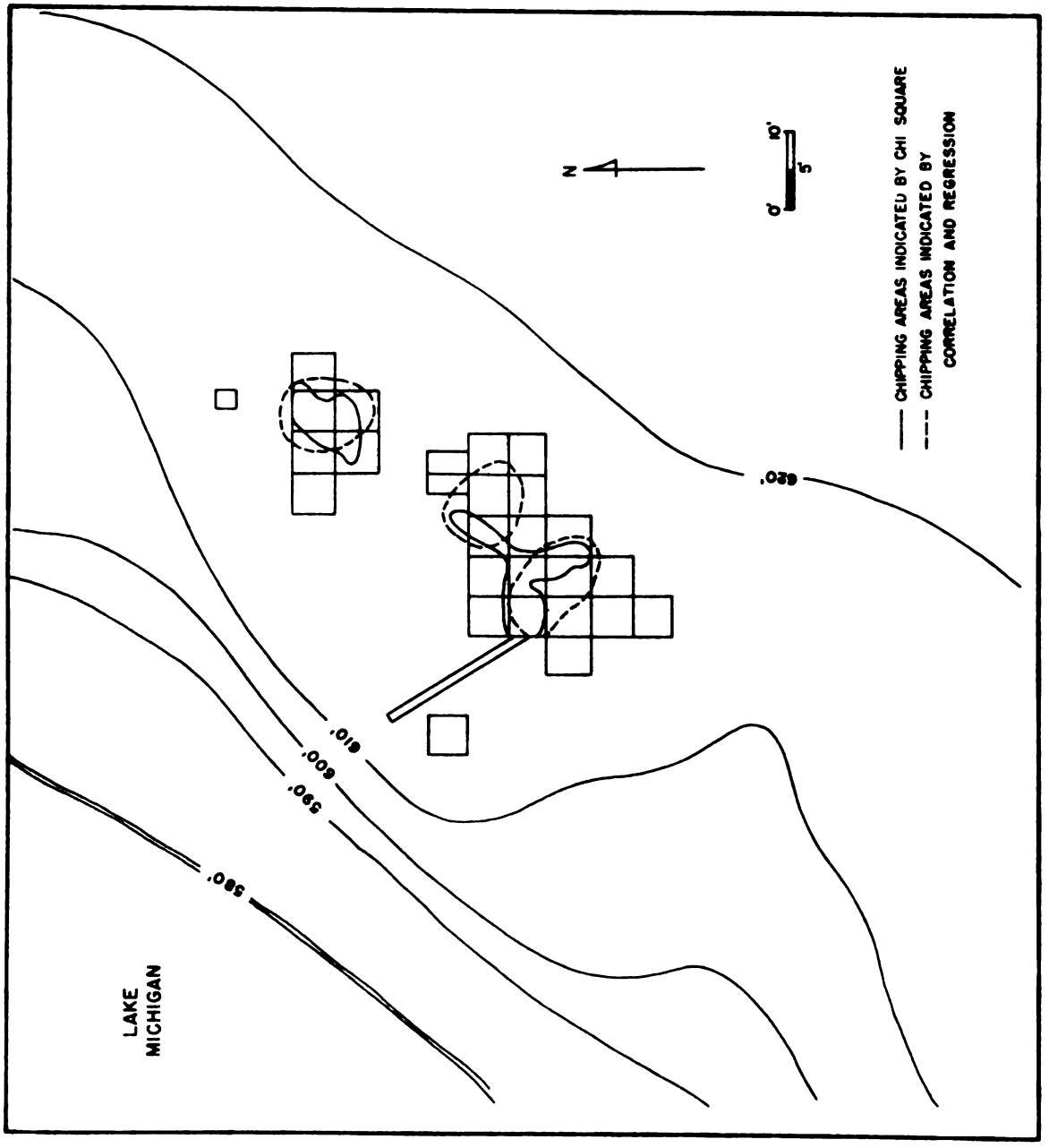
X^2 significant at .01 level

association of bifaces and knives on the basis of chi square appeared to be random at a level of <.02, when they occur together it probably reflects the same relationship of preform to finished artifact. The significant, or non-random, association of points with knives and scrapers may well reflect both the possibility that they were manufactured together and that they were used in performing tasks connected with hunting. Knives and scrapers were found to be randomly associated, but the result of >.02 indicates some likelihood of these occurring together perhaps for the same reasons. Finally, the nonrandom association of utilized and retouched flakes suggests they were used for similar purposes.

When the significant associations indicated by the chi square tests are plotted on a map of the Pine River Channel site, a picture emerges of most stone tool making activity occurring near the bluff edge (Fig. 87). It is not surprising that hammerstones and/or anvils are found in the same areas of the site. The situation was somewhat similar at the O'Neill site where chipping of stone tools took place mainly on the first dune from the lake, while household activities occurred inland on the second dune (Lovis 1973:248).

The results yielded by plotting the associations of stone tools indicated as being nonrandom by the chi square tests are supported by a multiple correlation and regression analysis of artifacts concentrations conducted by Ms. Deborah

Figure 87. Chipping Areas at the Pine River Channel Site.


LAKE
MICHIGAN
580'
590'
600'
610'
620'
N
0'
5'
10'
CHIPPING AREAS INDICATED BY CHI SQUARE
CHIPPING AREAS INDICATED BY
CORRELATION AND REGRESSION

Sabo, a graduate student in anthropology at Michigan State University (n.d.). The aim of her study was to define activity areas within the Pine River Channel site and she too limited her observations to the five by five foot units of the 1972 excavation and to the Woodland occupation. However, she eliminated N10/W30 and N20/W60 because of considerable disturbance in those units.

Briefly, multiple correlation and regression measures the extent to which variation in a dependent variable is contingent upon, or is explained by, the action of several independent variables. In the case of the Pine River Channel site, variables chosen were; (1) debitage, (2) finished stone artifaces and cores, (3) utilized and retouched flakes, and (4) ceramic sherds. Debitage was selected as the dependent variable. The final regression equation is Y_p = .006792 + (.37488178) x artifacts,cores + (.15108134) x utilized and retouched flakes + (.07601675) x sherds and the final multiple R value is .59277 with R^2 being .35138. This means that only around 35 percent of the variation in the occurrence of debitage at the Pine River Channel site is "explained" by the occurrence of artifacts and cores, utilized and retouched flakes, and ceramic sherds. Thus the variables used together did not go far in "explaining" the dependent variable. The degree to which each of these affects the presence of debitage in order of their importance is indicated by the Beta weights of .4483919 for artifacts and cores, .2347727 for

utilized and retouched flakes, and .1278659 for ceramic sherds.

The analysis became more fruitful for ascertaining the presence of activity areas at the Pine River Channel site when the residuals from regression were examined. These measure the difference between actual values observed and values predicted from the regression equation. The patterning of residuals over space may indicate the effect of variables other than those included in the regression equation (Yeates 1968:66). This was the situation at the Pine River Channel site. Three cases, or 5 percent, appeared as anomolous when they were plotted on a map of the site and Sabo was able to explain them through using additional information. Since all deviant cases had very large amounts of debitage, Sabo reasoned that this might indicate loci of tool making activities so she plotted the distribution of hammerstones and cores on a map of the site. Almost all hammerstones and 47 out of 50 cores occurred in or near the five by five foot units yielding the greatest quantity of debitage, thus indicating her suspicions were correct. Sabo concluded that there were three areas, with limits based on the size of experimentally produced chipping areas, where stone tool making occurred along the bluff edge. These coincide fairly well with the findings resulting from the use of chi square which did not take amounts of debitage into account (Fig. 86). The discrepancy that occurs between the two can

be explained as reflecting a differentiation between the production of suitable falkes and bifacial blanks from cores and the final finishing of stone tools as was suggested by the chi square tests.

In summary then, it appears that in general stone tool making occurred near the bluffs at the Pine River Channel site. Though all steps in the process took place near the bluff edge, there is some indication that initial chipping and final finishing of stone tools did not necessarily occur at the same time or locality.

In addition there is evidence that household activities were generally performed in areas separate from chipping activities. Thus most postmolds, all "domestic" hearths and a majority of 744 of the 746 bones plus 84 of the 94 seeds of prehistoric origin were found in units outside the chipping areas.

SUMMARY AND INTERPRETATIONS

Components

In reviewing the temporal distribution of occupations at the Pine River Channel site, it will be recalled that artifacts were found dating from the Archaic, the Middle Woodland and the Late Woodland. Though an attempt to isolate temporal components was only partially successful, some observations can be made about each one.

Table 47.--Features--Pine River Channel Site.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
6	NE¼ S10/W60	3.5' x 2.5' x 2.4'	elongate, oval	debitage-315, cores-2, bifaces-2, micra-2, small body sherds-2, Mackinac Ware-2, fire-cracked rock-80 (8 oz.) blackberry/raspberry (Rubus sp.)-1 American elder (Sambucus canadensis)-1 historic seed bead-1	Archaic hearth Class I
9	SE¼ S10/W60	3.0' x 2.5' x 1.1'	elongate, oval	debitage-8, core-1, small body sherd-1, fire-cracked rock-52 (4 oz.) huckleberry (Gaylussacia baccata)-1, American elder (Sambucus canadensis)-1	Archaic hearth
10	N½ S10/W60	3.0' x 2.2' x 1.2'	elongate, oval	debitage-41, core-1, groundstone-1, small body sherds-12, large body sherds-18, fire-cracked rock-43, (1 1/8 lbs)	Archaic

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 2			
11	SW¼ S10/W70	6.1' x 2.1' x .7'	semicircular	debitage-588, lanceolate knife-1, projectile tip-1, core-1, groundstone-1, fire-cracked rock-136 (11½ lbs.), mammal bone-1	Archaic hearth Class I
. .	NE¼ S10/W70	3.7' x 3.4' x 1.2'	. .	debitage-202, core-1, bifaces-2, utilized flakes-1, retouched flakes-1, projectile tips-2, small body sherds-2, Pine River Ware-1	Archaic hearth Class I
. .	NW¼ N0/W70	. .	. .	debitage-66, utilized flakes-3, retouched flakes-3, historic ceramics, fire-cracked rock-613 (91bs. ½ox.)	Archaic hearth Class I
. .	NE¼ N0/W70	. .	. .	debitage-124, retouched flakes-3, hammerstone-1 mica-5, small body sherds-1, fire-cracked rock 494 (21 3/41bs.)	Archaic hearth Class I

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
			Features--Pine River Channel Site 3		
. .	NW¼ NO/W80	3.2' x 2.2' x 1.3'	elongate, oval	. .	Archaic hearth Class I
1	S½ NO/W70	5.9' x 2.0' x .9'	irregular, elongate	debitage-1016, core-1, biface-1, utilized flake-1 retouched flakes-3, slate fragment-1, large body sherds-106, small body sherds-33, coal, fire-cracked rock-63 (111bs. 13ozs.)	Clay deposit Class II
3	NE¼ NO/W80	3.0' x 1.4' x .3'	irregular, elongate	debitage-209, large body sherds-2 small body sherds-42, Mackinac Ware-1, fire-cracked rock-11 (½oz.)	Clay deposit Class II
4	SE¼ N60/W40	4.7' x 2.8' x .9'	irregular circle	debitage-1187, cores-2 bifaces-3, large body sherd 61, small body sherds-93, Laurel Ware-1, Mackinac Ware-1, fish bone-1, bearberry (Arctoslaphylos uva-ursi)-44, hawthorn (Crataegus sp.)-1, sumac (Rhus sp.)-1, dock (Rumex sp.)-2	Domestic hearth Class III

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
			Features--Pine River Channel Site 4		
65	SE¼ N30/W40	3.3' x 2.9' x 1.4'	circular basin	black, organic sand, rocks, debitage-3339, cores-5, bifaces-1 utilized flakes-21, retouched flakes-4, scraper-1, graver-1, notched slate-1, quartzite fragments-3, large body sherds-4, small body sherds-50, fire-cracked rock-209 gr. unidentified bone-8	Domestic hearth Class III
27	NE¼ N50/W30 and SE¼ N60/W30	2.4' x 1.4' x ?	circular basin	dark gray sand, rocks, debitage-603, cores-2 biface-1, utilized flakes -27, retouched flakes-4 knives-2, projectile-Class III, Type B, var.1) -1, projectile tip-1, celt-1, large body sherds-7, small body sherds-86, Mackinac Ware-1, fire-cracked rock-17 gr., bone-24, fish-4, raccoon (Procyon lotor)-1 (possible 2)	Domestic hearth Class III

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
			Features--Pine River Channel Site 5		
24	NO/W50	? x 1.9' x 1.3'	angular basin	black sand, rocks, debitage-382, utilized flakes-23, retouched flakes-2, core-1, scraper-1, quartzite fragments-2, large body sherds-3, small body sherds-1, charcoal, fire-cracked rock-25 (119 gr.)	Domestic hearth Class III
48	NE¼ N60/W10	4.4' x 2.3' x 1.6'	basin	black sand, rocks debitage-468, cores-3, bifaces-4, utilized flakes-29, retouched flakes-6, scraper-1, projectile tip-1, projectile base-1, projectile (Class III, Type B, var.1)-1, large body sherds-72, small body sherds-218, Mackinac Ware-2, Juvenile Mackinac Ware-1, juvenile ware-1, charcoal, fire-cracked rock-2 (4.3gr.), snail-1, mammal-2	Domestic hearth Class III

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 6			
25	SW¼ N0/W50	3.1+' x 2.6' x ?	angular pit	black sand, rocks, debitage-579, cores-10, bifaces-2, utilized flakes-16, retouched flakes-3, large body sherds-11, small body sherds-52, charcoal, fire-cracked rock-213.5 gr., bone fragments-1, fish-1	Domestic hearth Class III
35	SE¼ N10/W60	3.3' x 1.8' x 1.0'	irregular basin	brown clay and black organic sand, debitage-309, utilized flakes-3 charcoal, fire-cracked rock-14 (27 gr.), bone-5	Chipping Area hearth Class IV
45	S½ N20/W60	3.6' x 2.7' x .9'	irregular double basin	black organic, sand, debitage-192, charcoal, fire-cracked rock-5 (46 gr.)	Chipping Area hearth Class IV
16	NE¼ N10/W70	2.2' x 1.8' x .9'	irregular	black sand, debitage-48, charcoal, small body sherds-4, quartz-1	Chipping Area hearth Class IV

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 7			
13	SW¼ N20/W50	2.8' x 2.15' x .78'	irregular basin	black sand, debitage-508, biface-1, utilized flakes-16, retouched flakes-3, fire-cracked rock-4	Chipping Area hearth Class IV
10	NE¼ N20/W50	2.15' x 1.5' x .7'	basin	black sand, rocks, debitage - 73, charcoal, quartz flake-1, fire-cracked rock-15 (260 gr.)	Chipping Area hearth Class IV
61	NE¼ N50/W30	? x ? x .67'	basin	black sand, rocks debitage-88, core-1, utilized flakes-2	Chipping Area hearth Class IV
66	NE¼ Test Pit 1	1.25' x .7' x .8'	circular u-shaped pit	black sand, debitage-20 utilized flakes-2, charcoal, bone-3	Chipping Area hearth Class IV
29	SE¼ N10/W50	1.4' x 1.1' x .6'	u-shaped pit	black sand, rocks, debitage-84, utilized flakes-small body sherds-5, quartzite-4 fire-cracked rock-1 (5 gr.)	Chipping Area hearth Class IV

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 8			
30	SE¼ N10/W50	? x ? x .91'	u-shaped pit	black sand, rocks, debitage-56, utilized flakes-13, fire-cracked rock-1 (171gr.)	Chipping Area hearth Class IV
29 & 30	SE¼ N10/W50			debitage-2914, cores-2, utilized flakes-7, retouched flakes-2, knife-1, projectile bases-2, projectile tip-1, projectiles (Class I, Type B)-2, slate frag.-1, hammerstone-1, fire-cracked rock-3 (59 gr.), bone-1	
47	NW¼ N60/W10	.75' x .75' x .48'	circular, conical	black sand	
41	SW¼ N60/W20	1.2' x 1' x .42'	angular, conical	dark gray to black sand, rocks, charcoal, debitage-33, bone-1, dock (Rumex sp.)-1	hearth
37	NE¼ N60/W30	1.1' x 1.1' x .38'	circular, conical	black sand, charcoal	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 9			
15	SW¼ N10/W70	2.4' x 1.4' x .41'	irregular, u-shaped basin	black sand, red ochre stain?, sterile sand instrusion, debitage-17, mammal-2	
43	SW¼ N60/W20	2.0' x 1.65' x .51'	irregular, conical	black sand, charcoal, debitage-28, fire-cracked rock-8 gr.	
44	SE¼ N60/W20	1.85' x 1.6' x .44'	circular, basin	black sand, charcoal debitage-372, utilized flakes-3, small body sherds-13, large body sherds-4, Mackinac Ware-1, bone-137, fish bone-11, bearberry (Arctoslaphylos uva-ursi)-1, Chenopodium album-1	cooking hearth
36	NE¼ N10/W60	1.36' x ? x ?	basin?	black sand, charcoal, debitage-383, cores-2, biface-1, utilized flakes-6, retouched flakes-1, fire-cracked rock, bone-8	hearth

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 10			
39	N0/W50	3.7' x 2.1' x 1.5'	angular basin	black sand with mottled gray and brown lenses to 2.1', charcoal, debitage-183, utilized flakes-4, retouched falkes-2, fire-cracked rock-1 (6.5 gr.), bone-13, shell-3	hearth
32	W½ N60/W30	3.3' x ? x 1.85'	basin	black with gray sand in top depression and small lense white sand at .1' from bottom, debitage-104, biface-1, sand cherry (Prunus pumila)-3	
14	SE¼ N20/W50	1.05' x .9' x 1.35'	basin	dark gray sand, rock, debitage-115, core-1, charcoal, fire-cracked rock-4, small body sherd-1, large body sherd-1, bone-82, fish bone-6, snail shell-4, dock (Rumex sp.)-1	cooking hearth

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 11			
31	SE¼ N10/W50	1.6' x .8' x 1.4'	basin	black sand, rocks, charcoal, debitage-1407, biface-1, utilized flakes-3, large body sherds-31, bone-5, fire-cracked rock-20	hearth
71	SE¼ N30/W30	? x 1.2' x 1.24'	angular basin	black sand, charcoal, debitage-45, small body sherds-81, fire-cracked rock-7 (130 gr.), shell-3	hearth
72	NW¼ N30/W30	? x 1.85' x 1.23'	u-shaped basin	black sand, rock, debitage-67, large body sherd-1, small body sherds-17, Mackinac Ware-1	
60	NW¼ N50/W30	? x ? x .44'	irregular basin	light black sand, rocks, debitage-19, utilized flakes-1, leadplant (Amphora canescens)-1	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 12			
11	NE¼ N20/W50	? x ? x .6'	conical pit	black sand with yellow lense, debitage-46, utilized flakes-1, retouched flakes-2, projectile tips-1, projectile bases-2, quartz-2, large body sherd-1, Mackinac Ware-1, fire-cracked rock-1 (22 gr.)	
17	E½ N20/W50	3' x 1.4' x .5'	circular basin	black sand, debitage-1 bone fragments-39, snail-1	hearth
62	NW¼ N20/W40	5.9' x 2.4' x .68'	circular basin	black sand, debitage-141, utilized flakes-2, charcoal, fire-cracked rock-15 (109 gr.) bone-3	hearth
12	NE¼ N20/W50	? x ? x .5'	irregular basin	black sand, debitage-210, utilized flakes-6, small body sherd-1, charcoal, fire-cracked rock, bone fragments	hearth

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 13			
23	NE¼ N20/W50	? x 1.6' x .98'	angular basin	black sand, rocks	
33	NW¼ N60/W30	3.5' x 2.8' x .95'	double basin	black with underlying gray sand, debitage-10	
21	SE¼ N20/W50	.45' x .3' x .67'	circular basin	black sand, debitage-35, bone-1, mammal-1	
54	SE¼ N50/W30	3.85' x 1.9' x .7'	angular basin	black sand, bone-1	
53	SW¼ N50/W30	2.25' x 1.95' x .97'	conical pit	dark brown sand, debitage-224, utilized flakes-10, small body sherds-54, fire-cracked rock-7 (1.5gr.), blackberry/raspberry (Rubus sp.) -1, American elder (Sambucus canadensis)-1	
53 & 54	S½ N50/W30			Whitetailed Deer (Odocoileus virgiansus)-1	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 14			
55	SE¼ N50/W30	1.5' x .7' x .78'	conical pit	light black sand, debitage-45, biface-1, small body sherd-1, charcoal, gooseberry/currant (Rhibes sp.)-1, American elder (Sambucus canadensis) -1	
57	NW¼ N50/W30	3.6' x 2.0' x .9'	conical pit	dark brown sand, rocks, debitage-199, retouched flakes-1, small body sherds-6, Mackinac Ware-1, charcoal, quartzite, Hawthorn (Cretaegus sp.)-1	
50	NE¼ N10/W40	3.1' x 2.1' x .92'	basin	gray-black sand debitage-246, utilized flakes-6, charcoal	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
			Features--Pine River Channel Site 15		
52	NW¼ N20/W30	4' x 1.5' x .71'	basin	gray sand, debitage-349, cores-3, utilized flakes-5, retouched flakes-1, fire-cracked rock (42.2 gr.), Mackinac Ware-1, bearberry (Arctostaphylos uva-ursi)-1, pin cherry (Prunus pennsylvanicus)-1	
67	NE¼ Test Pit 1	1.95' x 1.3' x ?	. .	dark gray/black sand debitage-22, utilized flakes-10, quartzite-2, small body sherds-2, large body sherds-2, charcoal, fire-cracked rock, pin cherry (Prunus pennsylvanicus)-5, sand cherry (Prunus pumila)-1	
69	NE¼ Test Pit 1	2.45' x 1.7' x .99'	circular basin	dark gray/black sand, debitage-180, core-1, utilized flakes-5, retouched flakes-1, small body sherds-2, large body sherds-1, fire-cracked rock-4 (15 gr.)	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 16			
49	NE¼ N20/W30	4.0' x 3.5' x .66'	irregular basin	dark gray sand, rocks, debitage-250, core-1, biface-1, utilized flakes-6, retouched flakes-3, small body sherds-19, decorated sherds-1	
63	SW¼ N20/W40	3' x 1.6' x .58'	basin	gray sand, rocks, debitage-248, small body sherds-2, fire-cracked rock-1 (10.2gr.)	
70	SW¼ N20/W40	? x ? .58'	u-shaped pit	gray sand, rocks, debitage-63, charcoal, historic artifact-1, fire-cracked rock-2 (18gr.), shell, pin cherry (Prunus pennsylvanicus)-1	
46	SW¼ N20/W70	2.3' x 2.1' x .5'	basin	gray sand, rocks, debitage-219, small body sherds-1, charcoal, fire-cracked rock (95gr.)	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site			
22	SE¼ N10/W70	.95' x .95' x .56'	circular u-shaped basin	orange sand	
51	NW¼ N10/W40	2.2' x 1.9' x .7'	basin	black sand, debitage-1159, core-1, biface-1, utilized flakes-2, retouched flakes-2, projectile tip-1, projectile-1 Mackinac Ware-1, small body sherds-33, large body sherds-8, fire-cracked rock-1 (167 gr.), groundstone chopper-1, cache blades-9, bunchberry (Cornus canadensis)-1 sand cherry (Prunus pumila)-2, blackberry/ raspberry (Rhubus sp.)-1	hearth ceremonial, chipping
56	SE¼ N50/W30	2.6' x 1.8' x .64'	conical pit	light black sand, debitage-1688, bifaces-2, utilized flakes-22, retouched flakes-1, drill-1, grooved slate-1, charcoal, small body sherds-45, large body sherds-13, fire-cracked rock (48 gr.)-5	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 19			
42	NE¼ N60/W20	1' x 1' x .75'	circular u-shaped pit	red ochre, debitage-629, utilized flakes-13, small body sherds-2, fire-cracked rock-13 (175 gr.), bearberry (Arctostaphylos uva-ursi)-1, pin cherry (Prunus pennsylvanicus)-1	fire pit
34	SE¼ N10/W50	1.8' x .8' x .84'	oval u-shaped pit	black sand, rocks, debitage-1147, small body sherds-20, large body sherds-1, charcoal, fire-cracked rock-5 (24.4 gr.)	fire pit
26	NW¼ N0/W50	? x ? x 1.5'	basin	rocks, debitage-159, cores-3, utilized flakes-7, retouched flakes-1, projectiles (Class III, Typa A, var. 1; Class I, Type A, var.2)-2, small body sherd-1, bone-1	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 20			
64	SE¼ N30/W40	4.2' x 3.1' x .58'	basin	dark brown sand, rocks, debitage-438, cores-2, small body sherds-2, fire-cracked rock-15 (184.1 gr.), red seed bead-1, bone-3, shell-6	
38	NE¼ N60/W30	? x ? x 2.18'	. .	debitage-232, biface-1 part A-debitage-59, charcoal, fire-cracked rock-3 (37 gr.) sterile sand part B-debitage-42, charcoal, fire-cracked rock-4 (43 gr.), paper, historic corn (Zea maize)-1	twice used and/or disturbed pit
. .	N10/W50	? x ? x ?	. .	debitage-258, cores-2, utilized flakes-7, fire-cracked rock-7 (80 gr.)	

Table 47.--Continued.

Feature Number	Provenience	Maximum Dimensions	Shape	Contents	Possible Function
		Features--Pine River Channel Site 21			
7	NE¼ N0/W80	2.1' x 2' x .3'	circular	black sand, debitage-99, biface-1, small body, sherds-1, mica-3, metal?, fire-cracked rock 87 (18 oz.), beech (Fagus grandiflora)-1, huckleberry (Gaylussacia baccata)-1 juniper (Juniperus virginiana)-1, sand cherry (Prunus pumila)-2, choke-cherry (Prunus virginica)-1, crab apple (Pyrus coronaria?)-1, mammal-1	hearth cooking
5	NW¼ S10/W60	. .	. .	debitage-5 small body sherds-140, large body sherds-41	pottery concentration possibly associated with hearth Feature 12

Archaic

The Archaic component at the site must have occurred late in the period, since the site is located below the Nipissing beach. Thus it could not be occupied until the waters began to drop after about 2250 B.C. A date of around 1500 B.C. seems reasonable and is compatible in time with the Turkey-tail projectile point recovered from the site.

The only features associated with the Archaic were the hearths which occurred in the southwest portion of the site. It is possible too that some of the postmolds found there dated from the Archaic as well. This evidence suggests that the Archaic occupation consisted of a series of small campsites. The recovery of plant remains from the hearth features implies the preparation and consumption of food took place there. In addition, cores and other chipped stone from the hearths attests to the manufacture of stone tools.

Whether or not the Archaic occupation was more extensive than that indicated is unknown. Artifacts from this time were found in other portions of the site. However, there were no other features, though an attempt was made to find them. It is possible that they were eroded away, but on the basis of the present evidence, it seems likely that the Archaic was a localized component.

Middle Woodland

With regard to the Middle Woodland occupation, it is apparent that it was minimal, based on the relative amount of artifacts assignable to it. Additionally, the Middle Woodland component at the Pine River Channel site seems, on stylistic evidence, to have occurred at the later end of the Laurel period. Highly decorated body sherds of Laurel Ware are not found in the Pine River Channel assemblage as they are at other Laurel sites. The presence of an Havana Ware sherd as well as one imitative of Illinois Middle Woodland suggests that Laurel component dates from at least A.D. 400. If it is indeed the case that the Middle Woodland component is late, then apparently the site was not utilized for some time after the Archaic.

Late Woodland

The Late Woodland is quantitatively the largest occupation at the Pine River Channel site. It is represented by more than one component beginning at the end of the Middle Woodland and continuing through the Juntunen Phase. However, only a few pottery rims were found representing the later Bois Blanc and Juntunen Phases. Therefore the time of greatest site use was from A.D. 600 to 1,000 during the earlier Mackinac Phase and the immediately preceeding period characterized by Pine River Ware.

The presence of Pine River Ware is of importance because it leads to the conclusion that the Late Woodland

in the study area was largely a local development. Not only does Pine River Ware possess attributes of both Laurel and Mackinac Phase ceramics, but a patterned sequence of stylistic change can be demonstrated. Thus continuity is seen from the Middle Woodland through the early Late Woodland. On the basis of this evidence it appears that the Mackinac Phase originated in situ in northern Michigan and is immediately preceeded by the Pine River Phase. The Pine River Phase begins at the end of the Middle Woodland, about A.D. 600 and ends about A.D. 800.

Site Utilization

A synthesis of the evidence from the Pine River Channel site provides a fairly complete picture of the nature of site occupation, at least for the Woodland periods. It seems clear that site occupants took advantage of the opportunities provided by locating in an ecotonal setting to procure the varied resources it offered as they became available. In addition, the artifact assemblage suggests that activities were not solely directed toward obtaining food. For example, the manufacture of chipped stone tools was certainly an important task performed at the site.

The analysis of faunal and floral remains indicates that during the warm season a variety of food resources including mammals, fish, birds, turtles and plants were obtained from both aquatic and terrestrial

habitats near the site. Certain resources, particularly fish and plants were probably obtained during successive periods of availability in abundance. Certainly, on the basis of the kinds of faunal and floral remains found, the site was occupied at times from the late spring to early fall. However, a winter occupation when only mammals and fish were available cannot be excluded as a possibility.

Artifacts found at the site likewise attest to the fact that a wide range of food resources were procured and that both these and their byproducts were processed at the site. Thus projectile points found were certainly in part intended for hunting. The netsinker and fishhook are associated with different techniques for fishing and the two groundstone pestles were probably used for grinding plants. Pottery was found with burned cooking residue and chipped stone knives and scrapers plus copper awls imply the preparation of meat and hides. Finally, some hearths were apparently connected with household activities including the utilization of food resources.

Activities other than the actual procuring and processing of food resources and their byproducts were also part of life at the Pine River Channel site. Certainly the evidence indicates that the manufacture of stone tools was one of the most important of these. Not only was it possible to delineate areas where this took place, but 99 percent of the ground and chipped stone at the site,

including hammerstones, anvils, debitage, cores and unfinished bifaces were associated with this activity.

An aspect of some importance about stone tool manufacturing lies in the fact that by following a patterned series of options, cores were being utilized so as to obtain the maximum flakes possible from each one. Further, by first working bifaces in places where breakage was most likely to occur, it was possible to avoid wasting energy in case of a break. Thus the flint knappers at the site were placing some importance on the efficient use of raw material. They did not waste it, nor did they expend unnecessary energy in processing it. Since most of the chipped stone at the site is Norwood chert and the quarry from which it could be obtained is about 10 miles by water from the site, it seems safe to conclude that the manufacture of stone tools was an important enterprise because of proximity to the quarry. However, the expenditure of energy involved was regulated so as to avoid unnecessary effort.

It is possible too that pottery was manufactured at the Pine River Channel site. The evidence for this is somewhat indirect. However, it is possible that two clay features (Features 1 and 3) were repositories for raw material. Further, if the miniature pots were indeed the product of young girls learning the process, the large number of them found suggests that they, at least were made there. Finally, the presence of celts, adzes, drills and

gravers implies work with wood and bone, though no artifacts of these materials were recovered.

Only limited conclusions can be reached about social aspects of life at the Pine River Channel site. Ethnographic sources for the historic period postulate a division of labor based on men doing most of the hunting, fishing and flint knapping, while women collected plants, processed hides and made pottery (Kinietz 1965). Evidence for these activities indicates, by analogy, that the site was occupied by both sexes. If this is correct, it can be concluded that adult members of the group actively contributed to subsistence and other kinds of activities. Further, the miniature vessels attest to the presence of children at the site and by implication, family groups.

APPENDIX B

FORMAL DESCRIPTION OF PINE RIVER WARE

APPENDIX B

FORMAL DESCRIPTION OF PINE RIVER WARE

Pine River Ware: Vessel Sample = 47
Pine River Channel Site-33
Portage Site-14

Temper: Grit ranging in size from .5cm. to over 2cm.

Manufacture: Normally coiled.

Surface Treatment: Smoothed or cordmarked.

Form:

Rim: Profile is generally straight or everted. No castellations or collars occur.

Lip: Square, round or bevelled in shape with no eversion of lip. Thickening of lip is rare and minimal when it occurs.

Base: Unknown.

Decoration exterior:

Technique: Punctation predominates. Incising occurs on some vessels.

Tools: Plain, twisted cord, cord-wrapped object, knotted cord.

Motif: The major decorative technique consists of punctations applied to the vessel rim in specific ways. Thus punctations will be found at the lip, about 1.5cm. below the lip or at both locations with no decoration between. Alternatively, there may be two or

more rows of punctations beginning at least 1 cm. below the lip. Often a lower row of punctations will have a vertical "trailed" effect.

This is produced by dragging the tool used upon removal from the clay. At least one vessel has v-shaped incised lines below the lower row of punctations, with the apex of each V immediately below each punctate.

Incised decoration in the form of cross-hatching is the only other major decorative motif observed. This is found about 3cm. below the lip. No other decoration occurs.

Decoration, interior:

Occasional interior decoration may occur. This usually consists of vertical cord-wrapped object impressions.

Geographic range: Lower Peninsula of Michigan north of Grand Traverse Bay. Probably extends to Upper Peninsula as well.

Chronological range: Begins at the end of the Middle Woodland and preceeds the Mackinac Phase. Occurs stratigraphically between Laurel and Mackinac Wares at the Portage site. Duration is from about A.D. 600 to A.D. 800.

Relationships: Since Pine River Ware is demonstrably intermediate in form and style between Laurel and Mackinac ceramics, it is clearly a northern ware. However, the presence of cross-hatching suggests some relationships to the south. This motif is seen on Allegan Cross-hatched in southwestern Michigan (Rogers 1972:96). However, as it appears on Pine River Ware it is dinstinctive because the design occurs considerably below the lip.

Types of Pine River Ware

Pine River Plain: Exterior rim decoration is absent.

Pine River Divided Punctate: Exterior rim decoration consists of one row of punctations that extend onto the front of the lip. A second row of punctations occurs from 1 to 2.5cm. below the lip. The intervening rim area is undecorated.

Pine River Punctate: Exterior rim decoration consists of one row of punctations.

Variety one: A single row of punctate impressions is found about 1.5cm. below the lip.

Variety two: A single row of punctate impressions occurs at the top of the rim and extends onto the front of the lip.

Pine River Multiple Punctate: Two or more rows of punctations occur beginning about 1.5cm. from the lip.

Pine River Cross-hatched: The single rim of this type has an incised cross-hatched design beginning at 3.6cm. below the lip. This band is at least 4cm. wide. Though the only rim was found at the Portage site, numerous cross-hatched sherds occurred at both the Portage and Pine River Channel sites. They probably belong to this type of Pine River Ware. Because the decoration occurs below the upper rim, it becomes separated from the rim when breakage occurs along coil lines.

APPENDIX C

POTTERY ATTRIBUTES

APPENDIX C

POTTERY ATTRIBUTES

Temper
- grit
- shell or limestone

Paste elements
- temper size
  - fine = 0.1-1.0
  - medium = 1.1-2.0
  - coarse = 2.1+

Lip Profile
- flat
- rounded
- interior bevel
- exterior bevel
- splayed
- rolled
- thickened

Rim Thickening Elements
- present
- absent

Rim Profile
- straight
- everted

Lip Form
- flat
- castellated

Lip Treatment
- present
- absent

Direction of Application
- longitudinal
- transverse
- oblique
- zigzag

Location of Treatment
- interior edge
- exterior edge
- interior and exterior edge
- top
- interior edge and top
- exterior edge and top
- exterior edge, top and interior edge

Mode of Application
- punctate
- incised
- impressed
- smoothed
- stab-drag

Tool
- cord-wrapped paddle
- cord-wrapped stick
- plain
- paddle edge
- knot
- dentate
- fabric or net

Interior Decoration
- present
- absent

Direction of Application
- oblique
- vertical
- horizontal
- chevron
- cross-hatch

Mode of Application
- punctate
- stab-drag
- impressed

Tool
- plain
- cord
- cord-wrapped stick
- paddle edge
- other

Exterior Decoration
- present
- absent

Number of Bands: Same Mode and Tool
- one
- two
- more than two

Orientation
- vertical
- horizontal
- oblique right
- oblique left
- zig-zag
- crosshatch

Continuity
- continuous
- linear closely spaced
- linear widely spaced

Location
- treatment up to lip
- treatment away from lip
- treatment over collar

Punctation
- only decorative element
- border
- circular
- crescent
- deep (raised interior nodes)
- shallow

Mode of Application
- impressed
- stab-drag
- incised
- nodes from interior punctation

Tool
- single cord
- twisted cord
- toothed tool
- brush
- cord-wrapped cord
- cord-wrapped stick
- paddle edge
- plain

Surface Preparation
- cordmarked
- fabric
- plain
- smoothed-over cord-marked
- smoothed
- brushed
- roughened

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